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Operational Research in the Evaluation

of Social Security Benefit Policies

by

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Dedication

This thesis is dedicated to my wife, Jean, without whose support and encouragement it would never have materialised.

Abstract

This thesis makes it possible for future reforms of the social security system to be based on the best available information. An approach to benefit policy analysis is defined and a technique for processing available data as required is identified. Progress on evaluating policies more faithfully in accord with expected performance rather than assuming perfect implementation is made.

Having reviewed the development of the social security system and previous contributions to benefit policy analysis the requirements of an information system are defined. Available data sources are evaluated. This analysis highlights the complementary nature of the qualities of the Family Expenditure Survey and specialised sources. The use of iterative proportional fitting procedures to combine these sources in such a way as to exploit their strengths and minimise the impact of their weaknesses is advocated. Validation tests show the approach results in good estimates. Furthermore the approach is easy to understand and lies well in an analytic process geared towards increasing involvement of non-technical personnel. The same approach can be used to analyse the alternative benefit regimes for the distributional implications of hypothesised trends in aggregate variables.

The need to consider operational issues when analysing policies is recognised. Two aspects of this problem are considered. An analysis of appeals data led to rankings of aspects of the benefit entitlement assessment procedure in terms of difficulty caused and persistence with which problems arose. The second analysis is a pilot study of inter-regional differences in population characteristics and aspects of benefit implementation to identify ways of improving the operational system generally. An important aspect of this analysis is the presentation of data on computer drawn maps - a further attempt to increase participation in the analytic process. Further development of this work should enable the evaluation of policy alternatives in terms of expected performance rather than on the assumption of perfect implementation.

Chapter 1

Introduction

The purpose of the work described in this thesis is to make it possible for future reforms of the social security system to be based on the best information available. An approach to benefit policy analysis is defined and a technique for processing the available data as required is identified. Progress on evaluating policies more faithfully in accord with their expected operation rather than on the assumption of perfect implementation is also made. The need for further work in this field is called for.

The work has been motivated both by the widespread political support for major reform of the social security system and by a number of calls from various quarters in recent years for improved analysis and planning of the system. The Social Services Committee (1980) called for more strategic planning at the Department of Health and Social Security (DHSS). Blackstone (1983) has argued for the definition of cross-programme social priorities and the establishment of a mechanism to review progress towards their fulfilment. Habib (1979) has called, at an international level, for changes in the way in which information systems to examine social security issues are

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constructed and presented, leading to new decision making processes. Politicians including Patrick Jenkin (Conservative Party, 1977) and Frank Field (1980) have called for family impact statements which describe the net distributional implications of social policies on individual families. Similar calls have come from the Study Commission on the Family (Craven _et al_. 1982) and the Family Services Unit (1983).

Chapter 2 sets out a brief history of the development of financial provision for the unemployed in Britain, concluding with a short description of the existing provisions. The rationale for presenting this material is to increase the awareness of potential analysts of social security policies of the historical perspective and the problems encountered in the past. The specific area of provisions for the unemployed is focussed upon because of its more controversial nature than other aspects of the system and because it has an important influence on the overall quality of the service of the system.

Chapter 3 reviews the previous contributions made by the Operational Research Services (ORS) division of the DHSS to social security policy analysis and describes briefly those models existing in other DHSS divisions and elsewhere in Government for the purposes of evaluating benefit policies. The potential advantages and political difficulties of establishing clear objectives for the

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system are then discussed and, in the concluding section of the chapter, a possible future approach to policy analyses is proposed which seeks to circumvent these problems.

Chapter 4 provides an overview of the major possible policy trends in social security being considered by political parties and interested pressure groups. This material is intended to serve as background information for analysts to place the planning of an information system for benefit policy analysis on a firmer foundation. The chapter also seeks to identify common questions raised by the wide range of objectives and policy proposals being put forward by the various political groups.

Having defined the boundaries of analyses for which OR might be of some assistance in future policy evaluations in Chapter 4, Chapter 5 then develops this further and specifies the requirements of an information system to support the necessary analysis and the implications of this for choosing suitable data sources for the information system. There would appear to be a strong case for basing the information system on a wide ranging survey of a representative sample of the general population. The most suitable such survey currently available is the Family Expenditure Survey (FES). Accordingly Chapter 6 describes the FES in detail and

discusses its weaknesses in relation to benefit evaluation studies.

The complementary nature of the strengths and weaknesses of the FES and more specialised data sources is highlighted and the advantages of combining these so as to exploit the strengths of each whilst minimising the impact of their inherent disadvantages are clear. Chapter 7 introduces a computational procedure which seeks to achieve this aim and the final section of the chapter sets out the analytic framework into which it is envisaged the procedure would fit. The quality of the results of this approach is discussed in Chapter 8 where FES data is combined with varying amounts of information from the Annual Statistical Enquiry (ASE) of Supplementary Benefit claimants to reproduce known data.

A widespread level of concern with operational aspects of the social security system is mentioned at various points in the thesis, and the need to tackle them at the policy level is also recognised. Chapters 9 and 10 therefore describe work carried out on these aspects of the policy analysis problem. Chapter 9 concerns an analysis of the operational complexity of various dimensions of the benefit entitlement assessment procedure based on data relating to the appeals procedure. The analysis ranks these dimensions according to the degree of difficulty which they have caused and classifies them according to

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whether they have been persistently problematic or whether they have caused problems in the short term but not in the longer term as the laws were more closely defined.

Chapter 10 then adopts a different approach to analysing related problems. This chapter describes work done by way of a pilot study on the analysis of inter-regional differences in population characteristics and aspects of the implementation of the benefit system such as levels of take-up. Such an approach might lead not only to a reduction in the level of any regional variations in policy implementation but also to insights into ways in which service implementation might be improved generally. The data used in the analysis are presented on shaded maps and it is hoped that such an approach advances the vital aspect of presenting the results of policy analyses in such a way that they can be fully appreciated by their recipients and such that they serve as a starting point and continuing focus for debate and dialogue between analysts and policy makers - and possibly Local Office staff also.

Chapter 11 draws together the main conclusions of the research.

Chapter 2

The Development of Financial Provision During
Unemployment

2.1 Motivation

Britain's social security system has been nearly 400 years in the making. The foundation stone was laid in 1597 when much of the legislation which went to make up the Elizabethan Poor Law reached the statute books - where it was to remain for 340 years.

The original Poor Law, the so-called 'Act of 1601', aimed to suppress 'vagrancy and idleness' at a time when feudalism was coming to an end and society was changing radically.

Following an endless procession of piecemeal changes the Department of Health and Social Security (DHSS) is now responsible for administering benefits valuing some 33 billion pounds a year at a cost of some 1400 million pounds to administer. These benefits aim to prevent people from suffering excessive financial hardship as a result of one or more of the numerous eventualities which cause a temporary or permanent abatement of earned income. They are also being used to play an increasing

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part in persuading people to adjust to a society which is changing every bit as radically now as it was at the time of the original Poor Law - by offering grants for training and retraining, by paying re-location expenses, by encouraging early retirement and so on.

The unprecedented rise in unemployment during recent years is straining the system to its limits - this was expressed at the end of 1982 in the form of industrial action amongst benefit office workers who are finding that the present system is becoming increasingly unworkable.

For some time now there has been a clear and growing need for a comprehensive review of the entire income maintenance system and this has received increasing political support from all parties. See for example Labour Party, 1982; Social Democratic Party, 1982; Parker, 1982; Vince, 1983. This was formally recognised in April 1984 when the Government announced that the system was to be examined by four review teams who would be reporting at the end of 1984.

As Watkin explained in his historical review of the health and social services:

> It has been said that armies are always ready to fight the last war never the next, and the same could be said of architects of social

> security systems. The scheme of unemployment
> insurance devised by Churchill and Beveridge
> before the First World War was unable to cope
> with the massive unemployment of the 1920s and
> 1930s. Similarly the chronic inflation of the
> 1950s and 1960s created problems with which the
> post-war system was ill-equipped to deal and
> much hardship was caused, especially to the
> elderly. The contributory principle solved
> certain problems in its day, but brought others
> in its train. Actuarial soundness and social
> justice - at least in the strongly egalitarian
> sense in which the term has been interpreted in
> recent years - seldom marched together.
> (Watkin, 1975: 73).

It is vital that any such review of the system should seek to ensure that the reforms which are suggested should, as far as possible, be designed to tackle the problems of today and tomorrow rather than yesterday. It is also important, however, that the reformers are aware of the problems encountered and mistakes made by their predecessors. Given the record of previous reformers it is not unreasonable to suggest that analysts in general and Operational Research workers in particular ought to have a contribution to make to the debate on the nature of such reforms and so it is important that they too should have an awareness of the historical and political background to the present system.

Although the number of unemployed people in receipt of benefits is around 3 million compared with around 9 million pensioners, as Donnison explains, they account for two-thirds of claims for Supplementary Benefits each year (a proportion which is increasing with the level of

unemployment and a decline in the value of National Insurance benefits), and as such,

> The quality of our service, the morale of its staff and its public reputation all depended heavily on our capacity for dealing with the unemployed. (Donnison, 1982: 67).

It is for these reasons that this chapter sets out a brief history of the financial provision for the unemployed in Britain, concluding with a short description of the existing provisions.

2.2 Early Schemes of Assistance for the Poor

Although relief of some form has been available for the poor since the beginning of the seventeenth century there was only one piece of legislation which sought to provide any positive assistance - and the benevolence shown by this was comparatively short-lived.

That exception was a scheme introduced by the Government under Charles I which was financed by making landowners pay a 'poor rate'. Whilst it did not relax Tudor harshness towards the 'idler and vagrant' it did aim to:

i.   regulate prices and supplies of basic foods and raw materials,

ii.   provide employment or, failing this, maintenance,

for the able-bodied willing to work,

iii. offer education and apprenticeship for children, and

iv. provide cash allowances, medical help and almshouses for the old and infirm.

However, following the Civil War and the Restoration of the monarchy, a new class emerged - the 'self-made man'. These people's new-found wealth meant that they were paying an increasing proportion of the poor rate, and generally resented it - their attitude was typically that the poor were perfectly capable of looking after themselves if only they were to show more initiative and a greater capacity for hard work. This is essentially the same philosophy which is expounded today by those people who believe in the prevalence of scroungers and voluntary unemployment and which is expressed in social security legislation such as the denial of the long term rate of Supplementary Benefit to unemployed claimants.

An example of the new attitude towards the 'indigent poor' as they were now called was the Law of Settlement of 1662. This law meant that if a family so much as looked as though they might be a burden on the rates of the place in which they were living and working they

could be sent away to their place of settlement - that is their own parish.

The combination of the Napoleonic Wars and a succession of bad harvests led to severe hardship at the end of the eighteenth century. In 1795 the Berkshire magistrates met at the Pelican Inn in Speenhamland and decided to modify the Poor Law by introducing a system of allowances financed from the rates to supplement wages of family men on a scale dependent upon the number of children and the price of bread. Other authorities quickly followed their example. Whilst the system did protect the poor it had the unforeseen consequence that farmers saw little incentive to pay a living wage when they knew it would be made up to susbsistence level by the rates.

This famous example illustrates the problems of any form of wage subsidy, and many people fear that if similar measures were introduced in the future then they would inevitably lead to similar consequences. As important, perhaps, is the lesson it offers regarding the need to think through the full implications of proposed policies in advance. It must be regarded as an essential attribute of an analytic system to aid policy making in the future, therefore, that information is provided in such a way as to enable a full consideration to be given to the implications without introducing inertia into the policy making process. This implies that a certain amount of

basic information must be readily available to the analysts.

The following year William Pitt produced a Bill which passed the Committee Stage in the House of Commons but which, in many ways, anticipated the Beveridge proposals made 150 years later. This Bill proposed that district social insurance funds be established to be financed from the poor rates, gifts from wealthy patrons and subscriptions from the insured themselves. Any local resident would be eligible to join - there was even a suggestion of making the scheme compulsory. Benefits were to be paid in sickness and old age and would be dependent upon the amount of subscription paid. Membership was to be transferable between schemes in order to assist in the creation of a national labour market. It was also argued that an additional contribution from public funds would serve as a form of investment because it would result in savings on payments which would have had to have been made eventually to alleviate poverty.

The Depression and unemployment which followed the Napoleonic Wars made the Elizabethan Poor Relief system increasingly expensive even though it offered only minimal protection to the poor. In 1832 a Royal Commission was set up under the chairmanship of Edwin Chadwick to investigate the reform of the Poor Laws. It is generally accepted (Walley, 1972: 22-3) that the

Commission did not undertake an objective investigation but rather set out to collect evidence to support the view of its members that relief for the able-bodied should be abolished. Their 'analysis' was centred on southern England which was still agricultural and had quite different circumstances to the industrial north.

The subsequent legislation, the Poor Law Amendment Act 1834, was based on two principles, those of 'less eligibility' and the 'workhouse test'. The situation of a beneficiary of relief was not to be 'really or apparently so eligible as the situation of the independent labourer of the lowest class'. Relief was to be provided in workhouses which were intended to act as a deterrent - if large numbers of unemployed had used them the system would almost certainly have collapsed. The underlying philosophy was that every able-bodied man was capable of looking after himself and his family and if the alternative was made sufficiently unpleasant then he would.

Although there was initial opposition to the proposals, especially in the north where their implementation was delayed for several years, the approach gradually became the accepted way of dealing with the problem of unemployment. Again one can identify similar attitudes today with a concern for replacement ratios (see Glossary in Appendix 2.1) and the need to maintain incentives to

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work in spite of very high levels of unemployment and the existence of only very few vacancies.

It has always been considered undesirable to enable people to receive more in benefits whilst not working than they might expect to earn if they were working. Whereas some would argue from that point that benefits should therefore be held down to ensure that they are below the lowest wage levels others would say that benefits should aim to provide an acceptable standard of living and it is up to employers to then set wage levels sufficiently high to attract the requisite workforce. Either way it is essential that the tax and benefit systems are properly co-ordinated so as to avoid poverty and unemployment traps developing (see Appendix 2.1).

The 1834 Act had two major consequences, both of which were ultimately undesirable. For the unskilled and irregularly employed worker the alternative to the workhouse was to have large families in the hope that there would eventually be sufficient children to care for them in later life. The skilled workers with regular employment established friendly societies, trades unions and industrial assurance companies to provide for them - but the benefits these paid were meagre and, ironically, the creation of these institutions was to prove a great obstacle to the development of social security in years to come as will be explained in the following section.

2.3 A New Approach

By the end of the nineteenth century conditions were favourable for a completely new approach to the treatment of the poor. There was peace, increasing prosperity, a greater awareness of the conditions of the poor and in 1884 the Third Parliamentary Reform Bill extended the vote to around two-thirds of the adult male population.

In 1883 in Germany, Bismarck introduced state supported schemes for earnings-related insurance for sickness, disablement and old age. For the newly enfranchised British worker the idea of a state run social insurance scheme was appealing - he understood the principles of insurance and would trust the state (but not employers) to organise such a scheme. The Poor Law offered no real alternative and so insurance did not have to show itself to be better than any apparently free system. Society is more complicated now than at the beginning of the century and the choices more diffuse. If a major reform is to gain popular acceptance - however great the dissatisfaction with the present system may be - then the proposed replacement must be shown to be worthy of the transitional period of turmoil. There will be numerous bodies with vested interests who will want to examine the consequences of the proposals in depth. If these calls are to be answered then the analysis should be performed

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at as early a stage as possible. Furthermore, in a democracy, the data and assumptions upon which the proposals are based ought to be made available to those interested groups.

The early emphasis in the moves to establish social insurance in Britain was on the creation of a state pension scheme, whilst sickness was left to the Friendly Societies. The unions wanted a non-means-tested scheme financed entirely by the Exchequer, the Conservative Government wanted a contributory scheme. Any progress was baulked by the fear that politicians had of upsetting the Friendly Societies, and that unions had of moving towards a contributory scheme (which would have been competing for the workers' contributions), and by the Treasury's insistence that a universal non-contributory scheme would not be viable.

In 1905 a Royal Commission was set up to undertake the first major inquiry into the Poor Laws since the 1834 Act. The motivation for setting up the Commission was that Poor Law officials believed that the principles of the 1834 Act had been eroded and needed to be re-affirmed. Unlike their 1830s counterparts, however, the Commissioners sought to be objective in their investigations and heard a great deal of evidence and, in some cases, travelled Europe to look at systems in operation elsewhere. The Commission was split however

and, consequently, had little impact. Although united in their support for the introduction of old age pensions (which had already taken place the previous year, 1908) and the recommendation of state insurance schemes for sickness and unemployment, the Commissioners were unable to come to complete agreement and the Minority Report was far more radical than the Majority Report which did not support the former's call for the abolition of the Poor Law.

Meanwhile, however, Lloyd George and Churchill had examined the German system and had been studying the possibilities of a comprehensive system of social insurance, including unemployment insurance. Churchill had very little to guide him in his attempts to set up an unemployment insurance scheme - the Germans had examined the possibilities not long before and had rejected the idea as impracticable. In 1901 in Ghent a system had been established which spread throughout Western Europe and in 1905 was introduced on a national basis in France. The 'Ghent System' consisted of municipal subsidies to private unemployment insurance schemes specifically to increase the value of benefits. The subsidies were paid annually and depended upon the amount of benefits paid by the fund in the previous year, the funds were mainly administered by the trades unions.

In 1909 Churchill, as President of the Board of Trade,

started to create a national network of labour exchanges. These would be used to administer the first national scheme of unemployment insurance in the world - this was eventually enacted in 1911 despite resistance from the labour movement towards contributions and without any real public debate.

The scheme was compulsory for workmen earning less than 160 pounds per annum in any of seven trades known to be subject to short-term unemployment - building, construction, shipbuilding, mechanical engineering, ironfounding, vehicle construction and saw-milling. The employee, his employer and the state each contributed 2 1/2 d a week and an unemployed worker was entitled to seven shillings a week for a maximum of fifteen weeks in a year. Initially employers were able to reclaim a third of their contribution for workers employed uninterruptedly for twelve months - an attempt to encourage employers to stabilise their employment practices which was later dropped. The Government also subsidised voluntary schemes by paying them one-sixth of the value of benefits but this was stopped in 1920 when the scope of the compulsory scheme was extended. A limited health insurance scheme was also established but this was to be administered by the Friendly Societies.

Although Churchill had little past experience to guide him in his attempts to establish a system of unemployment

insurance he had the benefit of being in the unique position of creating it from scratch and not having to adapt it to accommodate existing provisions. Unfortunately, however, Britain's first attempt at social insurance lacked both administrative co-ordination and popular support and consequently the overall structure did not provide a firm, coherent foundation on which to build.

In 1917 the administration of the system moved to the newly created Ministry of Labour and the scope, objectives and benefit structure were changed considerably. The original scheme was restricted to skilled workers with fairly predictable patterns of employment and unemployment; the duration of benefit entitlement was limited and dependent upon the contributions made; and benefits were set at as high a level as possible in relation to wages in the insured trades whilst maintaining incentives to work - that is benefits were essentially intended to replace earnings rather than provide a minimum subsistence.

With the demobilisation of the forces after the First World War there was seen to be a need for the scheme to cover all employment which was not secure, and with many people coming on to the labour market who had not worked before the war it became impractical to link benefits to contributions. The scheme was extended to cover all

manual workers except domestic and agricultural employees, and all non-manual workers earning less than a certain amount. The idea of benefits as a replacement for earnings was abandoned. Benefits were still paid as of right without means-test and from 1921 supplements were paid for wives and children. The scheme remained under the insurance banner to justify the continued collection of contributions and also because the local administration structure and stigma of the deterrent principles of the Poor Law did not offer a real alternative.

The suspension of the income maintenance principle was a fundamental change in the scheme which has essentially not been reversed to this day - except to a very limited extent by the Earnings Related Supplement, 1966-82. There ceased to be any link between benefits and the contributions which were by now a general levy on the employees and their employers. The introduction of subsistence type benefits with supplements for dependents created a serious problem which has never been resolved. Since wages are not related to the size of a worker's family then benefits which are so related will tend either to under compensate the single person or enable heads of large families to be able to gain nearly as much or even more in benefits than they might expect to earn in work.

The funding of the scheme was put under great strain during the Depression but it survived by borrowing heavily from the Exchequer. The debt was eventually repaid. In order to take account of falls in wages and prices the Labour Government of 1930 cut benefits, although not by as much as the 1930 Royal Commission on Unemployment Insurance had recommended in their First Report. In 1931 a crisis measure was taken which has survived to this day - the assistance payments to those who had exhausted their title to insurance benefits were to be means-tested.

In 1934 the Unemployment Insurance Statutory Committee was established and this was to give Parliament the machinery to control the scheme in the future. In the same year relief of all able-bodied persons was taken away from the county authority bodies and a national Unemployment Assistance Board, directly answerable to the Ministry of Labour, was created. The Poor Law was finally abolished in 1940.

2.4 A Unified System of Social Insurance - 'From the Cradle to the Grave'

In June 1941 the National Government appointed the Inter-Departmental Committee on Social Insurance and Allied Services under the chairmanship of Sir William Beveridge, who had played a major part in the designing

of Churchill's Part II of the 1911 National Insurance Act. The Committee's Terms of Reference were:

> To undertake with special reference to the inter-relation of the schemes, a survey of the existing national schemes of social insurance and allied services, including workmen's compensation, and to make recommendations. (Beveridge, 1942: 5).

The Report which resulted was produced in November 1942. It was given an enormous amount of publicity and its recommendations received a great deal of popular support. Although regarded as a radical document at the time, Beveridge's proposals for a unified social security system were based on the experience accrued as the various facets evolved. In Beveridge's words:

> The scheme proposed here is in some ways a revolution, but in more important ways it is a natural development from the past. It is a British revolution. (Beveridge, 1942: 17).

Back in the 1920s as an official at the Board of Trade, Beveridge had come to the conclusion that unemployment insurance could never take the place of economic policies designed to promote full employment. So one of the three assumptions he made, without which he said no satisfactory scheme of social security could be devised, and in particular with which his scheme was not intended to cope, was that mass unemployment could and would be avoided.

The structure of the report itself was characterised by the author's use of lists which make the identification of his priorities and objectives and their links with specific policy measures very clear - an example subsequent policy formulators have generally chosen not to follow. At the heart of the system he proposed for social security was a social insurance scheme based on the following six principles.

i.   Flat rate of subsistence benefit - Beveridge acknowledged that this was out of step with the rest of the world but argued that it followed from his recognition of the place and importance of voluntary insurance in social security.

ii.   Flat rate of contribution - all insured persons would pay the same contributions for the same security.

iii.   Unification of administrative responsibility - in the interests of efficiency local offices would administer all claims and benefits would be paid from a central Social Insurance Fund.

iv.   Adequacy of benefit - the proposed benefit was intended to be 'sufficient without further resources to provide the minimum income needed for subsistence in all normal cases'.

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v.   Comprehensiveness   -   the   scheme   was   to be
comprehensive   in   both the people and contingencies
covered.

vi.   Classification   -   the   scheme   was designed for all
citizens   irrespective   of   means,   the   term
classification   referred   to   the   different
circumstances   of   groups   of   citizens   such   as
children, employees and retired people.

The   underlying   philosophy of the report was that poverty
and   want   could   be   anticipated   and   avoided   by   a
comprehensive   system of social insurance, health services
and   children's allowances, with those payments being made
as of right without tests of means or character.

The   National   Government   was   united   in its support for
Beveridge   and   in   March   1943   Churchill broadcast to the
nation:

> You   must   rank   me   and my colleagues as strong
> partisans   of   national compulsory insurance for
> all   classes,   for   all purposes from the cradle
> to the grave. (Walley, 1972: 80).

Priority   was   given   to   family allowances and the Family
Allowance   Act   was   eventually   passed in 1945. These tax
allowances   were   not allowed for the first child and were
five shillings a week for each of the others.

Beveridge's ambition for a comprehensive social insurance was largely realised in 1946 with the passing of the National Insurance Act. The scheme was characterised by flat rate benefits and contributions, was comprehensive in its coverage and consisted of seven benefits - Unemployment Benefit, Sickness Benefit, Maternity Allowance, Widow's Benefit, Guardian's Allowance, Retirement Pensions and Death Grants. Initially all the main benefits were to be taxable, with the contributions tax deductible, but in the 1949 Budget unemployment and sickness benefits were made non-taxable.

Unemployment Benefit was to be payable for up to thirty weeks in one spell, but for the first five years after the war provisions were made for this to be extended indefinitely, at the discretion of the Minister and at the cost of the Exchequer. After title to insurance benefits was exhausted recipients had to resort to means-tested National Assistance.

The National Assistance Act of 1948 was intended to mark the death of the Poor Law and the birth of a new era, but the old image was not easily changed. The Assistance Board was replaced by the National Assistance Board which was to 'assist persons in Great Britain who are without resources to meet their requirements or whose resources... must be supplemented in order to meet their

requirements'. Beveridge had intended social insurance to make any need for assistance non-existent but the benefits were not sufficiently generous for this and the National Assistance Board was to play a much larger part in the system than was envisaged in 1948.

The 1948 Act forbade the payment of assistance to supplement the wages of full-time workers, and there was a rule called 'wages-stop' to prevent granting assistance in excess of the wages the beneficiary would earn in full-time employment. This meant that some families had total incomes below the official subsistence level and wages stop inevitably came in for consistent criticism from representatives of low income families. Eligibility for National Assistance was determined by the resources of the applicant and his wife and dependents - resources of other members of the family and certain capital assets were disregarded.

In 1966 a Ministry of Social Security was created to unify administration and to make 'claiming Supplementary Benefits' a less degrading process than the still stigmatised one of 'applying for assistance'. By the following year the number of claimants of the new Supplementary Pensions was more than a third higher than the previous number of applicants from retirement pensioners for assistance. Although Atkinson estimates (Atkinson, 1969: 76) that around one-half to two-thirds

of this increase is attributable to an increase in the size of the eligible population rather than the replacement of National Assistance with Supplementary Benefit. The Supplementary Benefit Commission, which was also set up as part of the Social Security Act 1966, had a wide range of discretionary powers within which it was to run the scheme. The Commission was abolished by the Social Security Act 1980 and their discretionary powers were replaced by legally binding regulations. Legal decisions are now referred to the Social Security Commissioners, formerly called the National Insurance Commissioners. This move from discretionary powers to legal regulations further eroded the distinction between means-tested assistance and National Insurance benefits, entitlement for which has always been determined by past contributions.

The Beveridge Report, and the legislation which it gave rise to, stands alone in the history of social security in Britain as a unique attempt to make the system coherent and comprehensive. During the inflationary 1950s and 1960s, however, National Insurance benefits failed to provide adequate protection and an ever-increasing proportion of applicants were pushed on to means-tested assistance. Now, in the 1980s, there is mass unemployment again in Britain, a condition Beveridge specifically stated his scheme was not designed to counter. Even though Beveridge's scheme has become increasingly less

applicable over the last 30 years, it remains the basis for the social security system today. Changes over those 30 years have been of a piecemeal, marginal character, attempting to adapt the system to cope with the immediate demands placed upon it. There has been a conspicuous lack of long-term strategic planning.

This form of development of an income maintenance system, of grand reform followed by a stream of marginal changes, is not peculiar to Britain. Heidenheimer _et al_. in a comparative study of the systems in Britain, the United States, Germany and Sweden (Heidenheimer _et al_. 1975), identify the following three factors which lead to considerable inertia in the systems:

i.   When a scheme of income maintenance is initially set up policy makers have plenty of scope but, once created, the scheme soon becomes entrenched in the social heritage of the country and the people grow fixed in their expectations with regard to types and levels of benefit, contributions, etc.

ii.   Finding general rules to administer the system better within the confines of these established expectations becomes very difficult and so there is a great incentive to leave the system as it is.

iii.   Comprehensive reform requires comprehensive support

since everyone will be affected, a situation which exists only exceptionally, as at the time of the Beveridge Report. Pressure for particular changes is more readily brought to bear.

These elements were certainly highly relevant in the development of the British system as has been observed during the course of this chapter. Furthermore these are evidently very real obstacles which will have to be overcome if the system is to be radically altered in the future. It is essential that the design of an analytic system takes these factors into account for although these are fundamentally political matters they are central to the policy making process. If the analytic system can assist that process to overcome these barriers to change then it will make a valuable contribution to it, if it fails in this objective then the impact of the analysis will be severely restricted.

The system which has emerged from the developmental process outlined above is undeniably complicated. The next section describes very briefly the structure of the existing system.

2.5 Social Security in Britain Today

The system which has evolved over the years is extremely complicated. There are a wide range of benefits but these

can be divided into three main groups.

Firstly there is the National Insurance scheme. Virtually all employees and their employers are now compulsory contributors to the scheme and the benefits it now provides are Unemployment, Sickness, Invalidity, Maternity and Widow's Benefits, Retirement Pensions, Child's Special Allowances and Death Grants. To qualify for these benefits the claimant must satisfy certain contribution conditions and many fail to do so.

To be eligible for Unemployment Benefit (UB), for example, the claimant must be involuntarily unemployed through no fault of his or her own and be available for, and capable of work. Furthermore the claimant must have paid 'Class I contributions' on earnings at least 25 times the 'lower earnings limit' and paid, or been credited with (during sickness or unemployment), Class I contributions of at least 50 times the weekly lower earnings limit in the 'relevant tax year'. If contributions between 25 and 50 times the lower earnings limit have been paid or credited then UB will be paid at a reduced rate. UB can be claimed for up to 312 days in any one period of interruption of employment (PIE). PIEs separated by less than 8 weeks employment 'link' to form a single PIE. For definitions of the terms used here see Appendix 2.1.

Secondly there are a number of non-contributory benefits which, like contributory benefits, are not subject to a means-test but, unlike contributory benefits, do not include contribution conditions in their eligibility rules. Non-contributory benefits are Child Benefit, Non-Contributory Invalidity Pension, Guardian's Allowance, Invalid Care Allowance and Mobility Allowance.

However, whilst the National Insurance scheme and non-contributory benefits, combined with the industrial injuries and war pensions schemes, cover a wide range of contingencies which give rise to financial hardship, in December 1981 there were 6,121,000 people receiving assistance from the means-tested Supplementary Benefits scheme. Beveridge had intended National Assistance, the forerunner of Supplementary Benefit, to act as a safety net for those people who could not claim National Insurance benefits, today it is the bedrock of the system. The reliance upon Supplementary Benefit amongst the ranks of the unemployed is particularly acute at present as the numbers exhausting their title to UB continue to rise. In February 1982 just over 40% of registered unemployed claimants were entitled to UB and 23% of those were receiving Supplementary Benefit also. Since then the number of people unemployed for over a year has continued to rise and the Earnings Related Supplement to UB has been abolished, these factors combined with the less than inflation uprating of UB in

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1981 and the re-introduction of the taxation of UB in 1982 are forcing an increasing proportion of the increasing number of the registered unemployed on to means-tested Supplementary Benefit.

Supplementary Benefit is for people not in full-time work, there are also benefits available for low-paid workers. There are rent and rates rebates (Housing Benefit) administered by the Local Authorities and Family Income Supplement (FIS). FIS is paid to families with children whose breadwinner is in full-time work (30 hours a week or 24 hours for a single parent) and amounts to half the difference between the claimant's normal gross income and a prescribed amount subject to a maximum payment. For many commentators the introduction of FIS in 1970 was a return of the Speenhamland system of nearly 200 years ago. The take-up rate for FIS is thought to be exceptionally low, official statistics estimate that around half those families who would be eligible for FIS actually receive it - in the DHSS Cohort Study of Unemployed Men it was found that only 17% of those eligible to receive FIS took up their title (Roll, 1983: 14).

The existence of this variety of different benefits gives rise to problems at several levels. Firstly it can be bewildering for claimants who, on the basis of limited information, may need to perform difficult calculations

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to determine which authority they should claim from in order to receive the maximum benefit. A National Consumer Council study of means-tested benefits identified 45 different means-tested schemes in 1976 (National Consumer Council, 1976: 20).

Secondly, the pressure on the staff of the local benefit offices is probably greater than ever before. At a time when levels of unemployment are so persistently high the Government on the one hand is committed to reducing DHSS staff numbers and on the other its benefit policies are forcing an increasing proportion of claimants on to means-tested benefits - a measure of the effect of this is that in 1979/80 the administration costs for UB and Supplementary Benefit to the unemployed were put at 10.5% and 18% respectively.

Thirdly the tasks of monitoring the effectiveness of policies and assessing the likely impact of changes are made immensely difficult by the complexity of the system. The DHSS's ability to perform these tasks came under attack from the Social Services Committee in 1980, their feelings were summarised in the following comment:

> We are struck by the apparent lack of strategic policy-making at the DHSS: the failure to examine the overall impact of changes in expenditure levels and changes in the social environment across the various services and programmes for which the Department is responsible... the Committee wishes to record

its disappointment - and dismay - at the
continuing failure of the DHSS to adopt a
coherent policy strategy across the
administrative boundaries of individual
services and programmes. (Social Services
Committee, 1980: para. 15).

The Committee's overall impression of the Department's

policy making was that decisions tended to be taken in

isolation without an overall framework or any long-term

objectives and without a proper knowledge of the likely

implications of its policies. Their report made three

recommendations with important implications for the

administration of social security.

i.   Future Public Expenditure White Papers should state

       more explicitly the links between policy changes

       and the aims which they are intended to further -

       rather in the manner of the Beveridge Report

       perhaps.

ii.   The Department should 'intensify its efforts to

       reduce the costs of administering the social

       security system, and that, in particular, it should

       seek to devise an income support system for the

       unemployed which is both more coherent and less

       expensive to administer.'

iii.   The Department should 'seek to develop a coherent

       strategy concerning the overall impact of

       government policy decisions - whether on taxes,

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benefits, subsidies or charges - on the relative
living standards of different groups of
beneficiaries and earners.'

To be fair, however, this comment ought to be placed in
an international perspective. Whilst many of the problems
of the British system are a direct consequence of the
manner in which it has evolved, Habib found similar
problems the world over - in concluding an international
conference on the interaction of tax and social security
sytems he had the following to say:

> Policy making is characterised by a piecemeal
> approach in most, if not all, countries. We
> only seem able to co-ordinate the total cost of
> the various programmes, but when we approach
> the issues of distribution, equity, adequacy
> and incentives we are consistently surprised
> when someone occasionally adds up the combined
> effects of various programmes. There are
> numerous reasons for this state of affairs.
> There are jurisdictional barriers related to
> the distribution of administrative and
> political responsibilities for various
> programmes. There are difficulties inherent in
> the complexities of the issues of the
> decision-making processes when faced with
> complex decisions, which are exacerbated with
> the trend towards specialisation which makes it
> increasingly rare to find people who can take
> an integrated overview. The high degree of
> specialisation also compounds the problem of
> communication among experts in different areas.
>
> These obstacles to more co-ordinated policies
> will not be easily overcome. We must change our
> research methods, how we gather and present
> descriptive programme data, and our conceptual
> basis for approaching social security issues.
> These qualitative changes in information
> systems must be fed into new decision-making
> processes (Habib, 1979: 129).

This historical review has shown that there has traditionally been a notable absence of long term strategic planning in social security policy making and this continues to be the case. The example set by Beveridge of clearly defining priorities and objectives and their links with specific policy measures has not been generally adopted. Policy making needs to be preceded by objective analysis based on the best possible information concerning existing and expected future circumstances - this applies to any field of course, but is made especially important by the controversial nature of the issues involved. The alternatives are policies based on perhaps unwarranted preconceptions as in the Poor Law Amendment Act 1834; policies designed to tackle the problems of yesterday rather than today and tomorrow as was the case with the first attempts at unemployment insurance by Churchill; policy stagnation as exemplified by the Poor Law remaining on the statute books until 1940; or incremental, piecemeal changes leading to the confused and complicated system which has developed since Beveridge reported.

This thesis is offered as a contribution to the debate on how the analysis of benefit policies might be improved.

Chapter 3

Operational Research and Social Security Policy Making

3.1 Introduction

In Chapter 2 the historical development of financial
provision for the unemployed was reviewed. It was argued
that there is a need for more strategic planning in
social security policy making with coherent, objective
analysis based on the best available information, and
with the objectives and priorities of the system stated
explicitly wherever possible and linked to specific
policy measures. The objective of this thesis was defined
as the identification of ways in which analysts,
particularly OR workers, might achieve these aims.

Accordingly the next three sections of this chapter
review the previous contributions made by the Operational
Research Services (ORS) division of the DHSS to social
security policy analysis. In Section 3.5 benefit
evaluation models existing elsewhere in the DHSS and
Government are briefly reviewed.

In Section 3.6 the potential advantages of establishing
clear objectives for the social security system are
discussed, as is the difficulty of finding such

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objectives which are both general enough to obtain support from a wide political spectrum yet detailed enough to be of real value to policy planners. In the final section of this chapter a possible approach to future policy analysis which seeks to circumvent this problem is described.

3.2 The Early Days of Operational Research in Social Security

The ORS division of the DHSS first became involved in the social security side of the Department's operations in 1972. The following version of their early involvement draws largely on Holdaway and Partridge (1981).

In 1970 a programme of integration had been implemented to combine 1200 Pension Offices and 500 Assistance Offices into 650 Integrated Local Offices. The Local Offices (LOs) were in a far from satisfactory state. Staff morale was at a particularly low ebb with conflict between the two sets of staff from the previously separate Ministries, calls by politicians to stem the rise in staff numbers and a consequently high turnover of staff. This was set against a background of a system of benefits which had become increasingly complex and with a virtually ever-increasing number of claimants. The consequence was falling standards of service and an increasing sense of frustration with the system on the

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part of both customers and staff.

The first job given to ORS in the social security field was to study the organisation of the LOs - not to seek out the root cause of the problems but to find a way to enable the LOs to cope with them more tolerably. Following a somewhat rushed preliminary review ORS responded with a report to the Director of Regional Offices suggesting Operational Research (OR) could be of use in examining problems such as the location and size of LOs and the causes of high error rates and proposing that the programme of integration be reconsidered. In his reply the Director essentially said, 'Thank you very much, but there's nothing I can do,' and added that he and his colleagues were convinced that OR could be of use to the policy divisions.

ORS had no further direct contact with social security for more than a year - although in the meantime members attempted to learn more about social security so that, given another opportunity, they might be better placed to make a contribution. The opportunity materialised in the shape of the New Model Office (NMO) study of the organisation and management of LOs. Their limited experience of social security had indicated to ORS that this was not the way forward and so it was agreed that in parallel with the NMO study they should also consider the interaction between policy and operations.

The first step was to establish measures of performance for the administrative system. Four were selected - total benefit paid, total administration costs, the proportion of people who receive the benefit to which they are entitled, and the number of people who receive benefit to which they are not entitled.

ORS then proposed to develop a model to both estimate the changes in the measures as a result of alternative administrative systems operating with the existing range of benefits and rules, and also to consider the consequences for the existing system of changing the benefits and rules. This approach was not supported, however, and ORS had to settle for considering issues such as centralisation/de-centralisation of the administrative system and optimal office sizes for the Regional Directorate. This was done by first breaking down the assessment procedure into three operations (the collection, processing and distribution of information), and then, by synthesising the various benefits in terms of these elementary operations, the impact on the measures of performance of centralising and de-centralising LOs was estimated.

This early stage of the analysis was received with some encouragement from the Directorate and so the next stage was to quantify the functional relationships which show

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how the operations in the LOs link together. However, when they looked more closely at the LOs, it transpired that there was considerably more variation between them, with much more 'managing' being done in order to cope with changing circumstances, than had been anticipated. Nevertheless some patterns did emerge - in particular, benefit complexity emerged as the prime cause of errors of assessment which, once complexity was defined as the number of different distinguishable operations through which a claim must pass, enabled the prediction of the effect on error rates of changes in benefit rules.

Furthermore this part of the study led ORS to draw three conclusions:

i. LO staff would 'somehow cope with whatever changes the administrators and politicians could throw at them'.

ii. 'The way in which they cope would materially affect how the policy would be implemented'.

iii. 'That the useful area for OR was in helping to evaluate proposed policy changes'.

The lessons to be learned from Chapter 1 would surely bear out this third conclusion - any improvements in the administrative system, whilst welcome, will merely be

scratching the surface of the operational problems without radical reforms to the substance of the policy. The other conclusions, however, are a little disturbing for they seem to be recognising and condoning the existence of considerable local variation in the implementation of policies. Given that the social security system is national and the DHSS goes to very great lengths to define eligibility rules in specific detail to endeavour to ensure that all claimants are, in some sense, treated equitably, this is surely not an acceptable position. However, the fact that the complex nature of the present system does lead to such local variations is surely further vindication for the need for reform and the need for analytic effort to be directed at policy issues rather than adapting the operational system to cope as best it can with the present benefit structure.

3.3 Benefit Evaluation Models in ORS

The formulation of the above views by ORS coincided with the setting up of the Supplementary Benefit Review team in 1976 under Partridge, who had been ORS's primary contact at the Regional Directorate. This gave ORS the ideal opportunity to involve themselves in policy evaluation. Partridge, however, wanted them to use their Operations Model and experience gained from the NMO work to consider the effect of proposed changes on LOs.

Nevertheless, although this was to occupy the bulk of available effort, ORS still found time to consider how an overall evaluation model could best be developed. The result was the Benefit Model.

The Benefit Model used unidimensional distributions of population characteristics to generate cohorts of claimants. These cohorts were then made to decay according to input exponential decay rates, thus by running the model for several time steps a steady-state population could be created. Alternative sets of benefit rules could then be applied to this artificial claimant population. Output included 'better-off/worse-off' tables and sensitivity analyses (particularly important, as noted by Sanctuary (1980), when the model relies on some basic assumptions).

The motivation for the Supplementary Benefit Review was to identify ways of simplifying the system, albeit very much within the existing framework. Thus ORS proposed a much simplified 'Short Term Scheme' - whereby claimants would receive benefit based on far fewer criteria for the first few weeks of their claim and then, if the claim continued, would be assessed for entitlement under the main scheme. This proposal was supported by the regional agencies and, with reservations, by the policy divisions. The Benefit Model thus had a part to play and so generalised development of the model was dropped in

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favour of work specifically directed at the Short Term Scheme. The model was used to evaluate the Short Term Scheme which appeared in _Social Assistance_ (DHSS,1978) but which was not adopted.

Another proposal to come out of the review was to reduce the number of Child Scale Rates - that is the allowances paid for children under Supplementary Benefit and which are age-related. At the time of the review there were five rates.

This highlighted the need to be able to study the implications of changes not for individual children but for families. This in turn highlighted the problem so frequently encountered in studying the distributional implications of benefit changes - there was no reliable data on the family structure of low income families. Thus ORS was commissioned to develop a model of family structure. The resulting project consisted of three parts.

The first stage of the project was to develop measures of the effect of the changes on different family types including comparisons with 'equivalent income scales' (McClements, 1978). The second stage was to extract data from the Supplementary Benefit Annual Statistical Enquiry (a sample of 100,000 claimants taken annually on a single day) to construct an estimated claimant population. The

third stage was to develop the Family Structure Model
(FSM).

The development of the FSM represented the first real
attempt by ORS to address some of the major problems of
data which the evaluation of social security benefit
policies presents. The administrative statistics only
cover existing claimants and are thus of limited value
when considering possible new policies, especially if
this involves a new population characteristic which will
not even be covered for existing claimants. Although
there are a number of general surveys which contain data
relevant to the evaluation of benefit policy none of
these contains all the data required, moreover there is
usually a delay of around 18 months between surveys being
conducted and the data becoming available for analysis.
Even if the DHSS was to conduct its own survey,
specifically for the purposes of evaluating benefit
policies, apart from the high cost involved and the
extended time-lag, this would still not be perfect
because changes in policy aims could mean changes in the
nature of the information required, and the structure of
the claimant population is sure to change over time.

It should also be noted that to enumerate all possible
claimant types for any but the most narrow of benefits
would be infeasible. The number of characteristics one
needs to know to determine a claimant's benefit

entitlement and their corresponding possible values multiply up to give a number of claimant types many orders of magnitude of the population of the country. Moreover these cannot be greatly reduced by a priori knowledge because such knowledge does not always exist and, even if it does, what may be an insignificant claimant group for one application may not be insignificant for another.

The FSM used the technique of simulation to extract data from the Census on numbers of family starts and inter-sibling age gaps to generate distributions of family size which could be compared with actual data. These data related to the entire population of the country, however, and DHSS interest was, as always, in those subsets eligible or nearly eligible to various benefits. So these family structures were converted to those of the sub-populations by combining them with published distributions such as couples by ages of members and sick males by age.

> These were put together assuming that they were all independent of one another but with the facility to vary the weighting factors to allow correlation between pairs of variables. In this way we were able to accommodate almost any changes in assumptions which were requested and to predict future distributions (Holdaway and Partridge, 1981: 465).

It should be noted, however, that the model makes some very basic assumptions of independence - in particular it

assumes characteristics such as income and rent are independent of each other, and that family size and inter-sibling age gaps are independent of the age of the mother. Finally any set of benefit rules could then be applied to the population so generated to assess benefit entitlement. The model produced estimates of total cost, better-off/worse-off distributions and numbers attracted on to Supplementary Benefit as a result of a rule change.

The model was validated at a somewhat late stage in the Supplementary Benefit Review and apparently (Sanctuary, 1980: 9) its impact was restricted to only one option which did not appear in <u>Social Assistance</u> (DHSS, 1978). Partridge was satisfied, however, and sponsored its extension to cover all National Insurance benefits because of the way in which they interact with Supplementary Benefit - even though he had no direct responsibility for National Insurance benefits. 'He also tried to persuade his NI colleagues that they needed the models' (Holdaway and Partridge, 1981: 465). This led to the development of the Dependency Model.

The Dependency Model was a population generator. It passed cohorts of males and cohorts of females from age zero through states of dependency (marriage, widowhood, one child, etc.) according to input transition rates. By generating a series of such cohorts with the transition rates held constant the model would produce a

steady-state population - although it would also have been possible to generate non-steady populations. The model was not developed beyond a pilot version but the intention was to use distributions of health, employment, housing, etc., by sex, age, and dependency to model the population by those characteristics relevant to determining benefit entitlement. The Dependency Model has much in common with the early modules of the Population Model.

The Population Model (PM) is the latest of the general purpose benefit evaluation models developed by ORS. Development of the PM began in 1978 and it was used for four applications in 1980-81. It would be fair to describe the PM as having been in 'cold storage' since the latter part of 1981. Apart from the knowledge and expertise accumulated over the years spent developing the earlier models the PM consumed a considerable amount of effort directly. It is not unreasonable to expect, therefore, that many of the problems encountered in developing the earlier models would have been overcome by the time work started on the PM, it is also important that the experience gained in developing and applying the PM should not be wasted. The next section looks at the PM and its applications in more detail.

3.4 The Population Model

The PM, then, was the culmination of the efforts of ORS to contribute to social security policy making to date. The original intention was for the PM to model the population of Britain, assigning each member the characteristics relevant to determining benefit entitlement. It was to be capable of modelling radical policy changes and sequences of policy changes whose effects may not be additive, it was to be comprehensive in its coverage of benefits and it was to be flexible in its consideration of demographic changes.

Once again, however, the intention to retain generality was sacrificed. An opportunity arose to use the PM for the National Insurance Short Term Benefit Review so it was decided to restrict the population modelled to the unemployed and sick. Tables of family characteristics were available for these groups and so by restricting coverage to them the need to adopt sophisticated modelling of family building would be avoided. At this stage it was envisaged that the PM would eventually be extended to cover other groups of interest such as one parent families and pensioners. In fact the model has only been validated for families with unemployed or sick male heads.

The model is sub-divided into modules which fall into two

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groups. The first group of modules generates an artificial population and the second applies benefit rules to that population to determine its benefit entitlement. The population is first passed through a module which allocates to each member a sex and an age group using stratified sampling which takes into account the correlation between the proportion of people of a certain age and their sex. The population is then passed through a number of other modules which allocate to each member a variety of characteristics by random sampling or, in a few cases, deterministically. A flow diagram of the modules of the PM is given in Figure 3.1. A complete list of the variables, their inter-relationships and the data sources of the PM is given at Appendix 3.1. To include all the correlations which exist between characteristics would have made the model unmanageably complicated, even if the necessary data were to exist which they do not. This inability to embrace all the interdependencies was one of the major drawbacks of the PM and this became increasingly apparent when compared with information from the DHSS economists' Cohort Study of Unemployed Men - see Section 3.5.

The PM is structured so that the modules can be replaced, altered or missed out, so the model is able to focus attention on a particular sub-population of interest and generate a larger sample of such claimants (a sample size

Figure 3.1 Modules of the Population Model

```
                        ( Sex and Age )
                       ( Marital Status )
                         ( Children )
                ( State of Employment and Health )
              ( Employment History (PIE) )
                      ( Old Income )
                       ( Housing )

                                    ( Income and NI Contributions )

                        Simulated Population

                           ( Linker )
                   ( Contribution Conditions )
                        ( NI Benefits )
                  ( Non-Contributory Benefits )
                        ( Taxation )
                     ( Supp Ben and FIS )
                 ( Local Authority Benefits )
                           ( TIS )
                     ( Difference Runs )
```
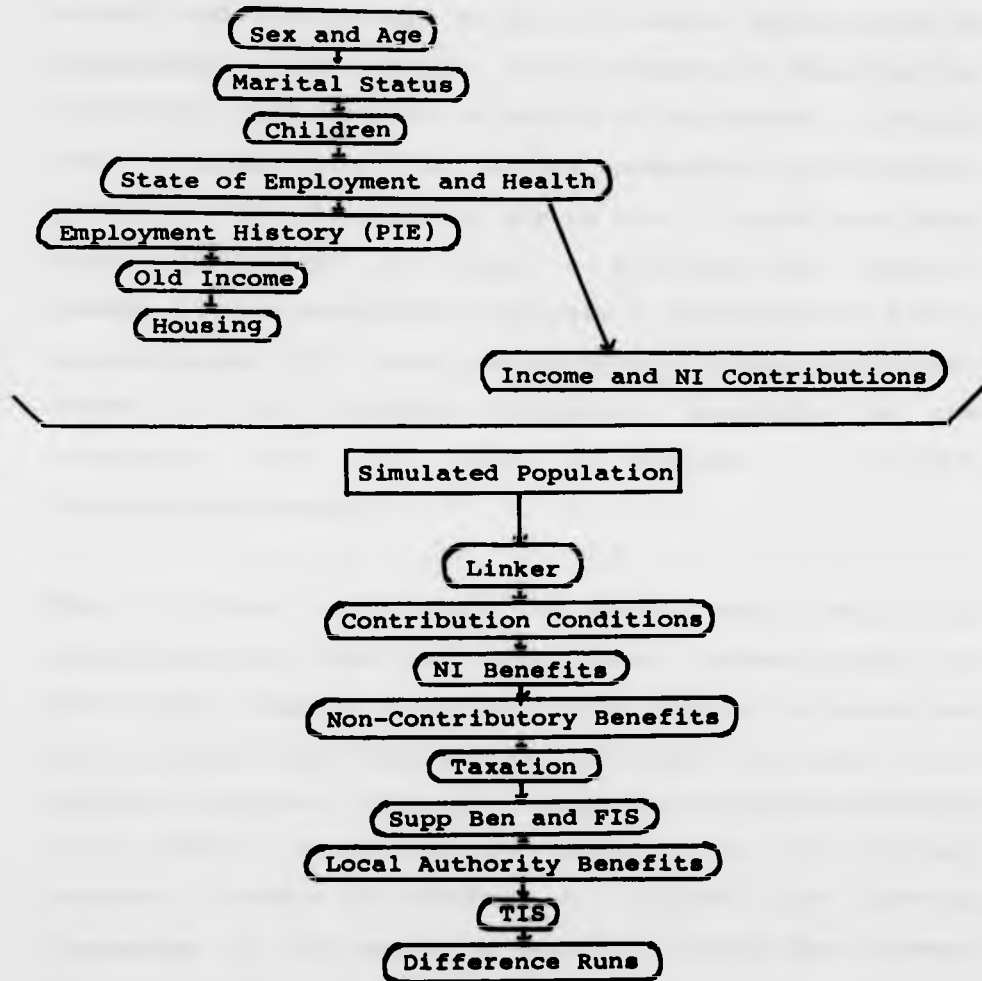
of 5000 is usual). This offers a degree of flexibility which no purpose-built survey could offer.

The model is conceptually simple and contains little actual modelling except in the 'Period of Interruption of Employment' (PIE) module which attempts to describe the occurrence and duration of spells of employment, sickness and unemployment. This module presented considerable problems. In retrospect it may be that it would have been more appropriate to adopt a hypothesising approach combined with sensitivity analysis - incorporating a more sophisticated PIE model as and when it became available. There is no explicit projective modelling of the population but the model is designed to consider hypothesised changes.

The PM does not attempt to model such factors as administration costs or behavioural factors either. In particular take-up is assumed to be 100% in the model and the results are subsequently adjusted by hand. It is doubtful whether available estimates of average take-up are really applicable to consideration of marginal changes. There is evidence to suggest that take-up increases as the amount of benefit to which the claimant expects to be entitled increases and also as the length of the claimant's PIE increases (Supplementary Benefits Commission, 1978).

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The PM covers comprehensively the main benefits and income sources to households whose head is male and unemployed or sick and can assess the cumulative effect of complicated interacting changes. Existing benefits covered include contributory benefits, Family Income Supplement, school meals and welfare milk and the model performs a calculation to determine whether claimants would be better-off on Supplementary Benefit or on rent and rates rebates. It can consider both radical changes and complicated questions concerning, for example, 'linking rules' (see Appendix 2.1) or the relevant tax year. There have been a few simplifications made to the benefit rules.

Validation of the PM has been for particular benefits and claimant types rather than for the model as a whole. When a result is quoted the associated sampling error expressed as a standard deviation is also quoted, the target accuracy is plus or minus 10% since greater accuracy would have been expensive to achieve and quite often spurious. Validation for hypothetical rules is, of course, more difficult and consists of plausibility and qualitative checks.

The major applications for which the PM has been used are:

i.   Work commissioned in March 1980 by one of the

National Insurance policy divisions to forecast the consequences of alternative packages of benefit cuts then under discussion - decisions concerning which were announced in the Budget statement on 26 March 1980.

ii. A more carefully considered reworking of the same calculations as in (i) after the decisions were taken.

iii. Estimates of the total cost of the main proposals for the Statutory Sick Pay scheme and one of its main variants.

iv. Estimates of the impact of the taxation of Unemployment Benefit on individual families carried out in 1981 after the decisions had been taken but before they were implemented.

There are two comments which can be made about this list of applications without looking any deeper. The first is that after the investment of such a great deal of effort and expertise the PM was never commissioned at a sufficiently early stage of the policy making process to influence the policy decisions. So that, even if administrators would be prepared to take into account the results of the sorts of analysis which the PM could provide when formulating policy, they have not had the

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opportunity. Thus the PM has largely been used as a tool for monitoring the outturn rather than forecasting the consequences of decisions. This belated intervention is particularly problematic for a model such as the PM which is specifically designed to provide early quantitative information rather than highly accurate costings. Furthermore, despite suggestions by ORS to a potential customer that the PM had a part to play in providing a baseline against which to monitor, the task of monitoring is apparently agreed to be the preserve of the DHSS's statisticians - this was reflected in their taking on the bulk of the work following a meeting in June 1980 to decide how the work on research into cuts in benefits being considered should be divided between the various support groups in the DHSS.

It could be that the reason for this lack of early indication to ORS about likely live issues is in part attributable to the fact that the groups of economists and statisticians in the Department are longer established, with better contacts and more clearly defined roles than ORS. It is also almost certainly attributable to the nature of decision making in Government - especially the subset of decisions which are disclosed on Budget Day. However, if OR is to contribute to policy decisions in the future, OR workers surely need to be more aware of likely medium-term policy developments in order that they can tailor any extended

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model-building activity accordingly. To this end the major possible policy trends of the next few years are reviewed in the following chapter. It would seem, however, that more important than this background awareness is that, in future, policy makers and analysts from all disciplines need to be closely involved in the analytic work from the earliest possible stage. This would enable the users of the results to gain confidence in the analyses, to build a commitment to them and for their expertise to be incorporated in the analytic work.

The second point to emerge from the above list is the commissioning of the PM for estimating the total costs of a package. In its work on the abolition of Earnings Related Supplement (ERS) to short-term National Insurance benefits, ORS displeased the Finance division of DHSS by estimating the total cost of a package using the PM. Whilst this is no sin in itself it should be noted that the PM is really intended to estimate distributional effects of policy changes and its crude assumptions regarding economic and demographic factors make it less accurate for estimating overall costings. It is, therefore, perhaps unwise to use it for these purposes without great care. In the case of the ERS work the PM estimates differed quite dramatically from those of the Finance division, the economists and the statisticians and it transpired that the reason for this divergence was that ORS were not aware that the wives of unemployed men

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are significantly less likely to be in employment than the wives of the male working population as a whole. Whilst this experience led to a subsequent improvement in the PM it is unfortunate that it could not have been achieved at an earlier stage.

The point here is not that ORS benefit models need to be able to provide more accurate costings of policy proposals - that is not their function. Rather that the capabilities and limitations of the models need to be specifically set down. This would not only save them from being used illegitimately but would also enable potential customers to appreciate more readily when the models might be of positive assistance. As for the specific oversight regarding the interdependence of a husband's employment status and the probability of his wife being in work is concerned, if the assumptions contained in the models were specifically set down also, then, if evidence exists to suggest that such assumptions are invalid, other analysts are more likely to be able to offer advice sooner rather than later. This is, of course, further evidence to support the need for closer co-operation between different groups of analysts and users from as early a stage as possible.

It has been noted above that new information is now becoming available, particularly from the <u>Cohort Study of Unemployed Men</u>, and this needs to be incorporated into

evaluative models as soon as possible. It is unfortunate that reading through the papers of previous exercises gives the impression that this has been used to discredit rather than assist the work of ORS in the past. There are indications that this situation was improving during the above applications of the PM. It is perhaps regrettable, therefore, that ORS have not involved themselves in issues of benefit policy since the end of 1981 for fear of duplicating work done by other groups.

The importance of this has been well defined by Rein:

> To introduce competing analyses which arise from different knowledge orientations in the same arena of decision also diminishes and moderates the contribution of social science knowledge to policy-making. Certainly no one sector of the social science community has a monopoly on useful knowledge but even so a more competitive use of social science, over a wide range of orientations, with overlap across arenas and processes, is likely to produce substantial argument and increase confusion as the issues become more complex. Besides, disagreement among the experts will also give greater prominence to the political policy makers' responsibility for choices, at the same time reducing the claim of the social scientist to be a policy adviser... Even so, I believe that, given the present state of social science knowledge, it is probably better to recognise how conflicting and uncertain its interpretations are than to assign a very high value to a particular orientation, which is narrowly distributed in the policy-making process and has not the benefit of competition from alternative views (Rein, 1976: 33).

There is also a need for a party to co-ordinate the arguments and reconcile and explain differences so that

political choice is well-founded and open to clear criticism. Moreover there would appear to be a need for some party to act as an intermediary between quantitative analytical work and the administrators responsible for passing on the results to Ministers. The following comment was made by an Undersecretary in such a position in a memo to senior personnel in ORS and the economists in 1980 in relation to the above work.

> As one to whom even simple, single basic, figures "come hard", I shall be delighted if those who better understand numbers can put their heads together and thus give me sufficient understanding to help Ministers to understand whatever sifted figure work we give them for various purposes. I therefore welcome (the economists') initiative in relationship to the ORS studies, and hope that (the statisticians) will be able to join in when much more important things allow this.

It is suggested that it is to this end, of co-ordinating research effort and ensuring that it is fully utilised in the decision-making process, which ORS should be directing any future effort in the field of policy analysis in the social security field.

The next quetion concerns the type of policy issues which the PM was designed to be able to consider. It has already been noted that it was intended to be able to handle radical changes, the combination of several interacting changes and complicated alterations such as the way in which PIEs link together. There are several points here.

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Firstly, was it designed with any particular radical
change in mind and, if so, how wide a range of radical
changes was it to be able to consider?

Secondly it would appear that the principal customer for
the applications of the PM saw its main values as being
its abilities to consider the cumulative effect of a
package of changes and complicated adjustments to details
of benefit rules. Firstly, are such factors really
sufficiently important to justify the maintenance of a
large, general model, would it not be more appropriate
and the results more trustworthy if small,
problem-specific models were built for such purposes?
Secondly, if the PM can be shown to be wrong on issues
for which there do exist evidence, such as the working
wives case above, does this justify accepting its results
just because no other evidence exists, supportive or
otherwise?

It can be argued that any estimate, however poor, is
better than none but with a smaller, more specific model
it would at least be easier to identify its limitations
and assumptions. Although the customer in the above
applications was impressed with the PM's ability in this
regard a senior statistician preferred, not unreasonably,
the more direct evidence offered by the Cohort Study - in
a minute to the Cohort Study team in 1980 he asked them
to use the study to investigate the linking problem

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because 'it is only the Cohort Study which can shed light on the interval between linking spells of unemployment'.

The point here is that large, general models are often better suited to studying radical policy changes and detailed changes to existing policies are perhaps better studied using more specific models. To try to develop a model capable of considering both levels of policy change simultaneously, which is what the PM sought to do, especially in such a complicated problem area as social security, is surely over-ambitious and liable to result in a model which can fulfil neither aim satisfactorily.

Any policy analysis must be based initially on a broad database, taking account of the complete range of significant factors. Once the areas which require detailed analysis have been identified then specific, in-depth research studies can be commissioned. There is, then, a need for an established information base to carry out the initial analysis promptly, efficiently and effectively and to highlight those areas in need of fuller study. If such a facility is not readily available then the danger is that the parameters of the debate will be defined without reference to the facts and, once defined, will be that much harder to change.

The multiple source nature of the data not only gives rise to problems of interdependencies but also means that

in order to keep the data as consistent as possible it needs to be updated _en bloc_. This would be a considerable effort, probably of the order of 1 to 2 man-months. Consequently it has never been done and so the model was still using 1977 data when it was placed in abeyance in autumn 1982. Although the income and expenditure variables are updated for the application no allowance is made for demographic change - which in the case of the unemployed was considerable between 1977 and 1982. One of the main disadvantages of using survey-based data is the time-lag between the survey being conducted and the data becoming available, but this is normally around eighteen months to two years. There is no easy answer to the data problem but using out of date data and combining distributions under the assumption that they are independent when they are not is surely not the best possible compromise. This issue will be the subject of subsequent chapters.

Finally the argument in favour of major modelling exercises which holds that one of their values is in sustaining thinking in a consistent fashion, leading to an enhanced understanding of the system does not appear to apply in the case of the PM. The key feature of the PM would appear to be its highly flexible structuring, which, although commendable, does not in itself contribute to the quality of decision making in the DHSS.

Although the above may appear to be rather negative and comprehensive in its criticsm of the PM it must be recognised that the problems which it is addressing are highly complicated and the complete solution has not been formulated elsewhere either. The following section briefly reviews other Government models aimed at tackling similar issues.

3.5 Other Government Models for Benefit Evaluation

Within the DHSS the two other service divisions, SR (the statisticians) and EAO (the economists), who advise the policy divisions each have some form of modelling capability of their own.

SR3's Tax/Benefit Model uses what is known as the hypothetical families approach, that is it simply calculates tax liability and benefit entitlement and hence 'total income support' (TIS - see Glossary in Appendix 2.1) for certain stylised families. It makes no attempt to estimate the numbers of such families which exist. Furthermore it assumes expenses, in particular rent, rates and work expenses, do not vary with income and it is unable to consider mortgage repayments in place of rent. For families whose head is unemployed TIS is calculated separately for those out of work for 6 months and 12 months to attempt to illustrate the effect of exhaustion of title to UB. Not only is the assumption of

expenses being independent of income unrealistic it is also unhelpful because when policies are being considered attention may well not focus on those groups who are faced with average circumstances, but rather on those who are faced with exceptionally high housing costs, travelling expenses, etc. The Tax/Benefit Model is really no more than a powerful ready-reckoner which can be useful for early quantification of ideas but it must also be remembered that it can be very misleading. Since it makes no attempt to estimate the numbers of people in each of the various circumstances it cannot be used to estimate the total cost of policy proposals.

SR3 also use the Family Expenditure Survey (FES) to estimate benefit entitlement for the participating families and hence to calculate official estimates of 'take-up' (Appendix 2.1) of various benefits. This involves programmes for each benefit which are also used for ad hoc analyses of proposed changes to benefit rules.

The economists use a model based on the FES to estimate changes in net weekly incomes of families and households. It covers income tax (modelling all bands, rates and personal allowances and mortgage interest relief), National Insurance Contributions, Child Benefit, Family Income Supplement, Housing Benefit, free school meals and free welfare milk. Incomes are projected forward to current levels from those in the survey, which are about

18 months out of date on average. The model can produce
tables of gainers and losers in terms of absolute values
and as proportions of annual income, by households or tax
units, and by a range of other characteristics such as
income and family composition. Output from other models
can also be input. The model was to be extended so that
it would be capable of evaluating changes in out of work
benefits.

The value of the FES for evaluating benefit changes is
discussed in detail in Chapter 5 below. Broadly, however,
there are several disadvantages of using the FES for
analysing out of work benefits - disadvantages which
apply to any general purpose survey in fact. The first is
that the data are, on average, 18 months out of date by
the time they become available. The second is that there
is a suspicion of under-reporting of benefit income in
the survey, although in a recent paper Atkinson and
Micklewright (1982a) found 'reasonably close' agreement
between FES estimates and the administrative and Blue
Book statistics. The third drawback is that the FES
covers a total of approximately 7000 households each year
and although a number of families with out of work heads
can be identified (and this number is of course
increasing along with the numbers of unemployed in the
country as a whole) if interest focusses on a
sub-population of this group then the sample sizes can
become very small or even non-existent. This problem can

be overcome to a limited extent by taking data from the surveys of several years but this is not entirely satisfactory due to demographic change - which can be expected to have been considerable as a result of the sudden rise in unemployment. The main advantage of using survey data is that they relate to actual families and so it is possible to estimate, for example, the numbers of people in groups of interest without making assumptions, which may be unjustified, about the correlation of certain characteristics.

Another important source of information within the Department is the <u>Cohort Study of Unemployed Men</u>. This was a study set up by the Department to look at the labour market experience, living standards, financial incentives and so on of people experiencing a spell of unemployment. The study took a national sample of 2300 men (72% of the original sample) registering as unemployed in 1978, it thus focusses on the flow as opposed to the stock of unemployed. Data were extracted both from benefit records and from interviews with the men and their wives carried out approximately one, four and twelve months after registration - some 1800 were interviewed in the second round and 1500 in the third, some of whom had not been interviewed in the second round. The value of this study to evaluation modelling is that it provides a source of data on the characteristics of the unemployed against which hypotheses may be tested

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before they are included in a formal model - the value in pinpointing the cause of the PM's error with regard to the probability of the wives of unemployed men being in work has already been noted above.

To the best of our knowledge apart from the models within the DHSS outlined above the only models which exist within Government which attempt to perform similar tasks are those of the Government Actuary's Department (GAD).

GAD's role is to estimate social security and National Insurance expenditure and revenue for four to five years ahead - principally for the Treasury and DHSS Finance division. They have separate models for unemployment and sickness which utilise benefit statistics modified according to demographic and economic assumptions and forecasts. Whilst these models can produce quite good estimates of how the existing system will perform in the future they can only consider minor changes to the system (anything more radical necessitating ad hoc studies) and do not offer any real insight into the distributional impact of such alternative policies.

3.6 The Objectives of the Social Security System

In the historical review of the development of financial provision for the unemployed in Chapter 2 it was noted that legislation has traditionally been of a piecemeal

nature with occasional grand reforms and has generally been made in reaction to problems of the past rather than any anticipation of possible difficulties in the future. The purpose of this thesis is to consider how analysts might serve to remedy this situation and some areas where there appears to exist room for improvement in the analytic contribution have already been identified in this chapter. It could be argued, however, that a prerequisite for remedying this situation is to determine long term objectives for the income maintenance system to which all major political parties could agree. The case for defining the objectives of social services programmes has been forcefully advocated by Algie:

> To define and explore objectives is to open ourselves to alternative possible futures, thus extending treachorously narrow conceptions of what is possible. By clarifying objectives, decision-makers may support their bids for scarce resources and gain general sanction within which specific activities may be undertaken at their discretion. Stated objectives establish the expectations of sponsors and clientele, and provide a rationale for daily decisions. Lacking objectives, an agency has no basis for evaluating effectiveness of action. If relevant objectives can be agreed, some hope for improvement is established, some degree of optimism necessary for any committed action, and some limits are set to fatalism, pessimism or resignation. Where objectives are ignored, activities become meaningless... Only by projecting a future and attempting to realize it, can effective action be generated (Algie, 1975: 11).

The next question to be asked then is whether such objectives can be established for the income maintenance

system which are both general enough to receive support from a wide political spectrum and sufficiently detailed to be of real value to policy planners.

Wedderburn (1964) has identified the following four 'theories of the Welfare State'.

i. The 'anti-collectivists'

The anti-collectivists see the Welfare State as a transitory service which becomes increasingly superfluous as industrial output rises. Wedderburn quotes Peacock (1961) as saying, 'The true object of the Welfare State... is to teach people how to do without it.' This is very much the policy of thrift, self-help and independence expounded by the present Government. Two fundamental elements of the existing legislation embody this view - namely the contributory principle, representing the virtue of thrift, and the concept of a minimum income, stressing a desire to ensure that incentives for individual self-improvement are not jeopardised.

ii. The 'functionalists'

In common with the Marxian view of the Welfare State the functionalists see it as being necessary to the survival of a capitalist society. However, whereas the Marxist

considers all social reforms as palliative measures designed to avert working-class rebellion, the 'functionalist' attributes the existence of the Welfare State to the recognition by more enlightened legislators that the alternative would be incompatible with their overall view of society.

iii. The 'citizenship view'

A leading exponent of this school is Professor T. Marsall who argued in 1949 that the social services do not help to create an economically more equal society but do play an essential part in the creation of equality of status. This ideology he saw expressed in the post-Beveridge provisions of universal benefits and especially in the provision of health services solely on the basis of need. However by 1961 Marshall was saying that this stage had already passed as the Second World War faded into the past and that the consensus on which the Welfare State was built no longer existed. Developments in the 1980s would seem to confirm this view.

iv. The 'integrationists'

The integrationist school argues that by making the distribution of the national income more favourable to the mass of the population, wage-earners acquire a stake in society which includes pensions, health services and

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so on. The main thrust of the democratic process then becomes to preserve and perhaps marginally improve that stake but the quest for a higher ideal is essentially abandoned.

In their book presenting the results of a major research project on deprivation sponsored by the DHSS and the Social Science Research Council, Brown and Madge summarise the position thus:

> For some people, the only real objective of social policy is the total removal of inequality. For others, more modest goals would be to relieve the worst poverty, to tidy up the most glaring squalor, and provide care for the neglected and abused. For yet others the goal would be merely to maintain law and order and a minimal social tidiness. There is certainly no agreement on redistribution and no mandate to re-order society (Brown and Madge, 1982: 276).

To relate the problem to current political perceptions of the Welfare State it would seem impossible to square Thatcher's calls for a return to the 'Victorian values' of thrift and self-help with the recent declarations by both the Labour and Liberal parties that they believe the income maintenance system, in conjunction with the taxation system, should effect a substantial redistribution of income (see for example Labour Party, 1982 and Vince, 1983).

To summarise, any system and its purpose will be perceived in an individualistic light. In many cases

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these differences will be reconcilable, at least to such an extent as to enable long term objectives to be established for the system about which a consensus can be achieved. The social security system does not fall into this category.

3.7 Benefit Evaluation Studies - the Way Forward

If the definition of workable long-term objectives for the income maintenance system is accepted as being infeasible for the purposes of establishing long-term policy plans then the next question that needs to be raised is whether the analytic and evaluative parts of the policy making process can be designed in such a way as to compensate for the lack of objectives to some extent.

Rein has argued in relation to public policy in general that:

> Future policy is... a redefinition of either
> social objectives or the constraints which
> inhibit the implementation of objectives
> already held. Because this is so, it follows
> that it must be difficult to discover what an
> organization is trying to accomplish, and
> whether its present arrangements facilitate or
> inhibit the achievement of these evolving
> goals. We should not simply accept the goals as
> given; it is necessary to scrutinize both the
> input and the goals (Rein, 1976: 21).

It could certainly be argued that the ultimate aim of the

analyst should be to set out all the relevant consequences of all the available options and, although assumptions may be stated in order to define the boundaries of the analysis, by defining objectives the analyst may impose unnecessary restrictions and fail to consider acceptable alternatives.

The role of evaluation studies in the policy making process is described by Brown and Madge as follows:

> Evaluation is often undertaken because politicians or officials want to know if something works. But the value of studies on the effectiveness and efficiency of particular services or initiatives is more often that they begin to describe what actually happens. Without such detailed studies it is often quite difficult to know what the policies are in practice as opposed to what they are stated to be. So evaluation often begins with valuable description. Before it can proceed to measurement it has to establish criteria for assessment. Here it quite frequently founders because criteria for measuring effectiveness are not generally agreed upon: they differ according to the perspective adopted... But the attempt to establish criteria helps to elucidate the aims of social policies and clarify thinking about goals. It is often only when we have striven to establish criteria for effectiveness that the ambiguity of policy objectives becomes clear (Brown and Madge, 1982: 277).

This view of policy analysis is close to that which would appear appropriate for the purposes of comparing benefit policy alternatives and their distributional implications for existing and potential claimants.

Although it will not materially affect the information required by the analyst there is the question of the most effective tactics to be adopted by the analyst. The approach proposed by Brown and Madge is essentially of using the data to clarify ambiguities and stimulate analysis of criteria and objectives. A more desirable approach, which would build the policy maker's commitment to the analysis from an earlier stage in the policy making process, and perhaps a politically more realistic one, is for the analysts to liaise with the policy makers as early in the policy making process as possible and to gear the research effort towards the perceived needs of the policy makers. This approach is suggested with the idea that a database of the basic data is maintained in such a way that these analyses will not involve extended periods of primary analysis - rather extraction and analysis of data from the database in such a manner as to comply as well as possible with the needs of the policy makers. This is not to suggest that the information should be presented such as to support only the views of the policy makers, of course.

If OR is to make a contribution to policy analysis in the future then it is suggested that the following aims need to be met.

i. To find ways of increasing the involvement of potential users of the analyses in the analytic

process from as early a stage as possible with a view to building their commitment to the analyses and incorporating their expertise in the work and ensuring early analytic involvement in policy evaluation studies.

ii.   To assemble the means to describe the operation of the existing system as well as possible.

iii. To evaluate potential, alternative policies by describing their likely distributional implications in relation to the present and expected future populations as best as existing knowledge will permit.

iv.   To heighten the awareness amongst analysts of the kinds of policy which might be required to be analysed in the future - this end would be much advanced by the achievement of (i) of course - in order that sustained efforts on major benefit modelling projects will be well directed.

To these ends the following chapter outlines possible policy trends in social security during the next few years. The following chapter then attempts to define in more detail the issues which need to be examined during the course of benefit evaluation studies with a view to identifying important attributes of an information system

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designed to assist such analyses.

Chapter 4

Possible Trends in Social Security Policy

4.1 Introduction

This chapter provides an overview of the major possible policy trends in social security being canvassed by various political parties and pressure groups. This has two main purposes. The first is to provide background material for analysts to place the planning of an information system for benefit policy analysis on a firmer foundation and define the range of problems with which it might expect to be presented. The second purpose is that the previous chapter identified a wide range of philososphies underlying people's perceptions of the objectives of the social security system and this chapter goes on to identify a similarly diverse range of policy proposals stemming from these philososphies - this chapter, therefore, seeks to identify common questions raised by the various policies.

If common questions can be identified then it would be sensible to concentrate any extended research activity on these areas. Moreover, if similar questions are being asked about policies currently being considered, it may

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justify a fuller analysis than might otherwise be the case. It is always necessary to balance the costs of research against the expected value of its results and so an awareness of the likelihood of similar questions recurring is important since it will affect that value.

In common with the historical review of the system in Chapter 2 consideration will be restricted to policies which are broadly concerned with the able-bodied under retirement age - this would include the unemployed, those in work, the sick and children. Policies primarily aimed at disabled or retired people will not be discussed. This is not because these latter groups are thought to be less important in any way but they do raise different questions and much current debate is focussed on problems associated with high unemployment where the same degree of political consensus regarding objectives does not always prevail. In the longer term it would be desirable to include these other population groups in the same analytic framework and any approach to the problem which would facilitate this end should consequently be given added weight.

The pressures on the existing system have already been noted. The approaches of the main political parties to tackling these would seem to encompass all the main options for the future and can be summarised as follows. The Labour Party's approach would be to concentrate on

taking people off means-tested benefits by increasing the value and scope of non-contributory and insurance-based benefits with a new, improved earnings related supplement. The Alliance parties' approach would involve a move towards better co-ordinating the taxation and benefits systems with the introduction of some form of tax credits scheme. The Conservative Government is primarily concerned with reducing the 'burden' of the Welfare State on the economy and looking for ways of saving both on benefit payments and administration costs; it announced in April 1984 that it was to set up a major review of the social security system and these issues are likely to be high on the agenda.

Accordingly this chapter consists of four further sections. The next three look in turn at the questions raised by policies of simplifying the Supplementary Benefits scheme within its existing framework, relating benefits to earnings and negative income tax. The final section attempts to bring together the implications of this review of policies for the design of the analytic system.

4.2 Simplification of the Supplementary Benefits Scheme within the Existing Framework

In September 1976 a team of DHSS officials was set up by the Secretary of State for Social Services to conduct a

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comprehensive review of the Supplementary Benefits scheme. The resulting report (DHSS,1978) indicates that this was carried out very thoroughly; the team heard a great deal of evidence and sought advice from independent researchers, from the Supplementary Benefits Commission and from the analytic groups within DHSS.

Due to constraints on public expenditure the team decided not to consider wider reforms but to concentrate on how best to deploy existing resources within the Supplementary Benefit framework, whilst taking account of the implications of the changes for other Government programmes. The team also tried to bear in mind the changes in demography and social behaviour which had important implications for the system.

The team concluded the underlying need was to simplify the system. Although many of the changes advocated in the report have been implemented the fundamental problem of over complexity still remains and the review of social security set up by the Thatcher Government in 1984 is likely to address similar issues.

Accordingly this section draws on the 1976 review to identify the issues likely to be examined in the present review or any similar study and the considerations which were felt to be important when the options were being evaluated and compared.

The basic aim of the Supplementary Benefits scheme is to provide a minimum standard of living for everyone in the country. To define minimum standard of living is extremely difficult and the harder the scheme strives to achieve equity, so that every claimant has the same standard of living, the more complicated the rules become. Consequently, in a study such as this, where the principal objective is to simplify the administration of the scheme, there is always a trade-off between simplification and equity. The standard indices for simplification and equity used in the study were estimates of numbers of staff saved and 'better-off/ worse-off' tables respectively, and in some cases 'attraction rates', that is the number of people newly entitled to benefit. In considering the simplification of the system the way in which provisions interact and overlap was also taken into account.

Apart from the trade-off between simplicity and equity the other factors which were important in all the possible changes were the implications for total costs and the possible consequences for financial incentives to work for unemployed claimants. Also it was decided when studying the adequacy of the rates that need was greatest amongst families with children and so this was borne in mind when evaluating the other possible changes and it was regarded as a priority to devote any additional expenditure to this group.

The inter-relationships of the changes, that is their implications for each other, were generally borne in mind but this can become very difficult and the ability to assess the net effect of a package of changes would be an essential feature of an information system to aid the evaluation of benefit policy analyses. Although each change was analysed in depth and its effects on total costs and staffing requirements were estimated it is the combined effect of the package of changes on total income support and marginal tax rates of claimants which really matters. Without an indication of the overall cost and distributional effects of a set of packages there is a danger that an attempt such as this to take a comprehensive view of the system in order to make it more consistent will only serve to replace one set of anomalies and complexities with another.

Superficially a model which is intended to be capable of studying the implications of detailed changes to existing benefits - basically the manner of change addressed in the 1976 Supplementary Benefit Review - requires largely the same qualities as a model capable of assessing the full implications of the annual uprating of benefits to allow for inflation. An 'uprating model' requires descriptions of the characteristics of the existing claimant population and the current rules for determining eligibility to all the existing benefits available to

that population in order to be able to describe and explain the current distribution of benefits and estimate such a description of the future claimant population. It should be noted that the population will change to a limited extent as a result of the uprating because the eligible population for means-tested benefits is dependent upon the needs allowances and there is also evidence that take-up increases with the level of benefit entitlement (Supplementary Benefits Commission, 1978). If the model is also to be able to analyse detailed changes to existing benefit rules, however, it will generally have to tackle two further problems.

Firstly the characteristics which determine claimants' benefit title may be changed. This may require information concerning a characteristic not previously tested or information presented in a different form to which it has previously been arranged in the administrative records. Examples of the latter case would be the alteration of the children's scale rates in the Supplementary Benefit Review and the altering of the linking rules in the review of National Insurance Short-Term Benefits discussed in Section 3.4.

Secondly the introduction of new rules may or may not alter the eligible or claimant populations, whether it will may not be possible to determine prior to analysis.

These become important points when considering alternative sources of data on which to base a benefit evaluation model. Administrative records provide a great deal of information on the existing claimant population and would be a valuable source of data on which to base any analysis of policies which do not introduce new rules and do not increase the eligible population in any way. If information is required on people other than existing claimants, however, or if new information concerning existing claimants or possibly just similar information on existing claimants as already exists but arranged in a different form is required, then either the data of administrative records must be supplemented by additional data or demographic modelling, or an alternative data source must be used.

Any application of a benefit evaluation model would need to assess the forecast implications of the proposed policies against the expected consequences of a policy of no change. The ability to analyse fully the implications of the annual uprating would also give the model a valuable ongoing applicability.

The worth of a model to examine the functioning of the present system in detail should not be devalued by the inadequacies of that system, therefore, but, on the other hand, it should aim to do rather more than this given the widespread dissatisfaction with the state of that system.

The following two sections consider two possible directions reform of the present system might take.

4.3 Expansion of Non-Means-Tested Benefits

The decision by the Government to abolish Earnings Related Supplements to Short-term National Insurance benefits in 1982 further decreased the value of insurance benefits and forced a greater proportion of the greater number of benefit claimants on to means-tested Supplementary Benefit, and hence further increased the pressure on the Supplementary Benefits scheme. It was, incidentally, against the international trend towards the earnings-relation of benefits.

Moreover the TUC have called for the introduction of a new earnings related supplement, the Labour Party pledged to introduce an 'improved earnings related supplement' during the first months of unemployment in their last election manifesto (Labour Party, 1983: 18), and in 1982 a senior DHSS administrator expressed the opinion that this was a policy alternative which could well be considered in the next few years.

As far as the implications for choosing a data source are concerned the determination of a claimant's title to any form of earnings related benefit would clearly be based

on an earnings test with the possibility of additions for dependents. The Labour Party has suggested that any future earnings related benefit introduced by them should be calculated on the basis of earnings in as recent a period as possible to the claim and that a Period of Interruption of Employment in one year should not reduce title in the following year - one possibility mooted is thus to base the test on earnings in the best two of the previous three years revalued up to the October preceding the benefit year (Labour Party, 1981: 32-33). If an information system is to be capable of analysing the proposals for a scheme such as this, therefore, it would ideally contain details of the earnings of the relevant populations during the past four years. Additionally this may need to be linked to information on dependents although there is no indication of such an approach in Labour's discussion on the matter to date - such an analysis may be desirable even if supplements for dependents were not considered, of course.

Apart from earnings related benefit schemes the main need for research under a future Labour Government will almost certainly concern Child Benefits. The Labour Party has expressed its intentions to extend the scope of non-contributory benefits by improving the existing ones for disabled people, one parent families and children and introducing new, non-contributory benefits to cover other contingencies frequently associated with low incomes

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(Labour Party, 1982: 94). Whilst they have not attached priorities to all their measures the improvement of Child Benefit is designated to be of high priority (Labour Party, 1982: 84) and, given the widespread support for Child Benefits, it is sure to be an issue requiring early attention.

The improvement of Child Benefit is seen as a three stage process (Labour Party, 1981: 18-19). The first priority would be to raise the level of the benefits so that they exceed that of the child dependency additions to National Insurance benefits. They would then be indexed to a new prices-or-earnings formula proposed for all benefits - essentially uprating benefits according to the greater of wages-inflation and price-inflation. Finally the Child Benefit scheme would be improved and three possibilities have been proposed.

i.   Age-relation of Child Benefit - this is not thought to be a strong proposal since, although older children are more expensive to maintain, the caring for younger children is associated with a greater loss of earnings and these conflicting aspects would lead to complicating the system for unclear reasons.

ii.   Relating Child Benefits to family size - large families are more commonly associated with poverty

than small ones; however paying higher rates of benefit to larger families could be seen as an undesirable subsidy to large families and would also give rise to problems encountered with the old family allowance scheme whereby the benefits due to separated families could depend on the distribution of the children.

iii.   Family responsibility allowances – the final proposal is the payment of an allowance to every person with responsibility for children under five years of age or disabled relatives, such an allowance would be payable regardless of whether the recipient worked but would be subject to tax.

The important feature of an information system to analyse proposals such as these would be detailed information on family structure and the financial position of different family types. The population base for studies such as this would need to be much broader than studies concerning benefit uprating or minor rule changes and would essentially have to cover the general population.

The possibility of a Conservative Government considering the introduction of a means-test for Child Benefit, either in the 1984 review or subsequently, cannot be wholly discounted. This would be highly sensitive politically but the issues raised would be mainly

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concerned with target efficiency, and the trade-off
between equity and simplicity which will be taken up in
subsequent chapters.

4.4 Negative Income Tax

A great variety of schemes of 'negative income tax' and
'tax credits' have been proposed as universal,
income-based systems of support (see for example Green,
1967; Dilnot et al. 1984; Cmnd 5116, 1972; Cooper, 1983).
They can all be characterised by three simple parameters,
any two of which determine the third. These three
parameters are a tax rate, some form of minimum income
guarantee, and a 'break-even' income.

If M is the minimum income guarantee, that is the level
of credit paid to an individual with no earned income,
which may vary according to family size and composition,
housing expenses, or whatever; t is the tax rate per
pound of earned income, that is the rate at which the
credit is withdrawn as earnings increase; and N is the
'neutral' or 'break-even' income where pre- and post-tax
incomes are the same and above which positive taxes
become payable as in conventional systems of income tax;
then clearly Nt=M. See Figure 4.1 for an example.

Theoretically there is no need for t to be constant and
schemes have been proposed with both progressive and

Figure 4.1   The Relationship Between Break Even and Minimum
Income Levels in Negative Income Tax Schemes

At N Earned Income = 100
Benefit Received =   0
Tax Paid =   0
Final Income = 100

At M Earned Income =   0
Benefit Received = 50
Tax Paid =   0
Final Income = 50

$$\text{Tax rate} = t = \frac{OM}{ON} = 0.5$$

$OM = PQ$
$QN = OQ$
$$t = \frac{OM}{QN} = \frac{PQ}{OQ}$$
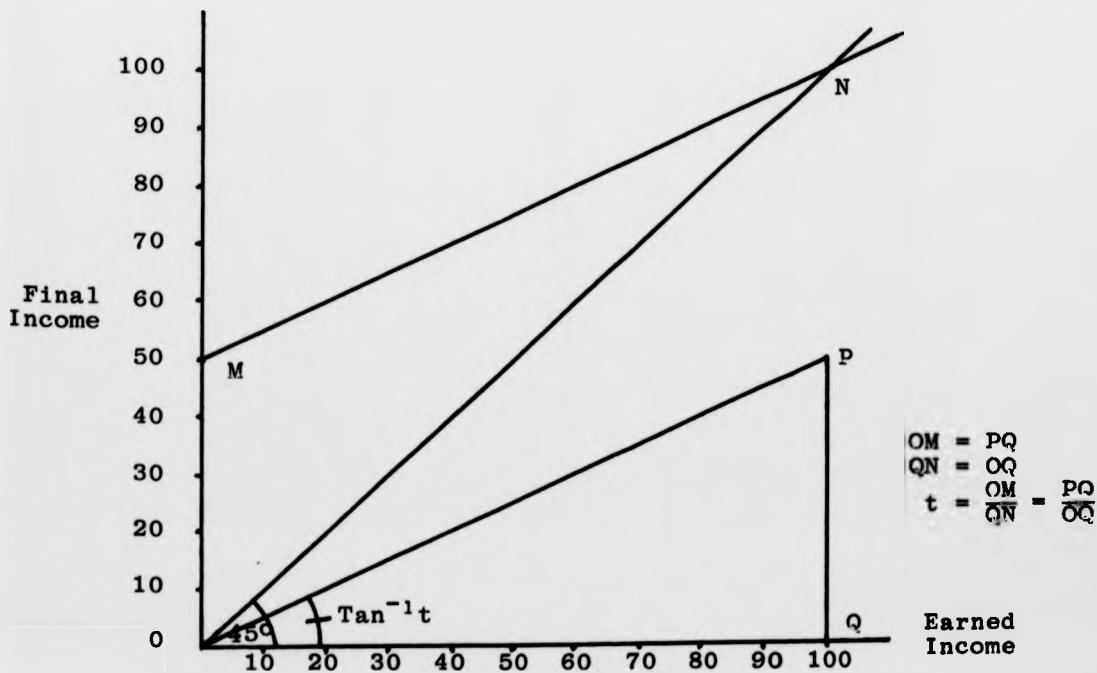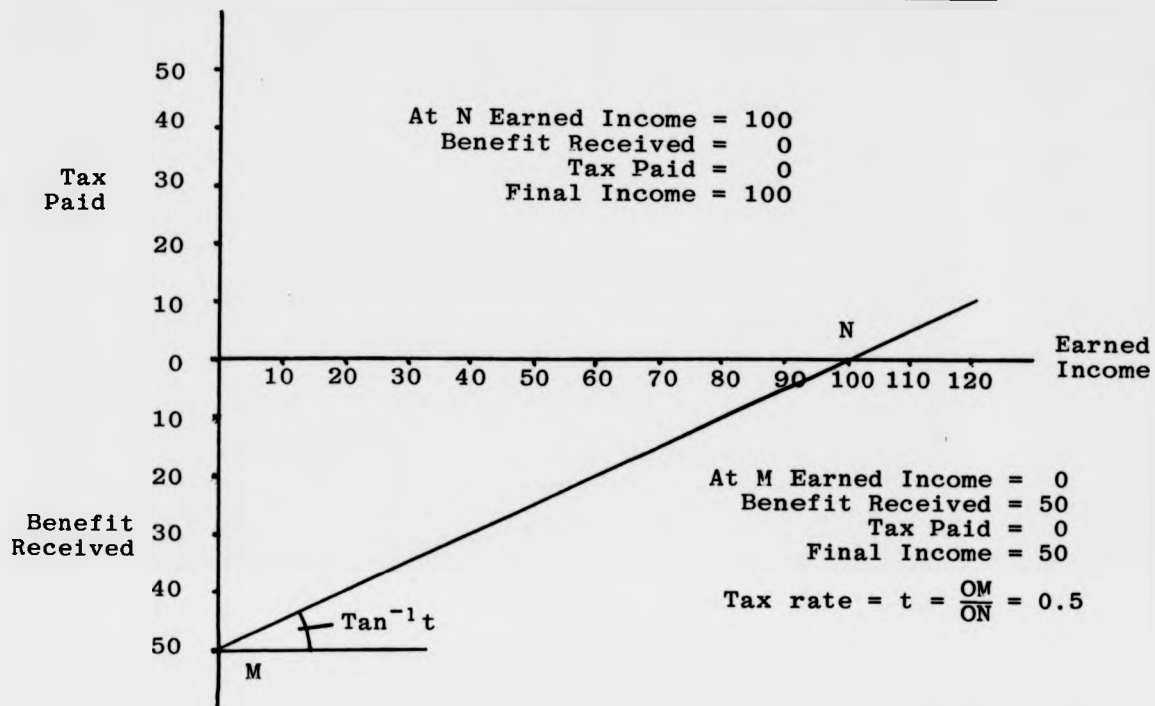
regressive tax schedules (Green, 1967). However if t is constant across the greater part of the income range then the scheme becomes very much simpler to administer.

In 1972 the Conservative Government developed a scheme of tax credits of comparatively modest proportions to the extent of administrative feasibility (Cmnd 5116, 1972). The Tax Credit scheme was proposed primarily as a tax reform, making the income tax system cheaper for the Government to administer, saving between 10,000 and 15,000 Civil Service posts and obviating the need for the PAYE system. At the same time, however, it was claimed that it would provide an improved level of support for the poor both in and out of work, without means-testing, that it would be easier to understand, and that it would reduce marginal tax rates and hence increase incentives to work.

The principal motivation for the 1972 proposals was administrative simplicity, but other factors were also recognised as being significant. An important part of any such scheme is the effect on marginal tax rates and financial incentives to work - since it aims to bring together or replace several existing measures which can combine to produce exceptionally high marginal rates, it offers the opportunity to smooth away such anomalies. In considering the likely consequences for the labour supply it is necessary to look at both the minimum credit level,

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which will effect individuals' total incomes, and the
marginal tax rates which will effect both total income
and the marginal price of leisure relative to work.

The interaction with and implications for other schemes
is clearly of prime importance in a reform of this kind.
Considerations such as the appropriate accounting period
and the unit of assessment become central. At present the
tax system has an annual accounting period whereas social
security payments are based on a variety of time periods.
For the purposes of benefits it is generally regarded as
more suitable to treat the unit of assessment as the
'household' or 'family', rather than the individual which
may be considered more appropriate for tax purposes. If
the tax and social security systems are to be brought
more closely together in some unified system it would be
necessary for these definitions to be made consistent.

Another important consideration with any negative income
tax scheme is the expected consequences for wage rates.
It was noted in Chapter 2 that mistrust of wage subsidies
dates back to the Speenhamland system of 1795, and
whatever the expected effect on wages maybe, even if it
is neutral, estimates need to be made explicit.

Behavioural aspects other than the work-leisure option
and household formation which need to be considered are
fertility, which could be effected by the child credit

level, and savings which could, for example, be increased if such a scheme were to encourage early retirement. A major advantage of tax credit schemes is that since there would be no need to apply for the credits there would be no problem of non-take-up.

Finally, any scheme of negative income tax will redistribute income to some extent but the degree of this redistribution is of course dependent upon the tax schedules and credit levels. A scheme such as the one proposed in 1972, with only limited levels of credit and a single tax rate for most of the population, is inevitably restricted in this regard. Whether or not this amounts to success or failure on the part of the scheme depends, of course, on the philosophy underlying the proposals.

More recently the Alliance parties (Social Democratic Party, 1982; Vince, 1983) have proposed systems of tax credits and the Institute for Fiscal Studies (Dilnot et al. 1984) have gone a stage further and devised a scheme of tax and benefit credits. The details of these schemes are not important for present purposes, the issues they raise are essentially the same as any wide reaching reform of the income transfer system. Clearly an information system capable of evaluating a combined tax-benefit scheme of any description would have to be based on the general population as it would affect people

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at all income levels.

4.5 Conclusion

This chapter has presented the main policy changes which might require analysis in the next few years. The purpose of this was partly to provide background information for potential analysts but mainly to seek to identify areas of common concern to provide a sound analytic framework in spite of the wide diversity of system objectives described in Chapter 3. This wide diversity of objectives has been seen to translate into an equally wide range of possible policy initiatives. It has been possible, however, to draw out the basic structure which would be required of an information system to aid benefit evaluation.

The primary decision which is necessary in determining the nature of such an analytic system is whether it is to aim solely to describe and monitor the operation of the present system or whether it is to seek to compare this with alternative proposals. Given the widespread dissatisfaction with the present system, the former approach would seem quite unsupportable.

Given this conclusion, then, it would seem essential that the analytic system is based on information relating to the general population. Any reform of the system will

require the consideration of a wider population than existing claimants and many proposals will directly effect a large proportion of the population - especially examples such as tax credit schemes and Child Benefit.

Having said this it must also be recognised that the description of the existing system and its expected operation in the future will always be the starting point for evaluation studies. Any alternative must first show itself to be better than the existing system. Moreover an analytic system which is able to provide a detailed assessment of the implications of the annual uprating of benefit rates will have an important, ongoing applicability. However because the present system is far from satisfactory this is not enough. If, therefore, the analytic system has to sacrifice some detail in its description of the present system in order to achieve a wider perspective and applicability, then so be it. The inadequacies of the existing system should not be allowed to frustrate attempts to analyse alternative systems to the best ability of available data, technology and expertise.

The bare essentials of the analytic system, then, are the ability to assess the net effects of a package of changes to the existing system in terms of the distributional consequences. This will involve estimations of total income support, marginal tax rates, better-off/worse-off

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tables, and attraction rates together with administrative implications and overall costings related to present and expected future populations. Apart from the information required to determine claimants' benefit title this will require information on previous earnings - this would be necessary to calculate replacement ratios but the ability to consider income-based systems of assessment would appear essential and so ideally earnings data would relate to the previous three or four years. This will need to be linked with information on family and household composition, housing expenses, work expenses where applicable, and so on. It will also be necessary to incorporate expectations of behavioural responses to policy such as household formation, fertility, savings, retirement, wage rates, etc.

Other issues which the analytic system should be able to address would be the consequences of policy changes for take-up of benefits and overall measures of distribution and redistribution of incomes. These latter are catered for to a limited extent by better-off/worse-off tables but an analytic system based on the general population would be able to produce similar tables covering the entire population - whether these should be reduced to a single index is debatable but this will be considered in Chapter 5. Wider reforms will also necessitate consideration of issues such as the appropriate unit of assessment and accounting period and a better

understanding of the trade-off between equity and simplicity would be a valuable input to analyses.

Given these observations the next chapter goes on to study these issues in detail to specify the requirements of the analytic system more fully.

Chapter 5

Requirements of an Information System to Evaluate Social Security Benefit Policy Alternatives

5.1 Introduction

In Chapter 3 it was concluded that the definition of workable long-term objectives for the income maintenance system is an infeasible goal. Chapter 4 then went on to consider the alternatives which are likely to receive significant political support over the next few years with a view to establishing a framework for future analytic work which would remain valid irrespective of the political composition of the government. The main issues would appear to concern the unit of assessment, the accounting period, distributional consequences, benefit efficiency and economic, demographic and behavioural changes and the sensitivity of the policies to these.

This chapter studies each of these issues in detail in order to first identify the desired nature of the output from an information system to aid benefit policy analyses and then to draw these requirements together to specify some essential and desirable attributes of a database for the information system.

The chapter consists of three further sections. The following section addresses each of the above issues in turn together with the question of the presentation of the results of policy analyses. Section 3 then draws out the implications for the choice of a suitable database. The final section summarises the conclusions of the chapter.

5.2 The Output of an Information System for Evaluating Benefit Policy Alternatives

5.2.1. Unit of Assessment

Fundamental to any analysis involving the distribution of income is the definition of the income unit on which the analysis is based. As explained in Low Incomes:

> Because families with disparate incomes can comprise a multi-family household, there is less dispersion of incomes about the average when a household definition of income unit is used than when a family definition is used. The composition of the lowest quintile is affected, and the income relative to the median that is associated with the lowest quintile is higher in the case of households than in the case of families. (Supplementary Benefits Commission, 1977: 64).

It would appear self-evident, however, that any comparison of alternative benefit policies should be based on consideration of the benefit unit as defined for

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the purposes of each alternative. This could result in the need to compare the effects of policies which use different definitions and in this case it may be necessary to evaluate the impact of each alternative on one or more common definitions for the purposes of removing the influence of the definition of the unit of assessment on other attributes of the policy alternatives.

The most common unit used both in determining benefit entitlement and analysing income distribution in general is some description of the 'nuclear family', that is a single person or married couple together with any dependent children. For the purposes of Supplementary Benefit, for example, persons of 19 or over are considered to be separate families if living with their parents, as are 16 to 18 year-olds no longer in full-time education, and elderly relatives.

However this is by no means the only unit of assessment used in the social security system as explained by McClements (1978, 28). In the National Insurance system the individual earner is the basic unit for contribution purposes and contribution records determine benefit entitlement, so that a married couple can be one or two benefit units depending on their individual contribution records. If there is only one insured spouse then the other spouse and dependent children are counted as being

in the same benefit unit, although a woman on Short-Term
benefits cannot normally claim for her husband and
children. A widow remarrying or cohabiting who is
dependent on her husband's insurance retains her title to
National Insurance Retirement Pension but loses her right
to Widows' Benefits. For Widowed Mother's Allowances any
child below the age of 19 can be classified as a
dependent even if it has an independent income.

Given this confusion; the facts that at least a fifth of
households contain more than one benefit unit and there
are, on average, 1.5 tax units per household (McClements,
1978: 57); and the extent of joint consumption and
intra-household income redistribution causing expenditure
data only to be available on a household basis;
McClements prefers to base his analysis on the 'household
unit' - that is a single person or group of people
sharing the same tenure and with common cooking and
eating arrangements.

The Supplementary Benefits Commission suggested (1977:
para 29) that the breakaway from the household means-test
which became complete with the passing of the National
Assistance Act in 1948 was permanent. It notes two
objections to the household definition - that it made
unemployed members of the household dependent on the
earning members and that it acted as an incentive to
split households. It thus concluded:

> While we would not suggest that low income
> should be defined solely in terms of the
> nuclear supplementary benefit family unit, we
> believe that this definition is particularly
> relevant to any consideration of policy options
> for improving the financial situation of those
> in the low income category (Supplementary
> Benefits Commission, 1977: para 30).

However, following reports of the policies considered by
the 'Family Policy Group' within the present Government
the possibility of a return to a broader, family-based
definition of the benefit unit of assessment being
considered should not be discounted.

Conversely the viewpoint of the women's movement and
socialists would emphasise the significance of
intra-household distribution of income and
responsibilities. So that although they would see the
distribution of income between families as of fundamental
importance they would also emphasise the need to consider
the distribution of income at the level of the
individual. In policy terms this may or may not manifest
itself in a shift towards greater independence in the
structure of the benefit system, but either way there is
sure to be a need to analyse policies at the level of the
individual.

It would seem, therefore, that it should be a
prerequisite of any data source adopted for benefit
comparison analyses that it should be capable of

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producing information on a 'Supplementary Benefit nuclear family' basis. However, given the existing diversity of definitions, and the possibility that future studies may need to consider still other alternatives, it would be highly desirable if the data could be based on the individual but in such a way that the individuals can be regrouped into their respective families, households, tax units etc. Such an approach would serve to strengthen the essential quality of durability in the database – and allow the information system to develop into a lasting aid to policy making. Whether such an approach is feasible depends upon the data being collected on a household basis with sufficient information to disaggregate the household into the smaller units of analysis as required.

It is worth noting that an approach such as this would be compatible with the 'whole person' approach which is being considered in the <u>Operational Strategy</u> documents relating to the computerisation of the DHSS Local Offices. In particular it was suggested:

> 1.1 All relevant data about the person concerned held by the Department should be readily accessible at the point of enquiry or claim.
>
> 1.2 The records of spouses (and other people with adult dependents) should be suitably cross-indexed, care being taken to avoid criticism of interfering or obtaining unnecessary information.

1.3   Child   Benefit   records   should   be
cross-indexed   to   the   records for both spouses
or other appropriate adults (DHSS, 1980: 14).

5.2.2. <u>Accounting Period</u>

The   next   aspect of the presentation of the results to be
considered   is   the   length   of the time period over which
the monitoring is to take place.

Income   and   expenditure   are subject to greater variation
in   the   short-term   than   over   longer   periods and so in
order   to   obtain   a   more   faithful   representation   of a
unit's   'average behaviour' it would be preferable to base
the   analysis   on   longer   rather   than   shorter   periods.
However   'average   behaviour'   is   not   necessarily   what
evaluation   studies   are   concerned   about.   For   example,
there   is   conflicting   opinion   as   to   whether   benefits
should   be higher in the long-term or the short-term. Some
people   would   argue that benefits should be higher in the
short-term   to   allow beneficiaries a period of adjustment
to   their   altered circumstances - this view was expressed
in   the   Earnings   Related   Supplement   scheme,   1966-82.
Others   would   argue,   however,   that   benefits   should
increase   in   the   longer-term   as capital stocks begin to
need   replacement   -   this   is   the   purpose of the higher
scale   rates   of   Supplementary   Benefits available to all
long-term   claimants   except   the   unemployed.   Informed
debate   of   issues   such as these would not be advanced by

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averaging experiences over longer periods.

The great majority of social security provisions are based on the payment of weekly benefits and discussion of them is normally conducted at this level. It would appear to be essential, therefore, that any analysis of benefit policies should consider weekly income, and possibly consumption or expenditure.

If reliable information on people's actual experience over longer periods existed so that fluctuations could be identified and changes in behaviour in the light of changing financial circumstances observed then this would surely be of considerable interest. Such information would be of value in improving understanding of the existing conditions which in turn could improve predictions of the likely consequences of future policy changes. Unfortunately data collected over longer periods is traditionally less reliable. For example, in 1976 the Office of Population Censuses and Surveys (OPCS) conducted an experiment to investigate the feasibility of recording annual income in the Family Expenditure Survey and it was concluded that if the consultation of records by respondents was important to ensure accuracy then it would not be feasible - it was not possible to draw firm conclusions about the accuracy of estimates not supported by records (Kemsley et al. 1980: 71-72).

It is suggested, therefore, that any information system used to evaluate social security policies should be able to describe units' experiences on a weekly basis as accurately as possible. Information concerning their experiences over longer periods, such as that from the longitudinal analysis of the Cohort Study of Unemployed Men is extremely useful for improving understanding and this should be used to augment basic data wherever possible within the main evaluation system.

5.2.3. Distributional Consequences

The estimation of the differential effects which a policy change is expected to have on various subsets of the population is the fundamental product of any analysis of benefit policy alternatives - any other research is essentially aimed at improving these estimates either directly by, say, attempting to better understand the composition of the existing population, or perhaps more indirectly by seeking to develop the theory of labour supply effects of benefit policies, for example.

The basic requirement for comparing the implications of alternative policies for different sub-populations is some measure of their incomes under the various schemes. Capital resources play an important part in determining material standards of living and some commentators, perhaps most notably of late the Institute for Fiscal

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Studies in work carried out for the Social Democratic Party (Morris, 1982), have suggested that consumption is a more indicative measure of living standards than income. However, with the exception of the amount of a claimant's savings in assessing title to means-tested benefits, all social security measures since Beveridge reported have sought to provide some sort of minimum income irrespective of a person's stock of capital. Whilst it is as well to be aware of the possibility that some future Government may wish to relate its income maintenance system more closely to consumption rather than income - and again it is important to bear in mind the underlying philosophy of the Conservative Government's 'Family Policy Group' - it is suggested that some measure of income will remain the primary gauge of people's material standard of living for the foreseeable future. Moreover, even if a Government did wish to shift the emphasis towards consumption, much of the debate would inevitably continue to focus on incomes and so even in these circumstances income measures would retain their importance. Clearly, though, a data source which also has information on expenditure would have added value.

For the purposes of comparing very similar benefit policies, particularly when considering a change in benefit rates without altering eligibility rules, for example, it may be adequate to compare benefit income before and after the change. Even in such simple cases

great care must be taken, however. Atkinson and Micklewright have shown (1980) for example that predictions of National Insurance benefit receipt calculated on the basis adopted in Lower Incomes (Royal Commission on the Distribution of Income and Wealth, 1978: Table 4.3), when compared with benefit actually received by unemployed respondents to the Family Expenditure Surveys 1972-77, resulted in only 19% of recipients with unemployment durations of less than a year receiving within 5% of the predicted amount of benefit, and only 34% of recipients for all durations. There were a number of factors which explained this divergence - disqualification from title to benefit at the beginning of a PIE, linking spells reducing length of title, errors in calculation of Earnings Related Supplement caused by assumption of uninterrupted earnings, wives' earnings exceeding the maximum permitted level so that the claimant is not eligible for benefit on her behalf.

It is therefore suggested that any model designed to compare benefit policy alternatives should, as a minimum, seek to describe the unit's 'Total Income Support' (TIS). TIS was defined in Social Assistance (DHSS, 1978: 115) as:

i. for those in work -

gross earnings less income tax, National Insurance contributions, rent, rates and work expenses, plus Child Benefit, Family Income Supplement, rent rebates, rate rebates, free school meals and free welfare milk; and,

ii. for those out of work -

National Insurance benefit less rent and rates, plus Earnings Related Supplement, Supplementary Benefit (including rent and rates), Child Benefit, any Family Income Supplement still payable, rent rebates, rate rebates, free school meals and free welfare milk (tax rebates were ignored).

The actual definition will vary according to the benefits available to claimants at the time. Also care needs to be taken with the allowance made for all these elements - for example, Atkinson and Micklewright have demonstrated (1982b) the difficulty of including a realistic allowance for work expenses and the need to offset this against the costs of job-seeking, which will also be subject to considerable variation between individuals.

It is suggested, therefore, that the fundamental output required from benefit evaluation analyses is a breakdown of the numbers of units - defined initially in terms of the 'benefit unit of assessment' for the particular policy, but also, for the purposes of policy comparison,

related to, say, individuals, families, households, or perhaps the Supplementary Benefit claimant unit - into a number of TIS ranges.

Determining the appropriate width of these TIS bands may be important when deciding whether or not a given data source is capable of supplying results of sufficient accuracy since the narrower the bands have to be then the more reliable the data upon which they are based must be if the results are not to be presented as spuriously accurate. Clearly the appropriate width of the bands will vary from one exercise to the next, and it is reasonable to suppose that the more radical the change which is being considered the wider the bands could be expected to be - as the possible policy changes become more radical the consequences will probably become more difficult to predict, hence making less closely defined predictions more appropriate, and the absolute size of the consequent changes in people's benefit receipts are likely to be larger.

In addition to the distribution of TIS by 'type of benefit unit', the analysis also needs to be able to describe its distribution by a number of other personal and household characteristics - some of these will have been required in order to assess the unit's benefit entitlement. The characteristics referred to here are housing type (owner occupier, council tenant, private

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rented accommodation, furnished or unfurnished), region (standard regions and type of region), ages of individuals, employment histories, length of current PIE, National Insurance contribution records, previous occupation, education, health and possibly others. The reason for obtaining this output is that it should serve to identify any groups whose incomes are particularly affected, and hence to improve understanding of the distributional consequences of the changes being considered. It may also provide information on groups in whom there is particular interest, a matter which will be taken up below.

Having established TIS by the various characteristics there are several sorts of analyses which can be carried out to improve understanding of the consequences of the alternatives. The first is to construct 'better-off/worse-off' tables - that is tables which divide individuals, benefit units, or whatever, by change in income, normally compared to a no change position or possibly by comparing policy alternatives in pairs.

The second study which should be carried out on the TIS tables is a consideration of the implications for horizontal equity. That is, implicit in any benefit scheme's rules, there is an idea that claimants with different family circumstances should be at a similar standard of living. This applies particularly to the

Supplementary Benefit scheme which seeks to provide a minimum standard of living, but also to other benefits as well. McClements (1978) has developed indices for comparing different households based on an analysis of the expenditure data in the 1971 and 1972 Family Expenditure Surveys, which attempt to define incomes which households, categorised in terms of the individual's sex and age, require in order to attain similar standards of living. The horizontal equity implicit in a given set of tables of TIS resulting from a policy evaluation could either be studied by dividing TIS by the appropriate indices and comparing results or alternatively by comparing the equivalence scales implied by the results themselves. This can be done in one of two ways, either by dividing the TIS for each group by that for a base group and deriving a given policy's implied equivalence scales and comparing the scales for different policies, or alternatively by taking the same population groups under the alternative policies and dividing their TIS by one of their number, say the no change option, so that if the equitability of the scheme were to remain unchanged the process would yield indices which, for any of the policy alternatives, were the same across all population groups.

A further study which could be undertaken once the TIS tables have been derived is an analysis of the extent to which the alternatives redistribute income. Whilst any

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income transfer scheme redistributes income by definition, it has not been clear in the past that redistribution with a view to reducing inequality of income has been an explicit objective. Both Labour and Liberal Parties have declared recently that they do wish this to be an explicit aim of the system in future. It would appear, therefore, that future analyses of benefit policy options should seek to quantify this quality. Such an analysis would begin with the distributions of the population of the country by pre- and post-transfer income - post-transfer income would be TIS, pre-transfer income could be simply gross earnings plus unearned income. Summary tables of pre- and post-transfer household income are published annually in <u>Economic Trends</u> - these include four definitions of income, 'original income' plus cash benefits equals 'gross income', gross income minus direct taxes equals 'disposable income', and disposable income minus indirect taxes plus other benefits equals 'final income', capital gains are excluded from these incomes and all direct taxes on capital are thus omitted also (the information to include these items is not available in the Family Expenditure Survey data upon which these tables are based). The Central Statistical Office produce tables of income distributions before and after transfers which are published in the Blue Book - these are based on the information contained in the Inland Revenue's <u>Survey of Personal Incomes</u> supplemented by Family Expenditure

Survey data, they are presented on a tax unit basis which is extended to cover units not liable for tax who are not included in the Survey of Personal Incomes. The Royal Commission on the Distribution of Income and Wealth considered these tables to be the 'most valuable income statistics available' in spite of their retaining many of the defects of the Survey of Personal Incomes (Royal Commission on the Distribution of Income and Wealth, 1975: 44).

The task of expressing the distributions of income in terms of a single index has been the subject of considerable research and continues to be a matter of academic debate (see Atkinson, 1970, for example). It is possible, however, to describe the various income distributions which are anticipated for the various policy alternatives by using several different summary statistics. This approach is adopted by Piachaud (1982) in which he first describes the distributions in terms of proportions of families in various income ranges and percentiles, he then quotes the Gini coefficient and the Atkinson measure of equality with three values of the parameter alpha (see Appendix 5.1 for an explanation of these indices).

A further benefit attribute which could be estimated once the TIS tables have been derived is total benefit cost. Although ORS may essentially be concerned with estimating

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the impact of policy decisions at a distributional level rather than overall costs, any model capable of producing reasonable distributional estimates should also be able to produce costings as well. Even if total cost estimates are only made to be used as a test statistic in validation runs they must still have a role to play.

5.2.4. Benefit Efficiency

It should be noted that in some circles the concept known as target efficiency would be called effectiveness. However, as target efficiency is a recognised term in social security, it will be retained here.

Roter (1975) discusses the need to tackle the problem of overall benefit efficiency, defined as the extent to which the actual implementation of a programme meets 'the original targets conceptualized by policy-makers'. For this purpose two elements of benefit efficiency are identified. Target efficiency - 'the degree of discrepancy between eligibility requirements as formally specified in programme regulations and the original targets or objectives which prompted the setting up of a programme' - and operational efficiency, the outcomes of actual programme implementation compared with the said eligibility requirements. Roter explains the trade-off between these two aspects of overall benefit efficiency -

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namely that increased target efficiency generally requires more complex operational rules and regulations leading to an increase in errors and a decrease in operational efficency and ultimately a breakdown in implementation with ad hoc rules being substituted at the local level and a greater mismatch between policy as analysed and policy as implemented. In essence an attempt to improve the equity of the benefit has a trade-off in operational efficiency which may have inequitable consequences.

For determining target efficiency Roter suggests a data set needs to be based either on a population census or a representative sample of the general population, and for operational efficiency 'a broad data base in which both eligible persons and non-recipients are included with a known probability so that both groups can be identified'.

It may help to understand the populations which need to be identified by considering the following diagram adapted from Roter.

Figure 5.1 <u>The Various Populations of Analysis in Benefit</u>

<u>Evaluation Studies</u>
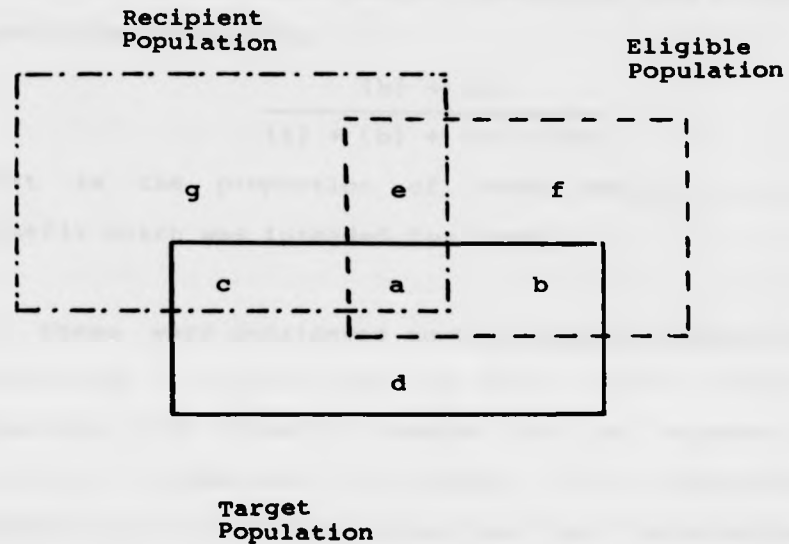
Clearly for a perfectly efficient benefit these three
populations would coincide so that one policy objective
would be to maximise (a) as a proportion of the union of
the above population sets. The other subsets in the
diagram can be explained as follows.

b - manifestation of non-take-up and operational errors
c - 'two wrongs make a right', rules do not define as
    originally intended but are incorrectly applied
    giving desired outcome
d - rules fail to embrace target
e - rules fail to exclude non-target
f - rules fail to exclude non-target but benefits fail to
    reach their eligible population either through
    operational error or non-take-up
g - administrative error and fraudulent claims.

Roter suggests a measure of overall efficiency as

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$$\frac{(a) + (c)}{(a) + (b) + (c) + (d)} \, ,$$

that is the ratio of the target population who receive benefits to the total target population, and a measure of inefficiency would be

$$\frac{(b) + (d)}{(a) + (b) + (c) + (d)} \, ,$$

that is the proportion of those who do not receive a benefit which was intended for them.

If these were considered to be acceptable definitions of efficiency (a point taken up later in this sub-section), assuming that benefit receipt can be regarded as a success irrespective of whether it is a by-product of misapplication of the rules and not considering the actual level of benefit received, then this requires the identification of two populations for any given benefit - namely the recipients and the target.

For an existing benefit the identification of the recipient population is fundamental to any comparison with alternatives. To identify the target population of a benefit requires an explicit definition of the objectives of that benefit and this may well be difficult to establish - the longer the scheme has been in existence the harder it is likely to be. To estimate the recipient population of a proposed benefit requires an understanding, and thence a formal model, of the way

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take-up and administrative errors vary between benefits. If such a model could be developed then the basic output from a policy evaluation exercise, which would normally be estimated on the basis of an approximation of the eligible population, could be used to transform the expected distribution of benefits amongst the eligible population into that for the recipient population.

Roter lists the factors which are generally acknowledged as leading to increased take-up as being the promotion of a more appealing service through advertising, the reduction of policing methods which can cause embarrassment to potential claimants and stigmatisation of the service, and the reduction of the cost of the service to potential claimants in terms of expense and effort relative to its value.

The Supplementary Benefits Commission (1978) found strong evidence that the proportion of sick and unemployed receiving their title to Supplementary Benefit rose as the length of their PIE extended. Moreover about two-thirds of those with an unclaimed title to benefit were living in households which had combined incomes above the Supplementary Benefit level.

Holdaway and Partridge (1981) report that a Delphi study involving eight Local Office managers revealed benefit complexity as the dominating cause of errors - benefit

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complexity being defined as 'the number of different distinguishable operations through which a claim must pass'. Other factors frequently proposed as having an influence on error rates are the number of claimants relative to the number of staff, the quality of Local Office staff and the amount of training which they receive and the level of staff turnover.

If it was felt unacceptable to assume the receipt of benefit to be a success irrespective of whether the amount of benefit received was correct then subsets (a) and (c) could have the additional condition imposed upon them of 'received within x% of the correct amount of benefit'. Those people excluded as a result would be added into subsets (b) and (d) respectively.

There is, then, a need for quantitative research into the interaction between benefit complexity and operational efficiency. This would have two main objectives. Firstly to establish a better understanding of how proposed policies will work in practice rather than theory. If it is the case that schemes with simpler rules are more faithfully implemented than schemes with more complex rules then a direct comparison of results of evaluation studies based on eligible populations rather than potential recipient populations will be deficient. Secondly the research may be able to identify more efficient policies for reaching the same target

population.

If this model could then be extended in both directions
it may also be possible to relate increased benefit
complexity to attempts to improve equity in the
eligibility rules, and to relate operational efficiency
to administrative costs. This would then enable analyses
of benefit policy alternatives to include a consideration
of their implications for the cost of administering them.
This has not been feasible in the past and yet whilst
National Insurance benefits cost around 4% of their value
in benefit payments to administer the corresponding
figure for Supplementary Benefits is around 17%. Nobody
would argue that to decrease the cost of administering
the benefit system is undesirable - whether such savings
should be used to enable an improvement in the quality of
service or to save on running costs may be a different
matter.

This is an area where the OR modelling approach could be
particularly valuable and could be a first important step
towards relating operational problems and policy making
more closely. To this end this subject will be addressed
again in Chapter 9.

The suitability of Roter's definition of benefit
efficiency could be questioned by policy makers.
Depending on political priorities concern might, for

instance, focus on the sub-populations e, f, and g. The important point to recognise for the moment, however, is that all these various sub-populations ought to be considered in benefit evaluation studies. If such groups are to be enumerated then clearly the data base for the information system needs to cover the general population or else not even existing benefits can be properly evaluated.

5.2.5. Economic, Demographic and Behavioural Changes and Sensitivity Analyses

It could be argued that the social security system is designed to ameliorate immediate social problems and so, providing it achieves this goal, any further problems which the measures themselves may create or which arise in the future for whatever reason can be dealt with by further measures - quite possibly by a different Government. Given this view of the system it could then be argued that all that is necessary to design social security policies is a knowledge of the social problems which the measures need to tackle - in other words a description of the existing population by the size of groups with various characteristics. Whilst this may seem an extraordinarily naïve approach to policy making it would not appear to be in altogether stark contrast with the pattern described in the development of the system in Chapter 2. It is suggested that if this pattern is to be

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improved upon in the future, then policies need to be made on a basis not only of knowledge of the existing population but also of how that population might develop in the future. Some of these developments may be expected to occur whatever social security provisions obtain, others will be dependent on those provisions.

This section is concerned with the nature of the output which is needed from benefit evaluation exercises. It has been noted that the basic product of such an exercise is a breakdown of the existing and prospective claimant populations by a number of characteristics in order that their benefit entitlement can be assessed and the impact of possible changes estimated. Unless the model which provides these estimates can embody the theoretical understanding of the supply of labour and other behavioural consequences of the policies then its value is severely limited. For example, at the most basic level, registered unemployment more than doubled between mid 1980 and mid 1982 from less than 1.5 millions to over 3 millions; at the next level of detail the number of people registered for more than a year rose from around 20% of the total unemployed (around 350,000 to 400,000) in 1980 and the first half of 1981 to 35% (around 1.1 to 1.2 millions) by the end of 1982. Any policy evaluation which concerned these population groups in, say, the late 1970s but did not anticipate these trends would inevitably have been far from faithful in its

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assessments.

There are two points being made here. The first is that a benefit evaluation exercise which makes no attempt to understand changes in the structure of the population will always be seriously inadequate. This does not necessarily mean that any model designed to evaluate benefit policy alternatives should also seek to model explicitly the behavioural consequences and likely demographic trends. There is a considerable tradition of research on all aspects of the interaction of social security benefits with the supply of labour and this needs to be incorporated into the policy analysis exercise at some stage. Preferably the data upon which the analysis is based would have the capacity to enhance the understanding of the behavioural and demographic aspects in its own right. If this were to be achieved the source data would have to include a time element - any attempt to understand the labour market, for example, requires information relating to different conditions in that market. If existing theory is to be applied to interpret the basic output, however, this time element would not be a necessity and 'snapshot' data describing conditions at a single point in time may suffice. It is essential, therefore, that the evaluation of the policies incorporates analysis of their sensitivity to tenable theories and changes which are predicted by experts.

The second point is that some changes which occur in the environment will not be a progression from the past and hence may not be predicted by any of the existing theories, based as they are on historic data - the unprecedented rise in unemployment in the period 1980-82 might be one example. For this reason the evaluation exercise should also explicitly test the sensitivity of the policy alternatives to discontinuous changes in various exogenous variables such as unemployment levels and price and wage inflation rates. A policy option which is able to show itself to be robust enough to cope with such dramatic changes would have considerably added appeal over less robust alternatives.

5.2.6. Presentation of Results

Evaluation studies of the kind being discussed here will inevitably generate a vast amount of basic data. These basic data need to be condensed and summarised by the analysts in such a way as to ensure that administrators and Ministers are made fully aware of all the salient facts and implications of the options open to them without being overburdened by the sheer volume of material and without exposing themselves to possible charges of editing the results in a non-objective fashion. Greater involvement on the part of these users in the analytic process would go a considerable way to overcoming this latter problem apart from the other

important advantages of such an approach to policy analysis which have already been mentioned in Chapter 3 above and will be discussed further below particularly in Chapter 10.

If further research could identify the correspondence between various consequences such as the trades-off between the complexity of rules and equity considerations in one direction and administration costs and error rates in the other direction then it could be possible to model such relationships explicitly. If this was to prove possible it would enable a greater understanding of how the system works and also make the results of evaluation studies more easily understood.

In the meantime, however, it should be possible to identify certain population groups of particular interest, the results concerning whom will be of especial importance. These groups can be placed into five categories.

i.   Groups who attract concern at all times - this will consist particularly of the poorest families.

ii.   Groups who attract concern at the particular time of the study. These may or may not be the groups at whom the policy is specifically directed. At present this class may include the long-term

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unemployed, unemployed school leavers, and single parent families. As with those in (i) these groups can be identified prior to the analysis.

iii. Groups with 'large' numbers of people in similar circumstances. 'Large' will be relative to the total number affected by the particular change in question. These groups can be identified once the population profile is known in sufficient detail to apply the given policy's eligibility rules.

iv. Groups whose TIS would be most affected by the change under study. These groups may not be identifiable until the analysis has been performed. If several alternatives are being considered then the groups in this class may vary between the alternatives, and all these groups will need to be enumerated.

v. Groups, if any, who are affected by particular aspects of the policy changes. Concern may focus on one or more specific aspects of a policy alternative, in which case it may be necessary to know how many are affected and by how much. It should be possible to identify this information from the distributions of TIS against relevant claimant characteristics.

Tables describing the changes in TIS for the above categories under the various policy options could be regarded as the minimum amount of information required to facilitate sensible analysis.

5.3 Attributes of a Database for the Information System

The previous section has described the factors which determine the desired nature of the output of an information system to assist in the comparison of benefit policy options. In this section the implications of this analysis for the definition of a desirable data base for the information system are considered.

The first aspect which was discussed was the appropriate unit of assessment on which to base policy comparisons. Each policy option will initially be analysed using the definition of the unit of assessment adopted in that policy. For the purposes of comparing the options the results will then need to be translated into one or more common bases, perhaps the Supplementary Benefit nuclear family and possibly individuals also. It was further suggested that ideally the database should be arranged on an individual basis but in such a way that the individuals can be grouped into other units such as the nuclear family, tax units, National Insurance benefit units or households. This would mean that the data would ideally be collected on a household basis, the widest of

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these groupings, in such a way that they can be separated into the smaller units, or alternatively on an individual basis cross-indexed so that individuals can be grouped accordingly to form the appropriate units. As a minimum requirement of any data source it must be able to provide consistent data relating to a common unit of assessment such as the Supplementary Benefit nuclear family for the purposes of policy comparison.

The second aspect was the time period on which the analysis should be based. It was noted that although it could well be argued that a longer period would be more appropriate debate is normally focussed on current weekly income support and would probably continue to be so even if the Government decided that it wished to change the emphasis. Given that it is easier to aggregate, possibly fluctuating, weekly incomes than to break down, say, annual incomes it is suggested that the information system should be based on data able to provide results which describe units' weekly incomes. If information from longitudinal analyses such as the Cohort Study of Unemployed Men is able to provide units' experiences through time, and this can be incorporated at the aggregation stage then this would be a valuable addition to the basic analysis.

Ideally it should then be possible to describe the TIS of individuals, families, and so on sub-divided by a wide

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range of personal and household characteristics along all dimensions at the same time. These characteristics would include family composition, housing type, standard region, age and sex of individuals, duration of current PIE, employment histories, National Insurance contribution records, previous occupation, education and health.

If a data source possessed the following four characteristics then it would be a very considerable aid to assessing the immediate implications of a policy change.

i.   The data source should preferably relate to actual units, that is families, individuals, or whatever current interest is focussed on, and be comprehensive in its coverage of the characteristics relevant to the application - if the analytic system is to be durable this would require a coverage of sufficient characteristics to make it of use in a wide range of applications.

ii.   The data should relate to samples of sufficient size to minimise doubts about the validity of results relating to sub-populations - this will be application-dependent since the results will need to be more accurate for minor policy changes than for more radical proposals.

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iii.   The data should at least cover the population
        eligible to claim the existing range of benefits
        being considered plus any who narrowly miss
        eligibility - if overall distributional
        consequences or target and overall efficiency are
        to be assessed within the analysis the data would
        have to cover a representative sample of the
        general population.

iv.   The data should be as up to date as possible.

As has been noted several times above, however, policies
are essentially made for future populations and if
evaluations are to be made with this in mind then the
analysis also needs to embrace views of how the existing
population may develop in the future, and this suggests a
need to incorporate an understanding of the population
beyond a knowledge of its present composition. It was
noted above that this understanding could be imposed on
the results from theories developed elsewhere, in which
case a single point in time description of the present
population would suffice. Alternatively if the data
source contains a time element then that understanding
could come at least partially from within the analysis.

5.4 Conclusion

This chapter has addressed each of the main issues which are likely to be considered when evaluating future social security policies. It has identified the requirements of the output of an information system to support the analysis of these alternative policies and hence essential and desirable qualities of a suitable database for the information system. This analysis is summarised in Table 5.1.

The essential quality of a database for evaluating social security benefit policies is that it must contain sufficient data to assess the TIS of each assessment unit under each benefit regime. The analysis of this chapter suggests a number of additional attributes which would be desirable in such a database, these are summarised in Table 5.2.

The analysis of this chapter would appear to amount to a very strong case for basing the information system on a survey of a representative sample of households from the general population covering the widest possible range of variables including income, housing, family structure, expenditure, employment histories, education and so on. The case for using such a general household survey is further strengthened by the experience of the Population Model which adopted the main alternative approach of

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Table 5.1 <u>Links between desired output of benefit evaluation studies and the implications for selecting a suitable database for the information system to support such analyses</u>

Desired Output	Desired Input

I <u>Unit of assessment</u>

Individuals, families, households, tax units, etc.   ⟶   Individual basis able to be regrouped into their respective families, households, tax units, etc.

II <u>Accounting Period</u>

Weekly plus longer term understanding   ⟶   Weekly income data plus results from longitudinal analyses

III <u>Distributional Consequences</u>

Distribution of TIS by type of benefit unit and by various personal and household charac'cs. Better-off/worse-off tables. Measures of horizontal equity, income redistribution   ⟶   TIS of each unit by type of benefit unit and by various other personal and household carac'cs under each benefit regime preferably covering general population

IV <u>Benefit Efficiency</u>

Size of target/non-target, eligible/non-eligible, recipient/non-recipient populations and interactions between them   ⟶   Data to assess eligibility of each unit in general population

V <u>Economic, Demographic and Behavioural Changes and Sensitivity Analyses</u>

Sensitivity analyses, especially changes in distributional consequences over time   ⟶   Behavioural and economic theories and hypotheses based on understanding of population structure and past changes

Table 5.2 <u>Desired Attributes of a Database for a Benefit Evaluation Information System</u>

Attribute	Desired Quality
Coverage	Representative sample of general population of the country.
Accuracy	Data as reliable and accurate as possible. Sample sizes of sub-populations large enough to be representative.
Currency	As up to date as possible - probably monthly or quarterly data on population structure.
Units	Individual basis able to be regrouped into their respective families, households, tax units, etc.
Definitions	Consistent enough with current benefit rules to evaluate existing system but not so closely tied to idiosyncracies of the present system as to be inappropriate to evaluate more rationally structured alternatives.
Correlations	As much information on interrelationships of population characteristics as possible.
Continuity	Either continuous or regular point in time collections of data with the minimum level of change in definitions in order to facilitate the identification of trends in demographic structure.
Availability	General availability to all interested parties.

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bringing together data from a wide range of sources and which fell down largely because of the great difficulties inherent in performing this task in a correct and consistent manner.

The best available general survey for benefit evaluation studies is the Family Expenditure Survey (FES). The major weaknesses of the FES have already been mentioned in Section 3.5. In particular the time-lag between data collection and the availability of results, small samples and doubts about some of the income data make the FES a far from perfect data source. However, given the failure of the alternative approach to make any real impact on policy analysis, it surely warrants further consideration. The following chapter therefore describes the FES in detail and discusses its weaknesses in relation to benefit evaluation studies. Chapter 7 then offers an approach to the analysis of FES data which endeavours to overcome the weaknesses to some extent whilst exploiting the inherent advantages of the FES.

Chapter 6

The Family Expenditure Survey as a Data Source for
Benefit Policy Evaluation Analyses

6.1 Introduction

The Family Expenditure Survey (FES) is a continuous survey of domestic households in Great Britain, with a separate survey of Northern Ireland being conducted using the same questionnaires and coding. The FES has been in continuous operation since January 1957 (except for temporary suspensions due principally to General Elections) and since 1967 the initial annual sample has consisted of some 10,750 addresses. The FES is conducted by the Social Survey Division of the Office of Population Censuses and Surveys on behalf of the Department of Employment. All members of a co-operating household over 16 years of age are interviewed and then complete a diary for 14 days.

A principal motivation for carrying out the FES was originally to determine household expenditure patterns in order to calculate weightings for the Index of Retail Prices - a use to which it has been put annually since 1962. However it has also proved to be a valuable source of household income data. The Central Statistical Office

(CSO) have used the FES to study the effects of taxes and benefits on households and to determine the distribution of payments of indirect tax, and it is used in conjunction with the Inland Revenue's Survey of Personal Incomes and the New Earnings Survey to derive tables of UK income distribution published in the Blue Book. The Treasury uses FES data to estimate the impact of Budget proposals on different family types. The Department of Environment use FES data to calculate take-up rates for benefits administered by Local Authorities. Within DHSS the economists (EAO) have a FES-based model covering primarily in-work benefits to study the impact of packages such as the Budget, and the statisticians (SR) use the FES to estimate take-up of benefits and for ad hoc studies. McClements based his work on equivalence scales (1978) on FES data. Outside Government the FES has been used in several major projects concerned with income distribution and the income transfer system – in particular it is the basis of the Unemployment Project at the London School of Economics supported by the Treasury and ESRC, a recent study by Piachaud (1982), and the analyses of the Institute for Fiscal Studies.

The tapes are made available to researchers through the ESRC Data Archive at the University of Essex. The tapes for the survey in year n become available around March of year n+2. Given that analysts then have to process the data into the necessary form for their purposes the data

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can be expected to relate on average to circumstances obtaining two years previously. Clearly this means that the data will have to be projected forward on some basis, be it theoretical or hypothetical, in order to describe even current circumstances.

The sample design of the FES as at 1979 and described in Kemsley et al (1980) is set out in Appendix 6.1. This chapter discusses the suitability of the FES for benefit policy evaluation studies. The following section considers the ability of the FES to meet the requirements of an information system which were identified in the previous chapter, conclusions are summarised in Section 6.3.

6.2 Comparison of the FES Against Desired Attributes of a Database for Benefit Policy Evaluation

6.2.1 Content

Clearly the precise nature of the information required in order to determine a unit's title to benefit under a given set of eligibility rules will be dependent upon those rules. Moreover experience suggests that there is almost no limit to the range of characteristics which may be considered to be relevant when testing for eligibility for a benefit.

However the range of variables included in the FES is as great as could be expected without jeopardising the level of response to an unacceptable degree and as such must be regarded as the widest ranging single source of household income and expenditure data which is likely to be available in the foreseeable future. This range of information is achieved at the expense of detail in many respects and inevitably a unit's title will not always be established as accurately as would be possible given more specific data.

6.2.2 Coverage

The FES is a survey of a sample of the general population as required. The proportion of households selected for the FES sample by the rigorous procedures described in Appendix 6.1 who agree to co-operate is around 69-71% of the effective sample. This would not be a problem if the remaining sample is as representative of the general population as the original sample.

Determining differential non-response directly from the results of a survey is not easy because only limited information concerning non-respondents is available. However follow-up studies have been carried out to identify the households in the 1971 and 1981 FES samples in the Censuses of the same years. The results of the 1971 study are reported in Kemsley (1975).

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This analysis consisted of constructing two sets of distributions - one for co-operating households and one for non-co-operating households. Each pair of distributions classified the FES sample by one of 17 variables relating to a characteristic of the household or one of its members. Three of these characteristics were identified as being associated with differential response. Households whose head is self-employed are considerably less likely to co-operate than households whose heads are employees; the presence of children in the household appears to increase the response rate considerably, although the number of children would not appear to be significant; and, most striking of all, there was a consistent decline in response rates with increasing age - a regression of response rates on age gave the following results:

	Age of 'head of household'	Age of 'housewife'
Regression coefficient - rate per 5 years per cent	-2.22	-2.08
Estimated response at 45 years per cent	72.22	71.21
Correlation coefficient between response rate and age	0.9180	0.9160

Although this linear regression gives a fairly good fit, actual response rates are slightly above the line for both younger and older age groups and a curved line may

be better still.

When this comparison was used to study the importance of differential response for estimates of income redistribution (Harris, 1977) the results were encouraging. The FES sample was reweighted for each variable in turn and in no case did this change the total income of the sample by more than 5% and in most cases the change was around or less than 1%. Thus even where there is evidence to suggest that differential response exists it would not appear to seriously invalidate the FES as an indicator of income redistribution.

In conclusion, therefore, the FES would appear to provide as representative a sample of the general population as can be expected of a survey for the purposes of evaluating benefit policies.

6.2.3 Accuracy

Apart from the concern as to whether the respondents to the FES provide a representative sample of the population of Great Britain as a whole there are further doubts about the reliability of some of the information contained in the survey which are potentially important when determining its value for benefit evaluation purposes. These fall into two main groups.

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The first group concerns the size of sub-populations of interest and the second the reliability of the responses to some of the questions in the FES especially those relating to income.

The representativeness of the FES sample of unemployed men aged 16-64 for the 1972 - 1975 surveys has been analysed in depth by Atkinson and Micklewright (1980). Whilst they found that the FES was able to pick up details such as the increasing proportion of under 20 year-olds amongst the unemployed which occurred during the period such trends are based on samples of 12 unemployed under 20s in the 1973 FES up to 27 in the 1975 survey. So whilst the FES is as representative a sample of the unemployed as can be expected of such a general purpose survey the sample size needs to be borne in mind at all times and the use of supplementary data to improve the representativeness of the sample would be most useful. The omission of residents of hospitals, hostels, hotels and other institutions could also be expected to bias results in benefit evaluation studies and supplementary data for these groups would be needed for certain applications at least.

The Central Statistical Office annually compares grossed-up FES expenditure data with the National Accounts figures in the Blue Book derived from alternative sources, more recently they have carried out

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a similar analysis of FES income data. The major discrepancies for 1976 were, on the expenditure side, alcohol (grossed-up FES 58% of Blue Book Consumers' Expenditure), catering (134%), tobacco (79%) and durable goods (79%), and, on the income side, self-employment income (67%), investment income (33%), and private occupational pensions (49%) (Kemsley et al. 1980: 51).

These discrepancies would appear to devalue the results of the FES to a considerable degree. There are, however, a number of explanations for them which would appear largely unavoidable and which do not seriously weaken the validity of the results for the purposes of evaluating social security policy options. Apart from errors caused by differential non-response discussed above they can largely be explained by difficulties of comparing the Blue Book estimates with FES data, defects in the survey design of the FES (particularly the need to use retrospective questions on income and expenditure) and errors caused by recording bias which are commonly associated with surveys such as the FES.

Atkinson and Micklewright (1982a) have reconsidered the evidence of the Blue Book comparisons by exploiting some of the results on differential non-response rates of the 1971 Census comparison (Kemsley, 1975). In their analysis the FES sample is first adjusted for the differential

non-response by region as identified in the Census comparison, assuming that these are valid for all years. The effect of adjusting for differential response by age is then also examined. In this analysis the assumption is made that within the region or age category all other characteristics are independent of respondent/ non-respondent status.

Their analysis of social security benefits showed that whilst comparisons would suggest that FES estimates of benefit receipts are reliable some individual years did display divergences. For example in the Supplementary Benefits Commission study of the take-up of Supplementary Benefit (Supplementary Benefits Commision, 1978), when FES estimates of Unemployment Benefit receipt were compared with official estimates based on the Annual Statistical Enquiry of Supplementary Benefit records for 1975, it appeared that Unemployment Benefit was marginally over-represented in the FES but in Atkinson and Micklewright's analysis of the FES 1972-75 this was an exception and the other years displayed far greater divergence. They also suggest more refined adjustments for the under-representation of groups such as the unemployed and sick in the sample and recommend further study of the misidentification of Supplementary Benefit as National Insurance benefits.

Overall their analysis showed that there exists real

scope for exploiting knowledge of differential non-response which should be advanced when the results of the 1981 Census follow-up study become available.

In summary there are justifiable concerns relating to the accuracy and reliability of some of the FES data which can have important implications when using the surveys to evaluate social security policies. For this reason it is important that supplementary information is incorporated into the analysis to improve the representativeness of the sample and correct the most obvious inaccuracies.

6.2.4 Currency

The tapes from the FES in year n are made available to analysts around March of year n+2. By the time the tapes have been prepared for the analyst's purposes and incorporated into the information system this means that the data refer to circumstances some 18 to 30 months previously, and of course will be a year older before more up to date information becomes available from the FES. This is a serious weakness, the value of such out of date information can be very limited. For example before the 1980 FES could have been incorporated into any social security evaluations, say June 1982, registered unemployment in Great Britain had risen from an average of around 1.3 millions for 1979 to 3 millions and was continuing to rise steadily.

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Having to base social security policies on such information as can be contained in a general purpose survey such as the FES is by no means ideal, doing so when that survey is describing an entirely different population to the present and expected future can be utterly misleading. It would be essential, therefore, to incorporate into the analysis theoretical understanding and supplementary information from other sources to project forward the FES data to current circumstances and to hypothesise about future possibilities. The structure of the unemployed population in particular changed dramatically in that 1979-82 period - for example, between July 1979 and July 1982 male unemployment in Great Britain increased by a factor of 2.32 but within that overall increase whilst the number of men aged 45-59 unemployed for more than a year increased approximately in line with this total by a factor of 2.41 and remained at a similar proportion of all unemployed males (9.1% in July 1979, 9.4% in July 1982), the number of men aged 18-44 and unemployed for more than a year increased more than four-fold from being 12.8% of the total male unemployed in July 1979 to 22.4% in July 1982 (author's calculations from data published in Employment Gazette).

It would be essential, therefore, to incorporate in the information system any changes in the structure of major population groups which occur between data collection and

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analysis and about which supplementary information exists.

6.2.5 Units

It was suggested in the previous chapter that the ideal configuration of an information system for benefit evaluation and comparison would be to have the data based on actual individuals, arranged in such a way as to allow them to be regrouped into a number of different units of assessment depending on the application - in particular the Supplementary Benefit nuclear family, National Insurance benefit units, tax units and households.

The FES is a household survey and contains no information on intra-household sharing of income or expenditure apart from payments to children under 16.

There are two processes necessary in order to transform data based on households into the form suggested. Firstly the various possible groupings of the individuals within the household into Supplementary Benefit family units, tax units and so on, must be identified as well as possible and this information appended to each individual's record. Secondly the income and expenditure data of interest must be allocated to the individuals concerned.

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The ESRC Data Archive will supply subsets of the FES data arranged so that each case either represents a household or an individual. In a recent study of income maintenance schemes using 1977 FES data Piachaud (1982) wished to base his analysis on the inner family - a single person or couple plus dependent children. The data thus had to be transformed into a nuclear family based format. In this study it was found that the coding scheme did provide sufficient information to identify most families within multi-family households (about one-third of all households in the sample). There were some instances where data did prove to be insufficient and in these cases 'the data restructuring fell back on an imputational procedure' (Piachaud, 1982: 134) - for example students away at university could theoretically belong to any family within the home household so the procedure adopted was to assign them to 'the family to which the student most probably belonged... (in no case was there any doubt)' (Piachaud, 1982: 134).

This is most encouraging for two reasons. Firstly the inner family is identified in Chapter 5 as being possibly the most important unit of analysis. Secondly it is potentially the most difficult to define. If imputational procedures can be used to identify the nuclear family then, given the data included in the FES concerning benefit receipts and income tax it should be feasible to achieve similar results for any other unit of assessment

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which one might care to define.

As for determining eligibility for means-tested benefits, it is necessary to be able to allocate certain expenditure items between members of the household. Atkinson and Micklewright (1981) base their calculations of housing costs on the assumptions that all those coded as not being heads of households are non-householders and that non-dependents contribute to housing costs either the fixed rate if they are Supplementary Benefit recipients themselves or a share of the total according to the formula:

$$(T - C - S) / T$$

where

T = Total number of persons in household treating children under 16 as half,

C = Number of persons in claimant's family unit, and

S = Number of other Supplementary Benefit claimants in household.

Whilst such assumptions are not wholly in accord with official practice they are a definite improvement on the standard assumptions (see Royal Commission on the Distribution of Income and Wealth, 1978: Table 4.3) that the claimant is a householder and that there are no non-dependent members of the household, and it would appear from their results to be a reasonable proxy.

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It would seem, therefore, that although the FES is a household survey and it does not contain any information on intra-household transactions, that apart from a few exceptional cases in which it will be necessary to make certain assumptions and approximations, the arrangement of the data into the desirable format described in Chapter 5 is largely a realisable objective.

This is a valuable attribute of the FES data since it means that the FES is a source of a vast quantity of information concerning the characteristics not only of actual households but also of actual individuals, families, tax units and so on.

6.2.6 Definitions

Variables in the FES are not defined for any one specific purpose and consequently do not always concur with the definitions appropriate for assessing benefit entitlement. However the diversity of the precise definitions of characteristics within the social security system is such that no defintions will achieve widespread agreement. It is more important therefore that definitions should be consistent and that changes should only be made where necessary to reflect changes in society at large. The definitions in the FES achieve this.

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An interesting example of the difficulties involved in determining most suitable definitions for variables is provided by duration of unemployment. The relevant question in the FES (question 2B) asks, 'How many weeks have you been away from work?' so that a current period of unemployment would link with any consecutive period of sickness. The Department of Employment's figures record the length of time a person has been registered as unemployed so that consecutive periods of sickness and unemployment are each recorded anew. Which of these definitions is the more appropriate will depend upon the application. At present, however, the FES definition would appear to be more suitable for many applications since PIEs, whether through unemployment or incapacity, link for the purposes of determining waiting days and exhaustion of title to National Insurance benefits.

For this reason it is suggested that the definitions of a general purpose survey such as the FES which have to be suitable for a wide range of uses are more appropriate for a general benefit evaluation system than definitions tied more closely to the peculiarities of the present social security system which are not even internally consistent anyway.

6.2.7 Correlations

Probably the main strength of the FES is the wide range

of information collected on individuals and households which means that the correlations between different characteristics are embodied in the data on the FES tapes.

6.2.8 Continuity

The FES is a continuous survey and as such is a useful source of information for identifying trends and developments in society.

6.2.9 Availability

Summary tables from the FES are published annually and are thus readily available to anyone. In addition subsets of the FES tapes, including whichever variables are required, can be obtained from the ESRC Data Archive at the University of Essex.

6.3 Conclusion

The FES is not an ideal source of data on which to base an information system to analyse social security benefit policies. However such a perfect data source does not exist.

Its advantages are considerable in that it provides a large amount of pertinent information concerning as representative a sample of the general population as can

be expected. It also has major limitations, however. In particular the problems of small sample sizes, differential non-response, the unreliability of certain variables and the time-lag between data being collected and becoming available all restrict its applicability. These weaknesses all suggest the need to supplement the basic FES data with more reliable, aggregate data. The following chapter sets down an analytic framework which makes this possible in a simple, consistent fashion whilst allowing for the retention of the important information on interdependencies of population characteristics embodied in the survey.

With the disadvantages overcome to some extent the FES provides the basis for a readily available information system upon which to base the initial evaluation of social security policy alternatives on the best possible information and understanding. If, after such preliminary analysis, more detailed studies of specific aspects are then considered to be worthwhile then such a decision will be well-founded and the areas in need of further investigation better identified.

Chapter 7

An Approach to Combining Data Sources which Maximises
their Strengths and Minimises their Weaknesses

7.1 Introduction

The main requirements of an information system to evaluate social security benefit policy alternatives were identified in Chapter 5, and the implications for selecting suitable data sources were drawn from these. In Chapter 6 the suitability of the main general purpose survey, the Family Expenditure Survey (FES), to perform such a role was considered. In Section 3.4 the Population Model (PM) was described and the advantages and disadvantages of the alternative approach of drawing on a wide variety of specialised data sources were discussed.

The strengths and weaknesses of these two alternatives are summarised in the following section. The complementary nature of these qualities is highlighted and suggests the desirability of attempting to combine them in such a way as to take advantage of their strengths whilst overcoming their weaknesses. In Section 7.3 a computational device is introduced which enables this to be achieved. The following section then sets out the analytic framework into which it is envisaged this technique would fit. The final section summarises the

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main conclusions of the chapter.

7.2 The Complementary Nature of General Purpose Surveys and Specialised Data Sources

The best general purpose survey of households available to form the basis of an information system to evaluate social security policy alternatives is the FES. Whilst it possesses many of the qualities identified as requisite for such purposes in Chapter 5 it was also found lacking in important regards in Chapter 6. The principal alternative to the FES is to base the information system on the best available data relating to each aspect of the population's characteristics and behaviour by extracting information from various specialised data sources. This was the approach preferred for the PM. The difficulties encountered in building the PM are described in Section 3.5. The important qualities of these two approaches can be summarised as follows.

i. Specialised data sources

Specialised data sources include administrative statistics based on claimants' records, specialised surveys and research projects.

Administrative statistics refer only to existing recipients with a limited amount of information

concerning ineligible claimants. The collection and arrangement of these data reflect the eligibility conditions of the present system. These data are as reliable and accurate as possible. Such data are generally published monthly or quarterly and are consequently as up to date as any available. These data are in the form of aggregate numbers of people in various categories.

Specialised surveys and research projects can provide a valuable depth of understanding and insights into behavioural aspects. Many such data sources will be 'one-off' projects or at best run for a few years and will not provide a continuous stream of data on the population.

There is only limited information available concerning the nature of the relationships between the various aggregated categories within individuals, families and households.

ii. General purpose survey data - particularly the FES

These are surveys of a representative sample of the general population of the country. Results of such surveys are available, on average, some 18 months after the date they were collected. The surveys are a source of large amounts of information on actual households and

their individual members, though much of this will inevitably be less pertinent than that from more specialised sources. Such surveys are usually either annual or continuous and thus provide a means of monitoring changes over time. There are weaknesses in the reliability and accuracy of the data due to differential response rates causing the sample to be less than perfectly representative and errors in the participants' records and responses. There are differences between definitions used in the surveys and those used in the existing benefit entitlement conditions which make it difficult to assess survey respondents' precise title to benefits. These data are equally available to non-Governmental researchers and analyses based on these would thus be more open to informed criticism and debate than analyses which can lay claim to be based on privileged information.

Sources such as the National Accounts and Census provide valuable cross-checks for the validation of survey data and hence the opportunity to compensate for the major deficiencies as was demonstrated in Chapter 6. It was also noted in Chapter 6 that the Office of Population Censuses and Surveys is conducting a matching exercise to compare the data from the 1981 FES with the same households in the 1981 Census and this will be of considerable value in improving the representativeness of the FES analyses.

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The complementary nature of the strengths and weaknesses of these two main sources of population data is manifest, as can be seen from Table 7.1. This suggests the strong desirability of combining data from both forms in such a way as to exploit the strengths whilst overcoming the weaknesses.

In particular the FES is a rich source of data relating to the behaviour of a representative sample of actual households in the general population but suffers from being out of date and contains inaccuracies due mainly to errors and small sample sizes. It is less well suited to the analysis of the existing system due to differences in definitions but is much more flexible in its ability to adapt to the investigation of alternative systems with its broader information base and general population coverage. Administrative data tend to be as up to date and accurate as any available statistics and cover all the relevant features of existing claimants. Such sources are less well suited to the consideration of alternative systems and their implications for the wider population. They are commonly in the form of aggregate numbers of people in various categories with no way of relating these categories to each other. Additionally there are specialised surveys and research projects which provide added insights into behavioural aspects which is important when considering changes in population

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Table 7.1 Complementary Nature of Specialised Data Sources and General Purpose
Surveys as Data Bases for Social Security Policy Analysis

Attribute	General Purpose Surveys (particularly FES)	Specialised Sources	
		Administrative Statistics.	Specialised Surveys and Research Projects.
Coverage	General population of country.	Existing recipients plus limited information on ineligible claimants.	Particular population groups of interest.
Accuracy	Doubts concerning reliability and accuracy. Small sample sizes for many sub-populations.	As reliable and accurate as possible.	Dependent on project.
Currency	18 months out of date on average.	Typically monthly or quarterly.	Dependent on project.
Units	Household basis with some information on intra-household relationships.	Usually individual basis with no information on wider family and household groupings.	Dependent on project.
Definitions	Some differences with existing benefit rules.	Consistent with current benefit rules.	Dependent on project.
Correlations	Rich source of data on inter-relationships of characteristics within individuals and households.	Data presented as aggregate numbers in various categories with limited information on correlations between them.	Should provide valuable depth of understanding concerning population structure and changes.
Continuity	Continuous design. Changes in definitions and coverage as society changes and evolves.	May change as benefit structure and rules change, possibly making identification of trends problematic.	Often 'one-off' nature or run for several years only.
Availability	Generally available to all interested persons.	Maybe restricted.	Dependent on project.

structure and likely future developments.

These various sources provide between them all the information required to develop a powerful, yet conceptually simple, system to evaluate and compare benefit policy alternatives in terms of their distributional implications for present and future populations. The problem is to harness this information in the correct manner. Section 7.3 introduces a technique which facilitates this and which should, it is suggested, form the basis for a future benefit policy analysis system.

7.3 Iterative Proportional Fitting

The computational task is to combine the richness of the FES data on the interaction of characteristics within individuals, families and households, the accuracy and currency of administrative statistics, the depth of understanding acquired from research projects and specialised data sources and hypotheses about likely future developments, all with the minimum of additional assumptions.

This problem reduces to a similar one addressed in a variety of other fields where suitable solutions have been developed. The technique is variously known as iterative proportional fitting, the RAS method and

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biproportional matrix adjustment in its use for updating input-output tables (Stone, 1963) and it is equivalent to the Furness method used in traffic models (Evans, 1970). So called 'entropy maximisation' procedures have been used for urban and regional modelling (Wilson, 1970) and are due to ideas from social physics (Jaynes, 1957). These techniques have been brought together more recently at the International Institute for Applied Systems Analysis to infer migration patterns of population categories from aggregate data (Willekens et al. 1981; Willekens, 1982).

First consider a population described by two characteristics, sex and age, say. The FES describes the population by these characteristics at time To, say, in the form of a matrix $M^0 = (m_{ij}^0) m \times n$ - that is M_{ij}^0 is the element in the ith column of the jth row of the matrix M^0 which consists of m columns and n rows. Administrative sources, for the present, or hypothesis-based projections for the future, provide unidimensional distributions, Mi and Nj say, for some later time T_1. The problem is to make maximum use of this information in deriving an estimate of the sex-age matrix $M^1 = (m_{ij}^1)_{m \times n}$ at time T_1.

In the absence of any additional evidence the estimate for M^1 which uses the maximum amount of this information with the minimum additional assumption will be of the form $m_{ij}^1 = k_{ij} m_{ij}^0$, where k_{ij} is some non-negative

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constant to be determined, and $\sum_i m_{ij}^1 = m_{.j}^1 = N_j$, $\sum_j m_{ij}^1 = m_{i.}^1 = M_i$ give the required unidimensional distributions. M^1 is said to be 'biproportional' to M^0.

If additional information does exist this will generally take the form of changes in the correlations from T_0 to T_1. Information such as this can be incorporated in either of two ways. If strong evidence exists that $m_{i_1 j_1}^1 = \mu$, say, then this can be fixed in the estimated M^1. If the evidence concerning $m_{i_2 j_2}^1$ is less strong then $m_{i_2 j_2}^0$ can be adjusted to reflect this additional knowledge.

Finally, it may be necessary to categorise the population by some variable for which there is no information, or even 'expert opinion' concerning the nature of M^0. In this case there is no alternative but to assume that the distribution of the characteristic is independent of all other characteristics. Although this could be calculated directly it can be shown that by setting $m_{ij}^0 = 1$ for all m_{ij} in M^0 then the solution obtained will be the same.

Clearly any solution to this two dimensional problem can be generalised to multi-dimensional problems since the row and column entries of M^1, whether estimated or not, become the unidimensional distributions constraining the row and column sums of further two dimensional distributions. So, for example, we may start with

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unidimensional distributions of sex and age for time T_1 and the two-dimensional distribution of sex-age categories from the FES for T_0. Once a two-dimensional distribution has been estimated for T_1, however, these estimates can then be used as the bases for further sub-dividing the population with the sex-age categories becoming the constraining row and column sums at T_1 and further information from the FES at T_0 relating to employment status, say, being incorporated to describe the interrelationship of these categories.

The technique of iterative proportional fitting addresses the problem of determining the matrix $M^*=(m_{ij}^*)_{m \times n}$ whose row and column totals are given and for which there exists an initial estimate for the elements of the matrix. That is, given row sums Mi for $i=1,....,m$, and column sums Nj for $j=1,....,n$ and given $M=(m_{ij})_{m \times n}$ the problem is to determine $M^*=(m_{ij}^*)_{m \times n}$ such that $\sum_{j=1}^{n} m_{ij}^* = m_{i.}^* = M_i$ ($i=1,....,m$) and $\sum_{i=1}^{m} m_{ij}^* = m_{.j}^* = N_j$ ($j=1,.....,n$) whilst taking account of the information contained in the estimate M for M^*. Note the rows and columns of M do not necessarily sum to the required values Mi, Nj.

The intuitively least biased solution to this problem would be to select elements m_{ij}^* such that the rows of M^* are proportional to the rows of M and the columns of M^* are proportional to the columns of M. This solution can be obtained iteratively from the following procedure.

Procedure A

$$m_{ij}^{(0)} = m_{ij}$$

$$m_{ij}^{(2k)} = \frac{m_{ij}^{(0)} M_i^k N_j^k}{(\sum_j m_{ij}^{(0)})(\sum_i m_{ij}^{(1)}) \; \rule[0.5ex]{1em}{0.4pt} \; (\sum_i m_{ij}^{(2k-1)})} \quad (k = 1,2,..)$$

$$m_{ij}^{(2k+1)} = \frac{m_{ij}^{(0)} M_i^{k+1} N_j^k}{(\sum_j m_{ij}^{(0)})(\sum_i m_{ij}^{(1)}) \; \rule[0.5ex]{1em}{0.4pt} (\sum_j m_{ij}^{(2k)})} \quad (k = 0,1,2,...)$$

where k numbers the iterations.

The uniqueness, existence and convergence of a solution to Procedure A is given in Appendix 7.1.

Now it will be shown below that Procedure A has the same solution as the non-linear programming formulation (adapted from Macgill, 1977: 688):

$$\text{Min} \quad W = \sum_{i=1}^{m} \sum_{j=1}^{n} m_{ij}^* \log \frac{m_{ij}^*}{m_{ij}}$$

$$\text{s.t.} \quad \sum_{j=1}^{n} m_{ij}^* = m_{i.}^* = M_i \qquad i = 1, \rule[0.5ex]{1.5em}{0.4pt} , m$$

$$\sum_{i=1}^{m} m_{ij}^* = m_{.j}^* = N_j \qquad j = 1, \rule[0.5ex]{1.5em}{0.4pt} , n$$

where $m_{ij}^* \log \frac{m_{ij}^*}{m_{ij}} = 0$ if $m_{ij}^* = 0$, and $m_{ij}^* = 0$ if $m_{ij} = 0$.

For if the Lagrangian associated with this latter formulation is

$$L = \sum_i \sum_j m_{ij}^* \log \frac{m_{ij}^*}{m_{ij}} + \sum_i \alpha_i (\sum_j m_{ij}^* - M_i) + \sum_j \beta_j (\sum_i m_{ij}^* - N_j)$$

with extremal conditions

$$\sum_j m_{ij}^* = M_i,$$

$$\sum_i m_{ij}^* = N_j,$$

$$m_{ij}^* = \exp(-1 - \alpha_i - \beta_j) m_{ij}$$

where α_i, β_j are the Lagrangians associated with the above constraints.

Let $A_i = \exp(-1 - \alpha_i)$, $B_j = \exp(-\beta_j)$, then

$$m_{ij}^* = A_i B_j m_{ij}$$

and

$$A_i = \frac{M_i}{\sum_j B_j m_{ij}} \quad (I)$$

$$B_j = \frac{N_j}{\sum_i A_i m_{ij}}$$

If B_j is set equal to 1 in constraints (I) to prime this iterative process then this will produce the same sequence of matrices $M^{(k)} = (m_{ij}^{(k)})_{m \times n}$ as Procedure A.

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Note that if it is desirable to fix certain m_{ij}^* on the basis of additional information, say $m_{i_1 j_1}^*$ is predetermined, then $m_{i_1 j_1}^{(0)}$ will be set equal to zero, M_{i_1} becomes $M_{i_1} - m_{i_1 j_1}^*$ and N_{j_1} becomes $N_{j_1} - m_{i_1 j_1}^*$ prior to the above procedure being executed. The procedure would then be used as above and the value of $m_{i_1 j_1}^*$ re-entered upon its termination. Call this Procedure B. Willekens (1982: 83) suggests the possibility of commissioning a special survey to obtain the data to fill certain cells and then using these techniques to fill the remainder.

Now if m_{ij} is set equal to 1 for all i, j above then Procedure A becomes an iterative calculation of an independence assignment of values for m_{ij}^* and the non-linear programming formulation becomes the general case of the entropy maximising problem where no a priori information exists:

$$\text{Min} \quad \sum_i \sum_j m_{ij}^* \log m_{ij}^*$$

$$\text{s.t.} \quad \sum_j m_{ij}^* = M_i$$

$$\sum_i m_{ij}^* = N_j$$

Entropy maximising procedures have been used for urban and regional modelling (Wilson, 1970) and are due to ideas from social physics (Jaynes, 1957).

The problem addressed by Jaynes was the following. Given

that x can take values x_i with the unknown probabilities p_i ($i=1,\ldots,n$) and given the expected value of $f(x)=\sum_{i=1}^{n} p_i f(x_i)$, what is the expected value of the function $g(x)$ such that the probability assignment is unbiased whilst agreeing with the available information. Jaynes (1957) shows with Shannon (Shannon and Weaver, 1949) that there is a function, unique up to a multiplicative constant, which is positive and increases with uncertainty and is additive for independent sources of uncertainty, given by $H(p_1, \underline{\quad} , p_n) = -k \sum_i p_i \log p_i$, $k>0$, constant (see Appendix 7.2).

Jaynes calls this function the entropy of the probability distribution and it indicates the degree of uncertainty about the occurrence of events in information systems – a high entropy value indicates that an event is likely to occur. In maximum likelihood estimators entropy maximisation is equivalent to maximising the likelihood of a macrostate. As Jaynes says:

> It is now evident how to solve our problem; in making inferences on the basis of partial information we must use that probability distribution which has maximum entropy subject to whatever is known. This is the only unbiased assignment we can make; to use any other would amount to arbitrary assumption of information which by hypothesis we do not have. (Jaynes, 1957: 623).

The solution to the problem of determining the most probable matrix $M^*=(m_{ij}^*)_{m \times n}$ such that $\sum_i m_{ij}^* = m_{.j} = N_j$ and

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$\sum\limits_{j} m_{ij}^{*} = m_{i.} = M_i$ for all i, j where Mi, Nj are given can be derived as follows.

Each consistent matrix M which satisfies the conditions is called a macrostate of the system. Each macrostate can be obtained by a variety of configurations of individual entries in the matrix, each such configuration is called a microstate. By simple combinatorics there are

$$W = \frac{(\sum\limits_{i}\sum\limits_{j} m_{ij}!)}{\prod\limits_{i,j} m_{ij}!}$$

ways of choosing a particular macrostate $M = (m_{ij})_{m \times n}$ W is called the entropy of the macrostate M . Now assuming that each microstate is equally probable then the macrostate with the maximum entropy will be the most probable macrostate and hence the best estimate for M* . However W can be replaced by any monotonic function of W and the maxima of those functions will occur at the same value of M* . In particular we may substitute log W for W in the objective function. Now,

$$\log W = \log (m.. !) - \log(\prod\limits_{i,j} m_{ij}!) \quad (m.. = \sum\limits_{i}\sum\limits_{j} m_{ij})$$

$$= \log (m.. !) - \sum\limits_{i}\sum\limits_{j} \log m_{ij}!$$

But m.. ! is a constant, so the objective function becomes $\max(- \sum\limits_{i}\sum\limits_{j} \log m_{ij}!) = \min(\sum\limits_{i}\sum\limits_{j} \log m_{ij}!)$.

Using Stirling's approximation $\log m_{ij}! = m_{ij}\log m_{ij} - m_{ij}$,

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we obtain the objective function

$$\text{Min log } \hat{W} = \sum_i \sum_j m_{ij} \log m_{ij} - m_{ij}$$

$$= (\sum_i \sum_j m_{ij} \log m_{ij}) - m_{..}$$

But $m_{..}$ is a constant so the objective function is

$$\min(\sum_i \sum_j m_{ij} \log m_{ij}) \text{ or equivalently } \max(- \sum_i \sum_j m_{ij} \log m_{ij}).$$

Shannon's rigorous proof that this represents the function unique up to a multiplicative constant which is positive and increases with uncertainty and is additive for independent sources of uncertainty is given in Appendix 7.2.

The above thus provides three procedures applicable according to the amount of information available and between them these cover all cases which may arise. In particular Procedure A applies where there exist unidimensional distributions from more reliable sources such as specialised data sources, together with information concerning their interdependence from less reliable sources such as the previous year's FES; Procedure B is applicable when, in addition to the information available before, there is also some limited information on the precise nature of the interdependence relationships; and finally when the only information available is the unidimensional distributions with no indication of their interrelationship then m_{ij} is set equal to 1 for all i, j and the procedure becomes an

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independence assignment. The procedures are both intuitively and theoretically the most preferable since they use all the information available and make the minimum of additional assumptions.

7.4 Adjustment Procedures as Part of the Analytic Process

The above procedures provide the means to update the data of a survey such as the FES so that they are in accord with more recent and reliable aggregate data from specialised sources. The same process can then be applied to the survey data in order to project them in a manner which is consistent with forecast values for variables. This section provides one approach to this analytic process.

Suppose the analysis is being performed at time T_1. Available data are the FES for time T_0, aggregate data for T_0, T_1 and forecasts or scenarios of aggregate variables for some future time or times T_x, $x > 1$.

Step 1

Compare FES data with aggregate data for T_0. The OPCS exercise matching 1981 FES households with the data on those same households in the Census would be particularly valuable for this part of the analysis. As will analysis of the type performed by Atkinson and reported in Chapter

6.

Giving each individual in the FES a weighting of 1,
reweight individuals multiplicatively according to the
results of this comparison in order to render the FES as
representative a sample of individuals in the general
population as possible. This could be done using the
above procedures.

The result of Step 1 will be to provide a best possible
sample for time T_0 , call this F_0 .

Step 2

Adjust monetary variables in F_0 for times T_1,T_x according
to the best information on prices and wages inflation,
interest rate changes, rent and rates changes etc., as
specifically as appropriate for the application.

Step 3   .

Obtain aggregate figures for T_1 from appropriate sources.
Obtain demographic projections according to OPCS for T_x to
establish aggregate data for F_x (that is the estimated FES
sample at T_x). Take Treasury economic forecasts,
alternative forecasts and hypothesised scenarios for T_x
as possible future environments. Use theoretical
understanding and hypotheses of behavioural response to

further enrich the forecasts for T_x - these may be dependent upon the policy alternative in question in which case a separate population sample would be generated for each alternative.

Step 4

Use the above techniques to derive F_1, F_x such that it uses the maximum amount of available information with the minimum of arbitrary assumption.

Step 5

Refer the F_1, F_x so derived to experts for comment and cycle through the process accordingly.

Step 6

Once the estimated F_1, F_x are decided then the alternative benefit policies as specified by sets of rules can be applied to their corresponding populations. The purpose of this exercise will be to enumerate sub-populations as defined by one or more characteristics in order to analyse them for size, to investigate the commonality of other characteristics within the sub-populations and to determine the financial impact of the policies on them. The above process is summarised in Figure 7.1.

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Figure 7.1 <u>Proposed use of Iterative Proportional Fitting</u>
<u>in Analytic Process</u>

Input: FES for time To,

aggregate data for To,T_1,

forecasts of data for Tx, x>1

Compare FES at To with aggregate data for To

Reweight FES using IPF to make it as representative of population at To as possible - call this Fo

Adjust monetary variables in Fo for times T_1, Tx

Create samples F_1, Fx by combining Fo and aggregates (actual, forecast or hypothesised) for T_1, Tx by IPF

Submit F_1, Fx to experts for comment

Satisfactory — No

Yes

Output: Estimated FES-type samples for years

T_1, Tx to be assessed for eligibility

to benefits under various policy

regimes

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This stage of the process should incorporate an implementation model to assess how the policies will behave in practice rather than theory. That is, the policy should be evaluated by considering the composition of the expected recipient population as opposed to the target population or the eligible population. The way in which these three populations vary with the number and nature of the eligibility rules needs to be the subject of further research. This has been discussed in Section 5.2 and will be taken up again in Chapter 9.

It must be emphasised, however, that a prerequisite without which this modelling effort would be wasted is to obtain maximum co-operation between the analytic divisions within the Department, interested researchers outside and direct sponsorship from the highest policy level possible. If the results of such analysis are to have any impact on the policy-making process then administrators and analysts must co-ordinate their knowledge and abilities. This does not involve submerging differences of opinion in a quest for consensus, rather that those differences should be made explicit in the modelling process and emphasised in the presentation of results. There should be, however, an acceptance of the modelling process itself, this is fundamental to any useful policy analysis. It is only necessary that the modelling process utilises existing data and knowledge to the full and recognises alternative interpretations and

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theories, it is not sufficient - in addition the process must be seen to be doing this by those for whose attention the results are intended.

It is suggested that a major strength of the approach proposed above is that it is simple to understand and encourages participation and constructive criticism from non-technicians from an early stage. This improves the quality of the analysis by utilising such people's knowledge and experience and builds a commitment to the results amongst the users of the analysis.

7.5 Summary

This chapter has highlighted the complementary nature of data from specialised sources such as administrative statistics, specialised surveys and research projects and general purpose surveys such as the FES. In particular administrative statistics are generally as accurate and as up to date as possible; specialised surveys and research projects provide valuable background knowledge and understanding; and the FES provides a very sound framework to build the information system around.

The aim, then, is to combine these data in a coherent and simple manner so that these strengths are fully exploited. Three procedures using iterative proportional fitting are described - the appropriate procedure being

chosen for each application according to the amount of information available.

One possible approach to the analytic process which incorporates these procedures is then described. The approach seeks to achieve maximum involvement in the analytic process on the part of other interested analysts and potential users of the results. The purposes of this are to ensure that the opportunity of incorporating their expertise in the analysis is not lost and also to build their confidence in and commitment towards the results.

The following chapter compares the results of an exercise which uses the above techniques to combine data from different sources with the unprocessed data.

Chapter 8

A Comparison of Alternative Approaches to Combining Data Sources

8.1 Introduction

The previous chapter has outlined the desirability of
being able to exploit the complementary strengths of
general survey data and more specialised statistics to
derive a database which is more reliable than raw survey
data and yet richer than administrative statistics alone.
The technique of iterative proportional fitting was
described and its use for this purpose explained. This
chapter shows how this approach compares with alternative
methods and emphasises the ability of the approach to
both exploit the maximum amount of knowledge and to
obviate the need for assumptions which may or may not be
justifiable. Furthermore the approach is both simple to
use and to understand and the results can therefore be
expected to be more readily acceptable to potential users
than those derived from less direct models which, however
sophisticated, can often be perceived as obscure and
somewhat mysterious.

In this chapter, then, the ability of the iterative
proportional fitting approach to enhance the quality of
unadjusted survey data is validated. The alternative

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approach of basing evaluations on aggregated data combined with assumptions of independence is also represented by a simple independence-based model. Finally the quality of the best fitting model is discussed together with some suggestions for possible improvements, and the value of the approach for analysing the expected composition of future populations emphasised.

8.2 The Alternatives

The data used for the purposes of this comparative analysis were a table published in Social Security Statistics 1982 (DHSS, 1982) and data taken from a subset of the 1981 Family Expenditure Survey tape. The former was derived from the Annual Statistical Enquiry (ASE) - a survey of 1 in 50 Supplementary Allowance cases and 1 in 200 Supplementary Pension cases on a day in December 1981. The data were extracted from the FES tape in such a way that the corresponding tables could be drawn up. The FES and ASE data are given in Tables 8.1 and 8.2 respectively. The tables categorise Supplementary Benefit recipients according to sex, age (13 categories), employment status, and whether or not they are in receipt of Unemployment Benefit. The form of the validation is to derive estimated versions of Table 8.2 using the data contained in Table 8.1 plus varying amounts of aggregate data taken from Table 8.2.

Table 8.1 <u>Supplementary Benefit Recipients in 1981 Family Expenditure Survey</u>

Males

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	30	20	68	50	34	24	8	-	-	-	-	-	-	234
With UB	-	2	12	13	6	5	1	-	-	-	-	-	-	39
W'out UB	30	18	56	37	28	19	7	-	-	-	-	-	-	195
Sick	-	-	4	6	8	10	7	1	-	-	-	-	-	36
Ret-ired	-	-	-	-	-	1	-	46	48	47	14	2	1	159
Unocc-upied	-	-	7	7	4	9	3	-	1	-	-	-	-	31
Other	-	-	-	3	-	1	-	1	-	1	-	-	-	6
Total	30	20	79	66	46	45	18	48	49	48	14	2	1	466

Females

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	18	18	28	8	5	1	-	-	-	-	-	-	-	78
With UB	1	-	4	-	-	-	-	-	-	-	-	-	-	5
W'out UB	17	18	24	8	5	1	-	-	-	-	-	-	-	73
Sick	-	1	1	2	4	5	1	-	-	1	-	-	-	15
Ret-ired	-	-	-	-	-	-	22	47	57	37	25	10	1	199
Unocc-upied	3	5	37	35	21	23	27	35	55	53	36	8	3	341
Other	1	3	6	20	9	1	3	4	1	-	-	-	-	48
Total	22	27	72	65	39	30	53	86	113	91	61	18	4	681

Male and Female

	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Total	52	47	151	131	85	75	71	134	162	139	75	20	5	1147

Source: Family Expenditure Survey 1981
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Table 8.2 <u>Supplementary Benefit Recipients on 9 December 1981 in Great Britain (Thousands)</u>

<u>Males</u>

Age	16–17	18–19	20–29	30–39	40–49	50–59	60–64	65–69	70–74	75–79	80–84	85–89	90+	Total
Unem-ployed	87	93	348	222	143	121	37	–	–	–	–	–	–	1053
With UB	–	6	77	65	34	22	7	–	–	–	–	–	–	212
W'out UB	87	87	271	157	109	99	30	–	–	–	–	–	–	841
Sick	5	4	24	21	20	29	20	2	–	–	–	–	–	125
Ret-ired	–	–	–	–	–	–	–	137	143	125	53	19	4	482
Other	2	1	3	7	8	11	25	1	–	–	–	–	–	58
Total	94	98	375	250	171	161	82	140	143	125	53	19	4	1715

<u>Females</u>

Age	16–17	18–19	20–29	30–39	40–49	50–59	60–64	65–69	70–74	75–79	80–84	85–89	90+	Total
Unem-ployed	63	59	71	18	24	30	–	–	–	–	–	–	–	265
With UB	–	2	10	3	3	3	–	–	–	–	–	–	–	22
W'out UB	63	57	61	15	21	27	–	–	–	–	–	–	–	243
Sick	3	3	18	16	18	35	1	–	–	–	–	–	–	96
Ret-ired	–	–	–	–	–	–	116	212	291	281	211	106	39	1256
Other	6	22	156	124	42	65	–	1	–	1	–	–	–	391
Total	72	84	245	158	92	99	117	213	291	282	211	106	39	2008

<u>Males and Females</u>

	16–17	18–19	20–29	30–39	40–49	50–59	60–64	65–69	70–74	75–79	80–84	85–89	90+	Total
Total	166	182	620	408	263	260	199	353	434	407	264	125	43	3724

The FES includes a code for 'unoccupied' which is not included in the ASE tables and so all FES cases with employment status so classified have been reallocated to the residual 'others' group. This is by no means an ideal first approximation, particularly for females beyond retirement age. However it will serve to illustrate the power of the iterative proportional fitting method in being able to surmount such a problem without needing to resort to additional assumptions or hypotheses. It may well be that in this case an explanation could have been readily obtained for the discrepancy and the data adjusted accordingly. If this were the case then clearly such information would be incorporated in the analysis, however in other cases the explanations will not be forthcoming and the only alternative to the approach adopted here would be to make some informed guesses as to the cause of the discrepancy - indeed in yet other cases the need to seek an explanation will not even be recognised.

The other main point to note is that whereas the ASE is taken on a single day the FES is a continuous survey and the sample was taken throughout the year and this may bias the results in so much as the characteristics of Supplementary Benefit recipients have changed during the year. Other points concerning the reliability of the FES in relation to beneficiaries have already been covered in Chapter 6. Finally the 1981 FES included 1147 recipients

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of Supplementary Benefit of which 559 were below retirement age and 588 were above, this compares with approximately 10,000 and 35,000 cases respectively which formed the basis for the ASE.

These basic data were then treated in various ways to derive six further sets of data which were alternative estimates of the ASE tables. That is the FES data and increasing amounts of the ASE data were used to attempt to reproduce the ASE tables. The purpose of this exercise is to replicate the kind of analyses which would be performed in studies under an analytic process of the type described in the previous chapter. In practice, of course, all the data available would be used but clearly for the purposes of validation it is necessary to select parts of the available data and to test the quality of the techniques by producing estimates of other known data.

The bases for these six derivations were as follows (all numbers rounded to the nearest thousand):

i.   The FES cell counts multiplied by the estimated population of Great Britain in June 1981 (54,397,600), and divided by the total number of persons in the FES - see Table 8.3.

ii.   The cells of Table 8.3 multiplied by the total

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number of Supplementary Benefit cases at the time of the ASE divided by the number of Supplementary Benefit recipients in the 1981 FES - see Table 8.4.

iii. The cells of Table 8.3 adjusted using iterative proportional fitting such that the total numbers of men and women and the totals (of either sex) in each age category were the same as those in the ASE-based tables - see Table 8.5.

iv. The cells of Table 8.3 adjusted using iterative proportional fitting such that the total numbers in each age category subdivided by sex and the total numbers in each employment status classification subdivided by sex were the same as those in the ASE-based tables - see Table 8.6.

v. The same as in Table 8.5 but in addition iterative proportional fitting was used to ensure that the totals of those in the unemployed category for each sex as divided into recipients and non-recipients of Unemployment Benefit also agreed with the ASE tables - see Table 8.7.

vi. Estimates derived from the ASE totals used for Table 8.7, assuming the existence of 65 structural zeroes out of a total of 130 estimated cells and, apart from the information contained in these marginal

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totals, that the cell values were independent - see Table 8.8.

To relate this validation exercise to the previous chapter, the data taken from Table 8.1 in each case corresponds to the FES data at time T_O say, whilst the data which is extracted from Table 8.2 corresponds to the data from specialised sources for T_1 say. In each case the table estimated corresponds to a subset of F_1, namely an estimated population at time T_1.

Tables 8.3 - 8.8 follow.

Table 8.3 <u>FES sample grossed up so that adjusted sample size equals estimated GB population (Thousands)</u>

<u>Males</u>

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	79	53	180	132	90	63	20	-	-	-	-	-	-	620
With UB	-	5	32	34	16	13	1	-	-	-	-	-	-	103
W'out UB	79	48	148	98	74	50	19	-	-	-	-	-	-	517
Sick	-	-	11	16	21	26	18	3	-	-	-	-	-	95
Ret-ired	-	-	-	-	-	3	-	122	127	125	37	5	3	421
Unocc-upied	-	-	19	19	11	24	8	-	3	-	-	-	-	82
Other	-	-	-	8	-	3	-	3	-	3	-	-	-	16
Total	79	53	209	175	122	119	48	127	130	127	37	5	3	1234

<u>Females</u>

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	48	48	74	21	13	3	-	-	-	-	-	-	-	207
With UB	3	-	11	-	-	-	-	-	-	-	-	-	-	14
W'out UB	45	48	63	21	13	3	-	-	-	-	-	-	-	193
Sick	-	3	3	5	11	13	3	-	-	1	-	-	-	44
Ret-ired	-	-	-	-	-	-	58	125	151	98	66	26	3	527
Unocc-upied	8	13	98	93	56	61	72	93	146	140	95	21	8	903
Other	3	8	16	53	24	3	8	11	3	-	-	-	-	127
Total	58	72	191	172	103	79	140	228	299	241	162	48	11	1804

<u>Males and Females</u>

Total	137	125	400	347	225	198	188	355	429	368	199	53	14	3038

1981 Family Expenditure Survey counts multiplied by estimated GB population for 30 June 1981 and divided by FES sample size, that is 54397600/20535 = 2649.0.

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Table 8.4 FES sample grossed up so that number of Supplementary Benefit recipients in sample equals actual number of recipients in ASE (Thousands)

Males

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unemployed	97	65	221	162	110	78	26	-	-	-	-	-	-	760
With UB	-	6	39	42	19	16	3	-	-	-	-	-	-	127
W'out UB	97	58	182	120	91	62	23	-	-	-	-	-	-	633
Sick	-	-	13	19	26	32	23	3	-	-	-	-	-	117
Retired	-	-	-	-	-	3	-	149	156	153	45	6	3	516
Unoccupied	-	-	23	23	13	29	10	-	3	-	-	-	-	101
Other	-	-	-	10	-	3	-	3	-	3	-	-	-	19
Total	97	65	256	214	149	146	58	156	159	156	45	6	3	1513

Females

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unemployed	58	58	91	26	16	3	-	-	-	-	-	-	-	253
With UB	3	-	13	-	-	-	-	-	-	-	-	-	-	16
W'out UB	55	58	78	26	16	3	-	-	-	-	-	-	-	237
Sick	-	3	3	6	13	16	3	-	-	3	-	-	-	49
Retired	-	-	-	-	-	-	71	153	185	120	81	32	3	646
Unoccupied	10	16	120	114	68	75	88	114	179	172	117	26	10	1107
Other	3	10	19	65	29	3	10	13	3	-	-	-	-	156
Total	71	88	234	211	127	97	172	279	367	295	198	58	13	2211

Males and Females

	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Total	169	153	490	425	276	244	231	435	526	451	244	65	16	3724*

1981 FES counts multiplied by total number of actual Supplementary Benefit recipients and divided by number of Supplementary Benefit recipients in FES, that is 3724/1147.
* denotes value input from ASE.

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Table 8.5 FES sample adjusted so that Supplementary Benefit recipients disaggregated by age and by sex equal actual numbers of recipients (thousands)

Males

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	105	88	301	167	111	70	24	-	-	-	-	-	-	862
With UB	-	9	55	44	20	15	1	-	-	-	-	-	-	144
W'out UB	105	79	246	123	91	55	23	-	-	-	-	-	-	720
Sick	-	-	21	23	30	33	25	-	-	-	-	-	-	132
Ret-ired	-	-	-	-	-	34	-	145	154	162	59	15	11	585
Other	-	-	36	39	16	34	11	-	-	-	-	-	-	136
Total	105	88	359	229	157	170	60	146	154	162	59	15	11	1715*

Females

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	48	59	91	19	11	3	-	-	-	-	-	-	-	230
With UB	3	-	13	-	-	-	-	-	-	-	-	-	-	16
W'out UB	45	59	78	19	11	3	-	-	-	-	-	-	-	214
Sick	-	5	5	6	13	16	3	-	-	1	-	-	-	49
Ret-ired	-	-	-	-	-	-	59	116	146	104	87	63	9	587
Other	13	30	165	154	82	71	76	91	134	139	118	47	23	1146
Total	61	94	261	179	106	90	139	207	280	245	205	110	32	2008*

Males and Females

Total	166*	182*	620*	408*	263*	260*	199*	353*	434*	407*	264*	125*	43*	3724*

* denotes value input from ASE.

Table 8.6 <u>FES sample adjusted so that Supplementary Benefit recipients disaggregated by age by sex equal actual numbers of recipients (thousands)</u>

<u>Males</u>

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	94	98	347	216	142	109	46	-	-	-	-	-	-	1053*
With UB	-	9	61	55	25	22	2	-	-	-	-	-	-	175
W'out UB	94	89	286	161	117	87	44	-	-	-	-	-	-	878
Sick	-	-	15	19	24	33	30	4	-	-	-	-	-	125*
Ret-ired	-	-	-	-	-	4	-	135	141	124	53	19	4	482*
Other	-	-	12	14	6	15	6	2	2	1	-	-	-	58*
Total	94*	98*	375*	250*	171*	161*	82*	140*	143*	125*	53*	19*	4*	1715*

<u>Females</u>

	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	61	57	110	24	12	4	-	-	-	-	-	-	-	265*
With UB	3	-	15	-	-	-	-	-	-	-	-	-	-	18
W'out UB	58	57	95	24	12	4	-	-	-	-	-	-	-	247
Sick	-	9	11	14	25	39	-	-	-	-	-	-	-	96*
Ret-ired	-	-	-	-	-	-	116	212	289	279	209	105	38	1256*
Other	10	18	124	120	55	57	1	1	2	3	2	1	1	391*
Total	72*	84*	245*	158*	92*	99*	117*	213*	291*	282*	211*	106*	39*	2008*

<u>Males and Females</u>

	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Total	166*	182*	620*	408*	263*	260*	199*	353*	434*	407*	264*	125*	43*	3724*

* denotes value input from ASE.

Table 8.7 <u>FES sample adjusted so that Supplementary Benefit recipients disaggregated by age by sex by receipt of Unemployment Benefit equal actual numbers in ASE (thousands)</u>

<u>Males</u>

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	94	98	347	217	141	110	45	-	-	-	-	-	-	1053*
With UB	-	11	74	66	30	27	3	-	-	-	-	-	-	212*
W'out UB	94	87	273	151	111	83	42	-	-	-	-	-	-	841*
Sick	-	-	15	19	24	33	31	4	-	-	-	-	-	125*
Ret-ired	-	-	-	-	-	3	-	135	141	124	53	19	4	482*
Other	-	-	12	14	6	15	6	2	2	1	-	-	-	58*
Total	94*	98*	375*	250*	171*	161*	82*	140*	143*	125*	53*	19*	4*	1715*

<u>Females</u>

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	61	57	111	24	12	4	-	-	-	-	-	-	-	265*
With UB	4	-	18	-	-	-	-	-	-	-	-	-	-	22*
W'out UB	57	57	93	24	12	4	-	-	-	-	-	-	-	243*
Sick	-	9	11	14	25	39	-	-	-	-	-	-	-	96*
Ret-ired	-	-	-	-	-	-	116	212	289	279	209	105	38	1256*
Other	10	18	123	121	55	57	1	1	2	3	2	1	1	391*
Total	72*	84*	245*	158*	92*	99*	117*	213*	291*	282*	211*	106*	39*	2008*

<u>Males and Females</u>

	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Total	166*	182*	620*	408*	263*	260*	199*	353*	434*	407*	264*	125*	43*	3724*

* denotes value input from ASE.

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Table 8.8 Cells estimated so that Supplementary Benefit recipients disaggregated by age by sex by receipt of Unemployment Benefit equal actual totals and assuming independence.

Males

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	80	84	321	214	146	138	70	**	**	**	**	**	**	1053*
With UB	16	17	65	43	29	28	14	**	**	**	**	**	**	212*
W'out UB	64	67	256	171	117	110	56	**	**	**	**	**	**	841*
Sick	10	10	38	25	17	16	8	**	**	**	**	**	**	125*
Ret-ired	**	**	**	**	**	**	**	139	142	124	53	19	4	482*
Other	4	5	18	12	8	8	4	**	**	**	**	**	**	58*
Total	94*	98*	375*	250*	171*	161*	82*	140*	143*	125*	53*	19*	4*	1715*

Females

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	25	30	87	56	33	35	**	**	**	**	**	**	**	265*
With UB	2	2	7	5	3	3	**	**	**	**	**	**	**	22*
W'out UB	23	28	80	51	30	32	**	**	**	**	**	**	**	243*
Sick	9	11	31	20	12	13	**	**	**	**	**	**	**	96*
Ret-ired	**	**	**	**	**	**	117	212	290	281	210	106	39	1256*
Other	38	44	128	82	48	52	**	**	**	**	**	**	**	391*
Total	72*	84*	245*	158*	92*	99*	117*	213*	291*	282*	211*	106*	39*	2008*

Males and Females

	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Total	166*	182*	620*	408*	263*	260*	199*	353*	434*	407*	264*	125*	43*	3724*

* denotes value input from ASE.
** denotes value assumed to be structural zero.

Table 8.8 **Cells estimated so that Supplementary Benefit recipients disaggregated by age by sex by receipt of Unemployment Benefit equal actual totals and assuming independence.**

Males

Age	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	80	84	321	214	146	138	70	**	**	**	**	**	**	1053*
With UB	16	17	65	43	29	28	14	**	**	**	**	**	**	212*
W'out UB	64	67	256	171	117	110	56	**	**	**	**	**	**	841*
Sick	10	10	38	25	17	16	8	**	**	**	**	**	**	125*
Ret-ired	**	**	**	**	**	**	**	139	142	124	53	19	4	482*
Other	4	5	18	12	8	8	4	**	**	**	**	**	**	58*
Total	94*	98*	375*	250*	171*	161*	82*	140*	143*	125*	53*	19*	4*	1715*

Females

	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Unem-ployed	25	30	87	56	33	35	**	**	**	**	**	**	**	265*
With UB	2	2	7	5	3	3	**	**	**	**	**	**	**	22*
W'out UB	23	28	80	51	30	32	**	**	**	**	**	**	**	243*
Sick	9	11	31	20	12	13	**	**	**	**	**	**	**	96*
Ret-ired	**	**	**	**	**	**	117	212	290	281	210	106	39	1256*
Other	38	44	128	82	48	52	**	**	**	**	**	**	**	391*
Total	72*	84*	245*	158*	92*	99*	117*	213*	291*	282*	211*	106*	39*	2008*

Males and Females

	16-17	18-19	20-29	30-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
Total	166*	182*	620*	408*	263*	260*	199*	353*	434*	407*	264*	125*	43*	3724*

* denotes value input from ASE.
** denotes value assumed to be structural zero.

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8.3 Comparison

The first problem encountered when attempting to compare the quality of the members of a set of models such as this is the choice of an appropriate error statistic. The problem is compounded somewhat by the existence of structural zeroes, random zeroes and some cells which may or may not contain structural zeroes and this makes the use of traditional tests for goodness of fit such as chi-squared inappropriate. It was felt that the absolute error between the estimated cell and the ASE-based cell counts, summed over all the internal cells was as good a statistic to start from as any. Table 8.9 shows the absolute errors summed over the age groups for each employment status category for each sex for each of the models.

Table 8.9 <u>Absolute errors summed over age groups by</u>
<u>employment status for Tables 8.3 - 8.8</u>

Model Employment Status	8.3	8.4	8.5	8.6	8.7	8.8
Unemployed with UB	110	86	73	43	22	79
Unemployed without UB	324	227	154	62	45	116
Sick	34	35	35	40	41	59
Retired	65	84	107	9	8	4
Others	83	98	108	48	48	55
Total Males	616	530	477	202	164	313
Unemployed with UB	15	17	17	19	23	7
Unemployed without UB	67	65	75	80	79	138
Sick	61	57	55	30	30	60
Retired	729	610	672	8	8	2
Others	704	881	726	74	74	145
Total Females	1576	1630	1545	211	214	352
Total Absolute Errors	2192	2160	2022	413	378	665

The goodness of fit of models 8.6 and 8.7 is most
encouraging, particularly so in the light of the large
discrepancies between the ASE and the unadjusted
FES-based models. This would seem to vindicate the aim of
exploiting as much of the data as possible - even the
minor addition to model 8.6 which is included in 8.7 of
specifying the breakdowns of the unemployed by sex into
recipients and non-recipients of Unemployment Benefit,
rather than assuming that the FES proportions were true
can be seen to result in considerable improvement,
reducing the cumulated absolute error by more than 8%.
The most important adjustment which the iterative
proportional fitting procedure makes is in correcting for
what is presumably a difference in definitions in the

classification of cases into retired/unoccupied/others particularly for females. Whilst it was noted above that it may have been possible to explain some of this discrepancy, and hence make allowance for it, this will not always be the case - indeed differences in definitions between alternative data sources was one of the major problems encountered when the Population Model was built. It is therefore a valuable asset of the technique that it can surmount this problem without recourse to additional assumptions. It must be re-emphasised that if the reason for the divergence is known and the figures can be adjusted accordingly then this should be done.

Much of the dependence between the factors is accounted for in the derivation of Table 8.8 from the marginal totals and consequently the estimates are quite good overall - although the cumulated absolute error is still 665 against 378 for model 8.7. Much of this error can be attributed to the correspondence between age and eligibility for Unemployment Benefit - there are proportionately far fewer unemployed persons eligible for Unemployment Benefit in the younger age groups because they are less likely to satisfy the National Insurance contribution conditions. This discrepancy is to be expected since the correspondence is well understood. However this again emphasises the value of the iterative proportional fitting method in enabling the use of both

survey data and administrative statistics. There are several important points to note.

i.   In many cases the existence of a dependency may not be common knowledge.

ii.   Even if the existence of the relationship is known there may not be sufficient data to estimate an equation to describe it.

iii.   Even if such a model could be estimated there would be so many such models required to build the overall picture of the population for benefit policy evaluations that they could not possibly be brought together in a single model.

        (Factors (i)-(iii) combined to influence the choice of the simulation approach when building the Population Model.)

iv.   All such interactions are embodied in the person-specific data of a survey such as the FES - albeit with the associated weaknesses already discussed. Failing to exploit this information when the wherewithal exists in such a readily available form has been shown here to be unnecessary.

v.   Comparison of the results from the iterative

proportional fitting approach and the independence based model may lead to added insights into the true nature of the relationships between characteristics and to the flaws in the survey data.

Table 8.10 shows how the percentage absolute error for each cell of Table 8.7 against the corresponding cell of Table 8.2 is distributed over the numbers observed in the cells of Table 8.2.

Table 8.10 Percentage absolute error for cells of Table 8.7 against the observations in Table 8.8

Actual count (OOOs) Percentage absolute error	O	>O and <10	>10 and <25	>25 and <40	>40 and <80	>80	Total
< 5	53	2	1	1	4	14	75
> 5 and <20	–	O	4	3	2	2	11
>20 and <40	–	1	5	1	1	1	9
>40 and <70	–	2	3	O	1	O	6
>70 and <100	–	15	1	1	O	O	17
>100	–	3	O	O	O	O	3
Positive estimate for empty observed cell	9*	–	–	–	–	–	9
Total	62	23	14	6	8	17	130

*The estimated values for these cells were 1 (four times), 2 (three times), 3 (once), 4 (once).

The first point to note is that this is not a uniform distribution - the large percentage errors are concentrated in the low count cells and the accuracy of the prediction of the cells with high observed values is very good. In particular 90% of cells with an error in excess of 70% contained less than 10,000 in the observed cells and over 80% of observed cells containing more than

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80,000 were estimated to within 5%. This can be partially explained by the smaller size of the denominator in calculating the percentage errors, and also the greater significance of rounding for the smaller values.

Table 8.11 shows the correspondence between percentage absolute errors for each cell of Table 8.7 against those of Table 8.2 and the number of individuals in the respective FES cells.

Table 8.11 Percentage absolute errors of cells in Table 8.7 against number of individuals in FES

Actual FES counts / % absolute error	O	1	2-5	6-10	11-30	31-50	>50	Total
< 5	53	2	1	1	8	7	3	75
> 5 and <20	–	0	2	5	4	0	0	11
>20 and <40	–	1	4	2	1	1	0	9
>40 and <70	–	1	2	2	1	0	0	6
>70 and <100	9	4	3	1	0	0	0	17
>100	–	1	0	1	0	0	1	3
Positive count for empty obs'd cell	–	4	1	1	1	1	1	9
Total	62	13	13	13	15	9	5	130

The encouraging aspect of this table is the way in which the level of accuracy improves rapidly as the size of the FES sample increases. The rate at which the accuracy improves would suggest that pooling data for two or three consecutive FES years for these groups would be worthy of consideration in applications where an accurate estimate of these groups is required. The higher level of error in the smaller cells also suggests that any additional information relating to these population groups would be

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of particular value.

The estimates will surely be open to improvement by using additional information, knowledge and hypotheses and these can easily be incorporated into the iterative proportional fitting approach. The important point, however, is that where those additional data do not exist good estimates can still be obtained which are considerably better than the unadjusted survey data or estimates based on theoretically unsound independence assumptions, whilst remaining conceptually simple.

For the purposes of constructing 'future' populations the approach would be exactly the same, the only difference being that the input marginal totals would themselves be estimates and hypotheses rather than the known values in the above example. Clearly the quality of the population profiles derived in this manner is constrained by the quality of these estimates. However the same arguments apply in this case as in the 'correcting' and 'updating' cases, indeed more so. Any forecast will be tentative and more open to error than the derivation of a description of the existing population so surely it is all the more important that the use of those data which are available is maximised, and that this is achieved in a clear, comprehensible and, perhaps most important, criticisable form.

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8.4 <u>Conclusion</u>

In Chapter 7 the potential advantages of combining data from general purpose surveys and more specialised sources were discussed. An analytic approach based on the use of iterative proportional fitting procedures was introduced to seek to fulfil this objective. Three such procedures were described, to be used according to the amount of data available for the particular application.

This chapter has validated this approach by reproducing known data of the kind which might typically be required in a benefit policy evaluation study. Data from the FES and the Annual Statistical Enquiry of Supplementary Benefit claims were used in varying combinations to derive estimates for data taken wholly from the ASE. The appropriate procedure as defined in Chapter 7 was used for the purpose.

The results of the exercise are encouraging. Each additional piece of information taken from the ASE served to improve the quality of the estimates obtained. This improvement was achievable irrespective of whether an explanation for the discrepancy was available. The level of accuracy achieved in the example which used most information from the ASE, that is Table 8.7, was particularly encouraging with over 80% of the ASE cells containing in excess of 80,000 people being estimated to

within 5%. The larger percentage errors were associated with those categories for which there were fewer cases. This is partially explained by smaller denominators and the greater significance of rounding. Accuracy was also shown to improve very quickly as the size of the FES sample upon which the estimate was based increases. This emphasises the need to exploit any additional information pertaining to such groups when the results concerning these are, or may be, of importance.

In conclusion, then, the value of the approach advocated in Chapter 7 has been clearly validated in this exercise. The approach is direct and simple to understand and yet embodies all available knowledge and understanding to derive the best possible estimates. Where explicit understanding does not exist estimates are made on the basis of the minimum assumption and have clearly been shown to be superior to those based on the arbitrary assumption of independence.

Chapter 9

The Operational Consequences of Policy Decisions

9.1 Introduction

The widespread level of concern with the operational aspects of the social security system has been alluded to several times in previous chapters. The need to tackle the operational problems at the policy making level has also been recognised - indeed it should be regarded as essential that the operational consequences of policy decisions are fully investigated at the policy analysis stage. Accordingly the following two chapters describe work carried out on these aspects of the policy analysis problem. This chapter describes an analysis of the operational complexity of the benefit system with a view to identifying those aspects of policies which give rise to the greatest problems in practice. The following chapter describes some work on the regional variation in benefit take-up which might lead to new insights into the causes of misimplementation of benefit policies. The motivation for this work is discussed further in the following section.

Section 9.3 then describes several approaches to analysing operational complexity which were considered and rejected. Section 9.4 describes the analytic approach

which was adopted. The strategy was to consider the procedure for assessing eligibility to benefits in terms of the procedure's component dimensions such as contribution records, the existence of dependents, availability for work and so on. The surrogate measure of complexity used was the number of appeals against benefit officers' decisions which were made concerning these various dimensions and the rates per claim for benefit at which they were generated. The substance of the analysis is set out in Section 9.5.

Section 9.6 uses further data to quantify the difficulties associated with means-testing.

Conclusions and recommendations are presented in Section 9.7.

9.2 Motivation

The complexity of the benefit system and the expressions of concern with this problem from all major political parties has been noted above - see Chapter 4 in particular. It would appear from the analysis of the historical development of the social security system that much of the complexity embodied in the system today is a function of the nature of its development and not a necessary attribute of any income maintenance scheme - although Heidenheimer et al (1975) have shown that

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Britain is by no means alone in its burden. It is imperative, therefore, that any areas of complexity which are purely a function of the development of the system and serve no useful policy function be identified and removed.

Furthermore, one only has to consider the introduction of Housing Benefit to appreciate the need to take account of the operational consequences of policy decisions when analysing policy alternatives and their financial and distributional consequences. The Housing Benefit scheme was fully introduced in April 1983, it is administered by Local Authorities and was seen as being a move towards a simpler form of assistance with housing costs. The difficulties encountered by the Local Authorities in implementing the scheme are almost legendary already - suffice to say that by December 1983 some eligible claimants had still not received any benefit (Raynsford,1983). In March 1983 Raynsford commented (Carvel,1983), 'It is the natural consequence of an unacceptably complicated scheme being implemented to an absurdly tight timetable. The Government has botched this badly'. Moreover it cannot be argued that the problems were unforeseen. In April 1982 Mr Peter McGurk, then senior housing officer of the Association of Metropolitan Authorities (AMA) detailed a list of difficulties of implementation of the scheme which he envisaged.

Suppose I were a local authority housing

director now, I would be getting anxious about time. We have the local elections in May and the council is on a six week committee cycle. There is very little time before the summer recess. I would want decisions by the beginning of July.

My problem is that I don't know what is going on. I have been told by my association - either the AMA or the Association of District Councils - that UHB is coming in in two stages in November 1982 and April 1983. I have some idea of the total case load I will be expected to take on, because I have been talking with the local office of the DHSS to establish numbers.

But I'm still a bit confused because these numbers don't seem to tally with the figures which have been handed down nationally. So I can't yet be sure about how many extra staff I would need.

I would be worried about training them and I would be worried about getting my computer systems ready in time. Suppose I am managing a reasonably large authority and I have put housing management on a decentralised basis. I need a system to handle benefit cases in area offices. I need a computer system to be able to identify individuals' entitlements...

I also need to review my rent collection system. If I am still on door-to-door collection do I need to re-organise my rounds? Should I have neighbourhood collection points in my area offices? Or should I go over to Giro payments through the Post Office.

I am not so worried about the November (1982) deadline. (When the housing element of Supplementary Benefit came under the Housing Benefit scheme). But I am worried about the following April.

My council will not let me set up a new system or take on staff until they get this assurance. As it happens, my hypothetical authority is just on the edge of Mr Heseltine's penalty zone for "overspending" and anything extra could tip it over the edge.

I am also worried about hostels. I am not sure at the minute whether people in hostels are going to be in the new scheme or whether they will continue to get supplementary benefit.

Another headache is the private rented sector.
I have to decide what is the "reasonable rent"
against which benefit can be calculated. Is
that a fair rent or market rent? I don't know
the yardstick, I need to ask what other people
are doing and get some uniform advice.

I am not clear about furnished tenancies.
Benefit will not cover the part of the rent
which is attributed to furniture. But how much?
Students are another problem.

The upshot is that I can't do much until I have
got more information.
(Carvel, 1982).

The basic lesson to be learned from all this is that much
of the chaos which has accompanied the introduction of
Housing Benefit could and should have been avoided. It is
essential that the operational consequences of policy
decisions are fully explored at the policy analysis
stage. Complexities in eligibility rules and claiming
procedures must be avoided where possible and otherwise
minimised and taken into account when assessing the
distributional consequences of the policy options and the
timing of the implementation of new schemes. Furthermore
the more accessible is the presentation of the results of
policy analyses the more feasible it would become to
broaden the involvement in the policy debate to include
those who will be responsible for implementing the
policy.

The need to allow for non-take-up and other factors
causing distortions between target and recipient
populations of benefits in assessing the distributional

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consequences has already been noted - see 5.2.4. The perceived complexity of the claiming process has recently been identified as an important cause of non-take-up of benefits - see for example Cohen and Tarpey (1982) and Kerr (1983). The analysis described in this chapter, therefore, focusses on the problem of identifying those aspects of the assessment process which lead to difficulties of implementation. The following chapter describes an approach which could lead to further insights into the causes of non-take-up.

9.3 Measures of Operational Complexity

A number of approaches to measuring the operational difficulties consequent of benefit rules were considered. The first approach considered was to attempt to devise some objective measure based on the number of rules for various benefits. This is by no means straightforward as one somehow has to encapsulate the effect of compound and conditional questions and a meaningful method of achieving this could not be identified.

Another attempt to determine an objective index which was considered was to classify rules according to the extent to which they can be verified or disproved by reference to documentary evidence. So that contribution conditions are wholly verifiable by reference to records, some factors may be substantiable by reference to a previous

employer for example, other factors will never be completely substantiable by documentary evidence and will rely upon subjective interpretation. Whilst early attempts to derive an index by this means suggested such a course would be feasible it was felt that it would still require a considerable degree of subjective judgment and would be somewhat arbitrary as a consequence.

The other main approach considered was to interview staff in Welfare Rights Offices and DHSS Local Offices to ascertain which aspects of the assessment process gave rise to the most difficulties. This approach could have led to a good, subjective index of operational difficulties being developed and should have had the additional advantage of involving operational staff in policy analysis. For these reasons such an analysis would still be a valuable exercise, the results of which would serve to augment the analysis presented here. Such an analysis would, however, require the collection of primary data from a large number of offices around the country.

At this stage a further approach was considered which seemed to fill the needs of the analysis more fully than any other. This approach was to study data relating to the appeals procedure. If the numbers of appeals relating to various benefits could in turn be related to the

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specific aspect of the claim which had given rise to it then this would produce an objective index of operational complexity. The data necessary to carry out such an analysis turned out to be readily available. Encouragingly the results of the analysis turned out to be well in accord with intuitive expectation.

The following section describes the data which were used for the analysis.

9.4 Data - Appeals and Commissioners' Decisions.

In the first instance a dissatified claimant can ask for a review of a benefit officer's decision. However reviews only concern cases where the claimant believes that decision to have been made in ignorance of a fact, or to have been based on a mistaken fact or where there has been a change in the claimant's circumstances subsequent to the decision having been taken. The first level of appeal against the original or reviewed decision is a Local Tribunal. Local Tribunals hear appeals against any decision taken by a benefit officer except those concerning medical questions relating to claims for mobility allowance which are heard by medical boards.

If the claimant is not satisfied with the decision of the Local Tribunal then the next stage is to seek leave to appeal to the Social Security Commissioners - until

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November 1980 these were the National Insurance Commissioners. The Commissioners are professional judges of equal standing to circuit judges. Their decisions set precedents and are binding on lower bodies deciding cases. The more important of these decisions are 'reported'.

The Commissioners will hear appeals from National Insurance Local Tribunals on any grounds, and have been doing so since the inception of the National Insurance scheme after the war. Appeals from other tribunals, however, may only concern points of law - this includes appeals relating to Supplementary Benefit, Family Income Supplement, Attendance Allowance and Mobility Allowance.

The main source of data for this analysis was Neligan's <u>Digest of Commissioners' Decisions</u>. This digest includes decisions reported from the inception of the Commissioners in 1948 through to 1983, although:

> An appreciable number of reported decisions have been omitted, particularly some of the earlier decisions which dealt with facts that are now wholly unrealistic, eg the amount of a person's earnings. Similarly, decisions which have been overruled by later decisions given by a Tribunal of Commissioners (these latter are included) or rendered nugatory by subsequent legislation have not been included... In some other cases it has not always been easy to decide whether or not to omit a decision but in general the benefit of any doubt there may have been was given in favour of inclusion rather than exclusion. (Neligan, 1979: x).

The year in which the decision was reported is also recorded.

Unfortunately, as explained above, the criteria for appealing against decisions of Local Tribunals other than National Insurance are rather different to those for the National Insurance Tribunals and also Commissioners have only been hearing such appeals since November 1980. It is not possible, therefore, to consider means-tested benefits by studying the data on Commissioners' Decisions. Some indication of the position of means-testing in relation to other eligibility criteria can be gained from data on appeals to Local Tribunals, however. The data used for this purpose were the total number of appeals and references to Local Tribunals from 1976-1981 - although here again there was a difficulty because the figures for Supplementary Benefit report the numbers of appeals heard whereas the figures for the other benefits considered relate to the numbers of appeals made.

This section has described the appeals procedure and the data used for the present analysis. The next section describes the analysis.

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9.5 <u>Analysis of Commissioners' Reported Decisions</u>

For the purposes of the analysis of Commissioners' Decisions all decisions recorded in Neligan for Unemployment Benefit, Sickness Benefit, Non-Contributory Invalidity Pension, Maternity Benefits and Allowances, Widows' Benefits and Allowances, Family Allowances/ Child Benefit, Guardian's Allowances, Child's Special Allowances and Death Grant were considered. Each was grouped according to the year the decision was reported and allocated to one of the following categories depending upon the particular aspect of the eligibility assessment procedure being decided upon so that those aspects of the assessment procedure which have caused the greatest problems could be identified.

a) Contribution record,

b) Unemployment - including Period of Interruption of Employment and linking problems,

c) Availability for work,

d) Incapacity for work,

e) Child dependents,

f) Marriage, cohabitation, and adult dependents,

g) Absence from GB and residence conditions,

h) Claiming process,

i) Trade disputes,

j) Reason for leaving previous employment - misconduct,

k) Reason for leaving previous employment - voluntary

leaving,

l) Appeal against period of disqualification under j or k,

m) Imprisonment and detention in legal custody,

n) Free in-patient treatment in hospital,

o) Household duties test,

p) Pregnancy and confinement,

q) Death,

r) Education,

s) Overlapping benefits.

Table 9.1 shows which benefits of those analysed have eligibility criteria in the above categories.

Table 9.1 Categories of Eligibility Criteria Covered by Benefits Under Analysis.

	Unemployment Benefit	Sickness Benefit	Non-contributory Invalidity pension	Maternity Benefits	Widows Benefits	Family Allowances/ Child benefit	Guardian's Allowance	Child special Allowance	Death Grant
a)Cont'n record	✓	✓		✓(3)	✓			✓	✓
b)Unemployment	✓			✓(1)					
c)Availability	✓								
d)Incapacity		✓	✓						
e)Child dependents	✓(2)	✓(2)	✓(2)	✓	✓(2)	✓	✓	✓	
f)M'ge/cohab'n/ad depts	✓(2)	✓(2)	✓(2)	✓	✓			✓	
g)Absent abroad/residence	✓	✓	✓	✓	✓	✓	✓	✓	✓
h)Claiming	✓	✓	✓	✓	✓	✓	✓	✓	✓
i)Trade disputes	✓								
j)Misconduct	✓								
k)Vol'y leaving	✓								
l)Disqual'n appeal	✓								
m)Prison/detention		✓	✓	✓	✓	✓	✓	✓	
n)Hospital		✓	✓		✓	✓	✓	✓	
o)Household duties			✓						
p)Pregnancy				✓					
q)Death					✓			✓	✓
r)Education						✓			
s)Overlap bens	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes (1) Allowances only
      (2) Supplements only
      (3) Since April 1982 Maternity Grant has been non-
          contributory.Some of these decisions relate to
          claims on husbands' contribution records which
          are, therefore, no longer applicable but have
          been included here as they remain indicative
          of the problems the condition causes.

The numbers of Decisions reported for all the benefits under consideration by each of the categories was, in descending order:

b)Unemployment   301

h)Claiming   120

f)M'ge/cohab'n/ad depts   95

d)Incapacity   66

g)Absent abroad/residence   62

i)Trade disputes   54

c)Availability   49

e)Child dependents   43

k)Vol'y leaving   37

j)Misconduct   35

l)Disqual'n appeal   15

n)Hospital   14

m)Prison/detention   13

o)Household duties   8

q)Death   6

p)Pregnancy   5

s)Overlap bens   4

a)Cont'n record   3

r)Education   2

The above list ranks the categories by the extent to which they have given rise to problems in the past. Such a scale fails to make allowance for the fact that some of the above categories of rules were relevant to more

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claims than other categories which in turn increases the likelihood of appeals being generated. For the purposes of evaluating the likely operational consequences of future policies, however, a scale of absolute complexity is more useful - this would be incorporated with a population model which would estimate the expected numbers of claimants of each type.

For this reason the next stage of the analysis was to set the rate at which these decisions are generated against the numbers of claims for the relevant benefits.

Determining the number of claims during a year for a given benefit is generally more difficult than ascertaining the number of recipients of a benefit on a particular day in the year which is a more commonly reported statistic but less indicative for present purposes. The number of claims were obtained for most years between 1948 (or the year of introduction of the benefit) and 1982 for the above benefits. Where the actual data were not attainable rough estimates were made on the basis of the figures for other years or alternative data - see Appendix 9.1 for details. See Appendix 9.2 for sources of claims data.

Having grouped the decisions as above and identified the rate at which claims were being generated the next stage of the analysis was to construct a series of graphs of

cumulated numbers of decisions against cumulated numbers of claims for the various categories both for individual benefits and collections of benefits. The following graphs are plotted.

Figure 9.1 <u>Commissioners' Decisions - All Benefits</u>.

This shows the cumulated number of Commissioners' Decisions for all the benefits covered in the analysis plotted against the cumulative number of claims for the benefits which have eligibility criteria in the categories of analysis (see Table 9.1). Note the 'Unemployment' curve has been truncated in order to facilitate the scaling of the graph.

Figure 9.2 <u>Commissioners' Decisions - Unemployment Benefit</u>.

This is the same as for Figure 9.1 except that this applies only to decisions relating to Unemployment Benefit. Again the 'Unemployment' curve has been truncated, but is shown in full in Figure 9.3 with the 'Availability' curve for comparison.

Figure 9.4 <u>Commissioners' Decisions - Sickness Benefit</u>.

As for 9.2, in this case those decisions relating to claims for Sickness Benefit.

Figure 9.5 <u>Commissioners' Decisions - Claiming Process</u>.

These are the curves showing decisions relating to the claiming process for Unemployment Benefit and Sickness Benefit depicted in Figures 9.2 and 9.4 respectively shown together here for purposes of comparison.
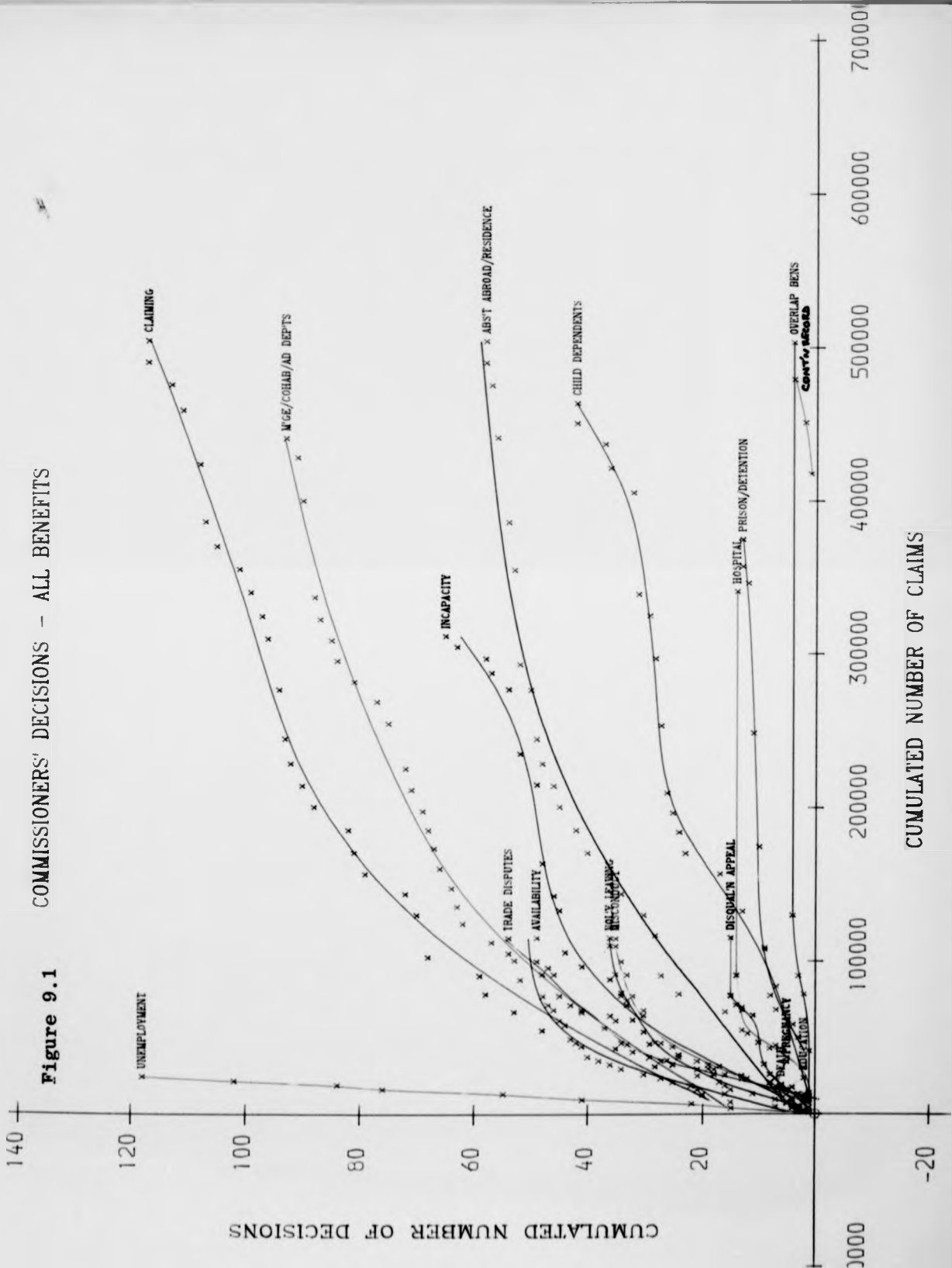
Figure 9.1   COMMISSIONERS' DECISIONS – ALL BENEFITS

Figure 9.1   COMMISSIONERS' DECISIONS - ALL BENEFITS

CUMULATED NUMBER OF DECISIONS

CUMULATED NUMBER OF CLAIMS

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Figure 9.1   COMMISSIONERS' DECISIONS - ALL BENEFITS

CUMULATED NUMBER OF CLAIMS
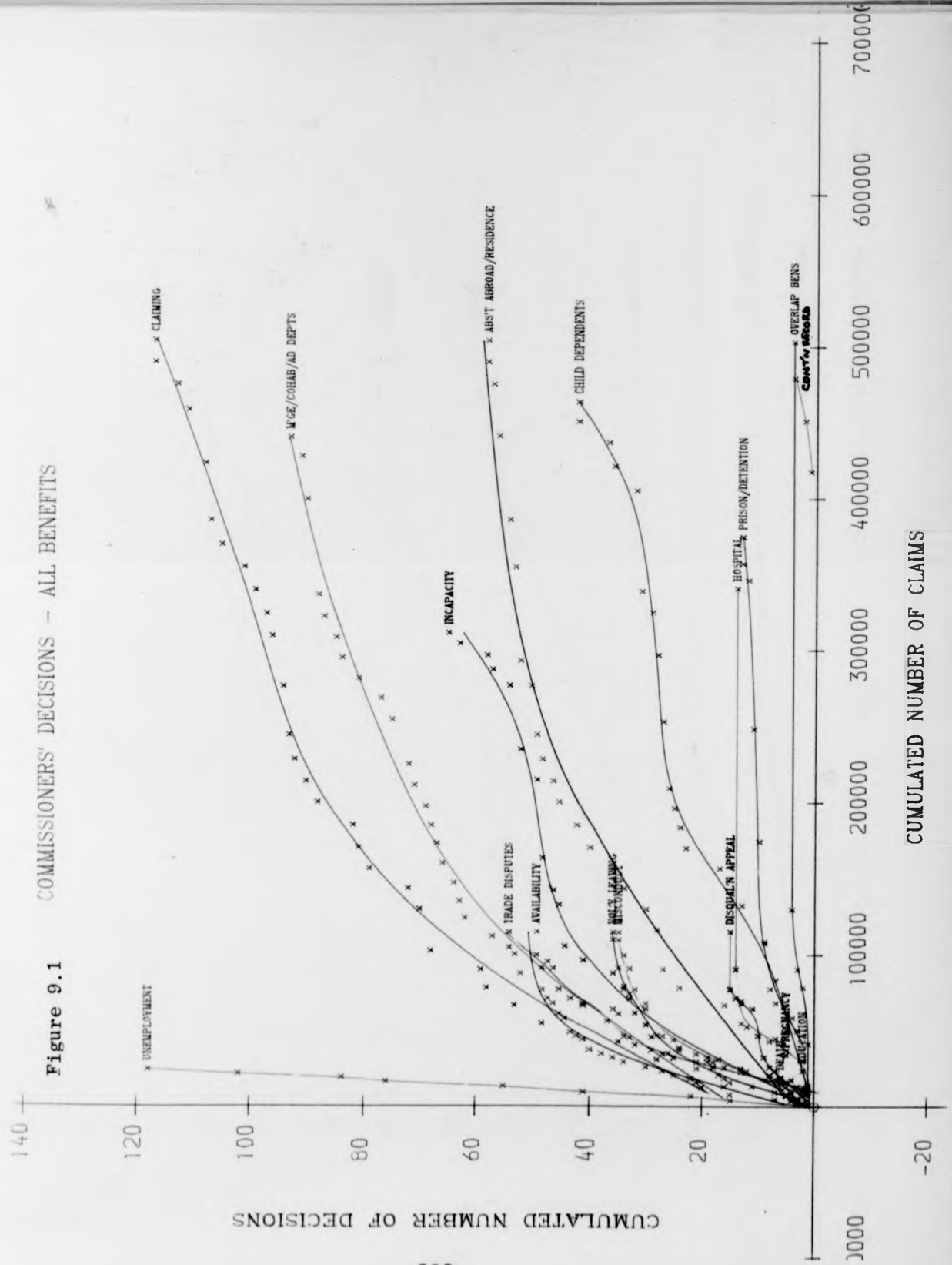
CUMULATED NUMBER OF DECISIONS
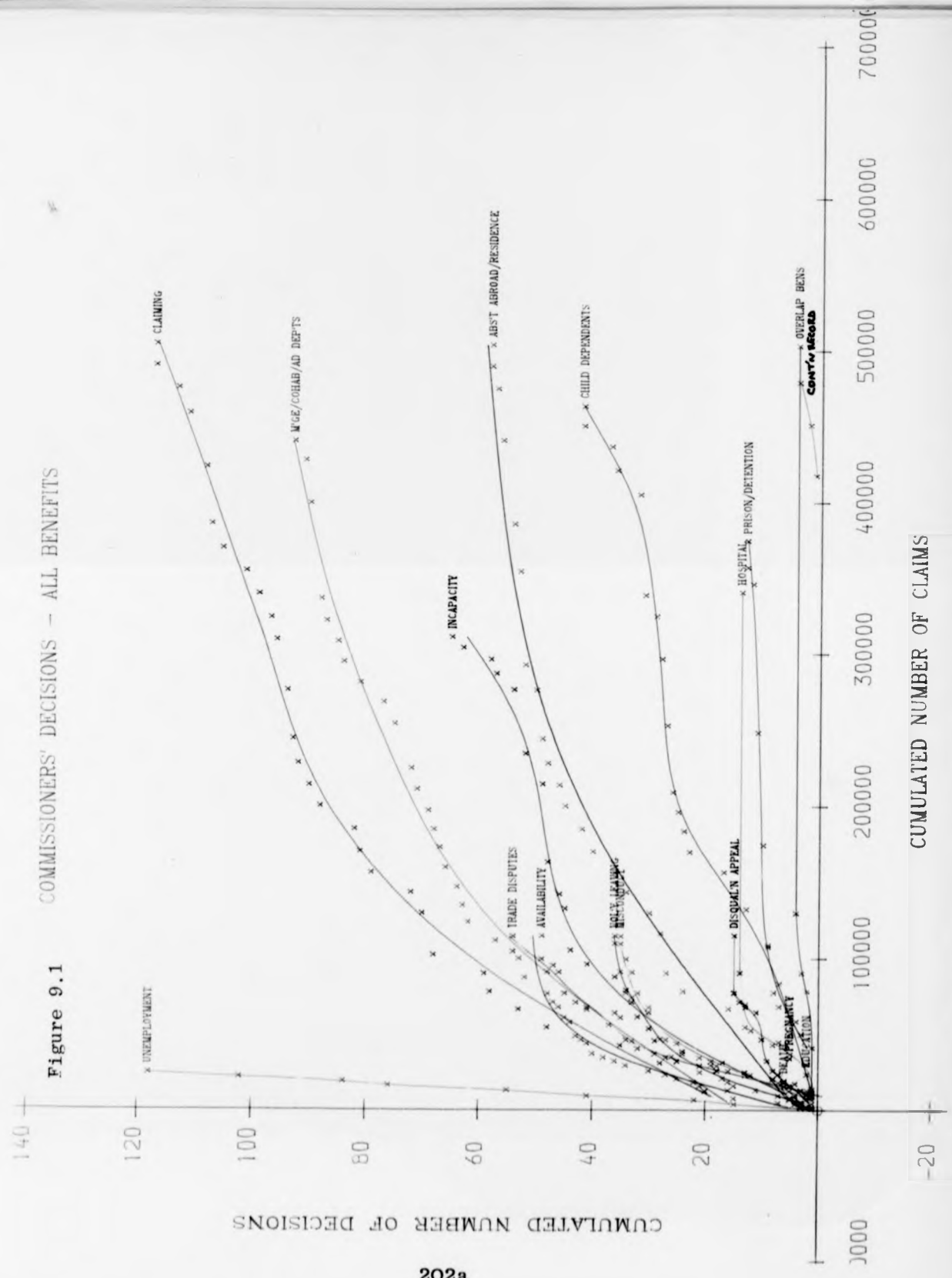
202a

Figure 9.2 COMMISSIONERS DECISIONS - UNEMPLOYMENT BENEFIT

CUMULATED NUMBER OF CLAIMS

CUMULATED NUMBER OF DECISIONS
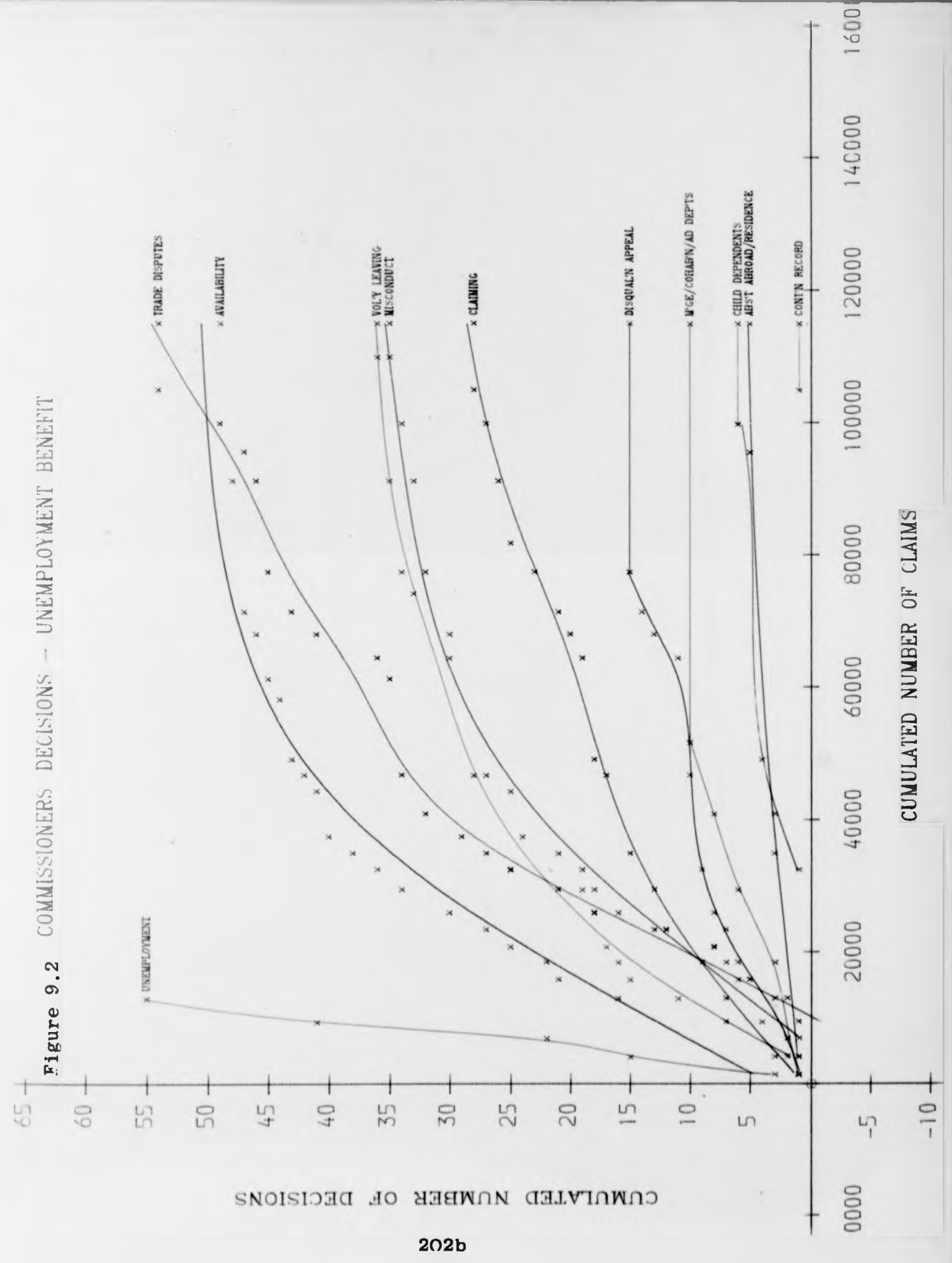
Figure 9.2 COMMISSIONERS' DECISIONS - UNEMPLOYMENT BENEFIT

Figure 9.3   COMMISSIONERS' DECISIONS – UNEMPLOYMENT BENEFIT

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Figure 9.3   COMMISSIONERS' DECISIONS – UNEMPLOYMENT BENEFIT

CUMULATED NUMBER OF CLAIMS

CUMULATED NUMBER OF DECISIONS

202c

Figure 9.4 COMMISSIONERS' DECISIONS - SICKNESS BENEFIT

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Figure 9.4   COMMISSIONERS' DECISIONS - SICKNESS BENEFIT

CUMULATED NUMBER OF CLAIMS

CUMULATED NUMBER OF DECISIONS

202d

Figure 9.5   COMMISSIONERS' DECISIONS - CLAIMING PROCESS

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Figure 9.5 COMMISSIONERS DECISIONS - CLAIMING PROCESS

A crude ranking of the categories of decision in this analysis, based on an approximate extrapolation of the curves in Figure 9.1, would be as follows (see Figure 9.1) - listed in order of decreasing difficulty.

o) Household duties test - see footnote.

b) Unemployment - including Period of Interruption of Employment and linking,

h) Claiming process,

f) Marriage, cohabitation and adult dependents,

i) Trade disputes,

c) Availability for work,

d) Incapacity for work,

k) Reason for leaving previous employment - voluntary leaving,

j) Reason for leaving previous employment - misconduct,

g) Absence from GB, residence conditions,

e) Child dependents,

l) Appeal against period of disqualification under j or k,

n) Free in-patient treatment in hospital,

m) Imprisonment and detention in legal custody,

q) Death,

p) Pregnancy,

r) Education,

a) Contribution record,

s) Overlapping benefits.

Note the 'Household duties test' applies only to

Housewives' Non-Contributory Invalidity Pension for which the total number of claims was around 110,000 between its introduction in 1977 and 1982 which generated 8 Commissioners' Decisions. Due to scale this is not shown on Figure 9.1 but, regardless of the measure one adopts, there is no doubt that the household duties test has generated Commissioners' Decisions at a rate per claim far in excess of any other aspect of the determination of claimants' eligibility to non-means tested benefits.

Note this ranking attempts to allow for the declining rate of generation of Decisions with increasing numbers of claims and as such is more indicative of absolute complexity than simply dividing the total number of Decisions by the total number of claims to obtain average rates of generation - these are computed in Table 9.2 for comparative purposes, however.

This ranking corresponds closely to what one would intuitively expect. Categories l, m, n, p, q, and r generally concern matters which only arise in a comparatively minor proportion of cases and the rankings reflect this. Category a, however, concerns some 1/2 billion claims which have given rise to just 4 Commissioners' Decisions which strongly emphasises the value in terms of non-controversiality of rules for which answers to questions can be substantiated or otherwise by documentary evidence. Indeed, more generally, the extent

to which non-disputable, documentary evidence can be used to resolve difficulties generally increases through the categories going down the rankings. This is not an altogether surprising phenomenon but it is no less important for that. It should also be borne in mind that with advances in information technology the cost of storing and retrieving the information required for documentarily substantiable eligibility conditions is declining in relation to procedures based on discretion and judgment.

The shape of the curves is also significant. The rate at which Decisions are made generally declines as the total number of claims for a benefit increases. Again this is not surprising since the Decisions set precedents and as such each eliminates a further element of uncertainty in the rules - and simultaneously further complicates the rule book. Indeed Neligan observes in the introduction to the digest (Neligan, 1979: viii) that over half of the 2488 Decisions reported between 1948 and 1977 were made in the first ten years, and in the last twenty years the problems have become increasingly complex. There are two main characteristics one might expect to observe when considering the shape of the curves in Figures 9.1 - 9.5.

A curve which climbs steeply and then flattens out may be indicative of a certain lack of foresight when framing the legislation. It may be that aspects of the conditions

were not made sufficiently clear in the rules. Any future legislation embodying similar eligibility criteria should take heed to avoid repetition of similar errors of omission.

A steadily climbing curve on the other hand is perhaps indicative of an aspect of eligibility determination which is inherently problematic to implement. This type of problem can be expected to be much more difficult to overcome and these criteria should be avoided where possible and, where not, the likely consequences must be taken into account when analysing policy options.

The following analysis attempts to quantify this aspect of the curves in Figure 9.1. Rates of generation of Decisions against claims were calculated for the first and last quartiles of claims for each of the categories. The ratio of the latter to the former is indicative of the extent to which the rate of generation has declined as the total number of claims has accumulated. Categories o, p, q and r are omitted due to the comparatively small number of claims relating to these. The results are given in Table 9.2.

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Table 9.2 <u>Analysis of decline in rate of generation of</u>
<u>decisions</u>

(i) Cate- gory	(ii) Total no. Decisions	(iii) Total no. Claims (000s)	(iv) Av. rate of gen- eration	(v) Rate of gen. - 1st quartile	(vi) Rate of gen. - 4th quartile	(vii) Col (vi) /Col (v)
a	4	479050	0.01	0.00	0.03	-
b	296	122455	2.42	5.19	0.95	0.183
c	49	114849	0.43	1.15	0.03	0.026
d	65	310788	0.21	0.44	0.17	0.386
e	42	463080	0.10	0.09	0.10	1.111
f	93	439265	0.21	0.51	0.05	0.098
g	58	503047	0.12	0.23	0.03	0.130
h	117	503047	0.23	0.55	0.09	0.164
i	54	114849	0.47	0.70	0.28	0.400
j	35	114849	0.30	0.63	0.07	0.111
k	36	109748	0.33	0.69	0.07	0.101
l	15	114849	0.13	0.28	0.00	0.000
m	13	374754	0.03	0.10	0.02	0.200
n	14	340625	0.04	0.16	0.00	0.000
s	4	503047	0.01	0.03	0.00	0.000

<u>Notes</u>

i. Av. rate of generation (Column iv) =
      Total no. Decisions * 1000 / Total no. Claims.

ii. Rate of gen. - 1st quartile (Column v) =
      No. Decisions gen'd by first 25% of Claims * 4000 / Total
                                                    no. Claims.

iii. Rate of gen. - 4th quartile (Column vi) =
      No. Decisions gen'd by fourth 25% of Claims * 4000 / Total
                                                    no. Claims.

This index gives the following ranking for 'persistence' of complexity.

e) Child dependents,

i) Trade disputes,

d) Incapacity for work,

m) Imprisonment and detention in legal custody,

b) Unemployment - including Period of Interuption of Employment and linking problems,

h) Claiming process,

g) Absence from GB and residence conditions,

j) Reason for leaving previous employment - misconduct,

k) Reason for leaving previous employment - voluntary leaving,

f) Marriage, cohabitation and adult dependents,

c) Availability for work,

l) Appeal against period of disqualification under j or k,

n) Free in-patient treatment in hospital,

s) Overlapping benefits.

Table 9.3 brings together the two sets of rankings for absolute complexity and persistence.

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Table 9.3 <u>Rankings of Absolute Complexity and Persistence</u>

	Complexity	Persistence
a)Cont'n record	19	-
b)Unemployment	2	5
c)Availability	6	11
d)Incapacity	7	3
e)Child dependents	11	1
f)M'ge/cohab'n/ad depts	4	10
g)Absent abroad/residence	10	7
h)Claiming	3	6
i)Trade disputes	5	2
j)Misconduct	9	8
k)Vol'y leaving	8	9
l)Disqual'n appeal	12	12
m)Prison/detention	14	4
n)Hospital	13	12
o)Household duties	1	-
p)Pregnancy	16	-
q)Death	15	-
r)Education	17	-
s)Overlap bens	18	12

Those categories which appear in the first half of both
rankings - ie those which are persistently, highly

problematic - are:

b) Unemployment - including Period of Interruption of Employment and linking problems,

h) Claiming process,

i) Trade disputes,

d) Incapacity for work.

These aspects of eligibility determination for non-means-tested benefits are those which should cause the greatest concern. If there is a genuine desire to improve the operation of the social security system then either radically different ways of testing for these criteria have to be devised or they must be dropped from the assessment process.

The claiming process could surely be simplified in many ways and this could go a considerable way towards easing the pressure on the operation of the system. Figure 9.5 plots the curves for the 'Claiming process' for Unemployment Benefit and Sickness Benefit. The degree to which the claiming process for Sickness Benefit is more problematic than that for Unemployment Benefit is almost entirely due to the existence of a time limit for claiming Sickness Benefit where no such limit applies to Unemployment Benefit.

As for the other three 'persistently' difficult categories, however, there is no clear way of radically

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altering the testing of these criteria and if a less contentious system is the primary aim of subsequent reform a move towards a tax credit scheme in which such aspects would not necessarily have to be tested would appear to be the solution.

Failing either of these measures to improve the operation of the system then when eligibility criteria which are known to be problematic are included in assessment procedures this fact should be taken into account at the policy evaluation stage.

Those categories which caused considerably more problems in the short term than the longer term - a difficulty which may be attributable to the framing of the legislation and a fault which need not and should not be repeated if such criteria were used in future systems - are:

f) Marriage, cohabitation and adult dependents,

c) Availability for work,

j) Reason for leaving previous employment - misconduct,

k) Reason for leaving previous employment - voluntary leaving,

l) Appeal against period of disqualification under j or k,

n) Free in-patient treatment in hospital.

The position of the category concerning marriage, cohabitation and adult dependents may appear somewhat surprising given the perennial nature of the cohabitation issue for Supplementary Benefit. It should be remembered, however, that in the case of the National Insurance benefits its significance is essentially in relation either to the payment of supplements or in determining widowhood status. The nature of the problem for Supplementary Benefit is far more fundamental in that it relates to the definition of the unit of assessment.

It is perhaps important to recognise that just because the rate of generation of decisions has declined through time for many of the categories this is no reason to argue that the existing, complicated system of benefits is acceptable. Such an argument could be given further weight by reference to the chaotic implementation of Housing Benefit where an attempt was made to introduce an alternative system. Rather the experience accrued in the development of the system to date and the mistakes made along the way must be exploited to the full when reforming the system, something which clearly was not done prior to the introduction of Housing Benefit. By doing this the replacement system can embody the quality of durability which is so essential if simplicity is to be retained for any length of time.

9.6 <u>Means-testing and Local Appeals Tribunals Data</u>.

As explained in Section 9.4 the Commissioners have only been hearing cases relating to Supplementary Benefit and Family Income Supplement since November 1980 and the basis for appeal is restricted to points of law. For these reasons the data relating to Decisions on Supplementary Benefit are not directly comparable to those on National Insurance and non-means-tested benefits.

The problems caused by means-testing in general and the public dissatisfaction with the Supplementary Benefit scheme in particular, however, mean that some effort must be made to relate this to the problems discussed above.

Two approaches can give some indication of the position of the Supplementary Benefit means-test in relation to the National Insurance criteria - data relating to Local Appeals Tribunals and the breakdown of Commissioners' Decisions relating to Supplementary Benefit.

Table 9.4 shows the rates of Decisions (multiplied by 1000) and appeals to Local Tribunals against claims made for several of the benefits considered. Again the Supplementary Benefit appeals data are not directly comparable because the number of appeals for Supplementary Benefit refers to the number heard whereas

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TABLE 9.4   Rates of Generation of Commissioners' Decisions and Appeals
to Local Tribunals for Various Benefits

	COMMISSIONERS' DECISIONS (UP TO 1982 INCLUSIVE)			APPEALS TO LOCAL TRIBUNALS (1976 - 1981)		
	Claims (000s)	Decisions	Decisions * 1000 / Claims	Claims (000s)	Appeals	Appeals / Claims
NCIP + HNCIP	290	11	37.931	276	10483	37.982
Supp Ben	-	N/A	-	33392	320187	9.589
UB	114849	535	4.658	28073	110850	3.949
Fam Al/CB	23765[1]	26[2]	1.094	5496[1]	6010[2]	1.094
Mat Ben + Mat All	34129	37	1.084	5545	6032	1.088
Death Grant	13444	12	0.893	3492	248	0.071
SB	310606	238	0.776	59796	43676	0.730

Notes   (1)   New claims for Family Allowances/Child Benefit.

(2)   Decisions/Appeals relating to Family Allowances/Child Benefit and
One Parent Benefit.

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for the other benefits the numbers refer to the numbers of appeals made, which will be something in excess of those heard.

It can be seen from the table that there is a remarkably close correspondence between the rate of generation of Local Appeals and Commissioners' Decisions. This is encouraging in itself and lends greater weight to the analysis of Commissioners' Decisions since the Local Appeals data relate to the first line of recourse for dissatisfied claimants. More importantly, however, for present purposes this enables some degree of quantification of the position of Supplementary Benefits in relation to non-means-tested benefits. In particular the rate of generation of appeals per claim for Supplementary Benefit is some 2.4 times that for Unemployment Benefit - probably the most appropriate benefit for comparison.

The second source of further information relating to Supplementary Benefit is the breakdown of those Decisions which have been made. Of the 77 Decisions made up to 1983 there had been no decisions regarding registration and availability for employment, one concerning the condition 'engaged in remunerative full-time work', two concerning 'aggregation' (essentially the cohabitation/ household composition issue), two concerning claims and payments, and 25 concerning requirements and resources (15 and 10

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respectively). There were also 34 decisions on the controversial 'Single Payments' Regulations which have been the subject of a recent enquiry by the Social Security Policy Inspectorate (Social Security Policy Inspectorate, 1983) and which, in a survey carried out by the Family Services Unit recently, was identified along with late payments as the dominating subject of enquiries concerning Supplementary Benefits to their advice centres (Family Services Unit, 1983).

When considering this breakdown it must be borne in mind that some criteria for Supplementary Benefit have been subjected to Commissioners' scrutiny for a number of years as eligibility criteria for other benefits. There therefore exists a substantial body of accumulated knowledge relating to some of these aspects. For these reasons, to quantify the differences between Supplementary Benefit and Unemployment Benefit would be exceeding the limits of the data.

The breakdown of Decisions relating to Supplementary Benefit would seem to suggest that whilst means testing is inherently more controversial and problematic than other eligibility criteria, the absence of Decisions relating to availability for work for instance suggests that there is a learning process developing. This latter point is encouraging for those who would like to see a radical review and reform of the benefit system - an

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indication that given due consideration and preparation the implementation of a new system could be made without the difficulties encountered with the introduction of Housing Benefit.

9.7 Conclusions.

The purpose of the analysis described in this chapter was to identify those aspects of the eligibility assessment process which cause the most problems. This was done by examining the rates at which the Decisions of the Social Security Commissioners categorised by various dimensions of the assessment process have been reported.

There are two immediate results of this analysis. The first is a broad ranking of these categories according to the degree of difficulty which they have caused, the second is a classification of the categories into those which are persistently problematic and those which caused problems in the short term but became less problematic as the laws were more closely defined. Both of these sets of results have turned out to be well in accord with intuitive expectation.

The lesson of this analysis is this. If a government sees the improvement of the operation of the social security system as a high priority then either radically different ways of testing for those categories which fall into the

classification of being both persistently and highly problematic must be devised or else benefit assessment procedures should be framed so as to avoid them wherever possible in the reformed system. Those categories which fall into the classification of causing problems in the short term but not in the long term should, if included in future schemes, exploit the experience accrued from the problems they have caused in the past. Those categories which have proved to be non-problematic in both the short and long terms should, of course, be used in preference to other criteria wherever this is feasible. In particular rules should aim for preference to be based on facts supportable by documentary evidence.

To exploit this kind of information in the framing of a reformed, unified, coherent, harmonised, simplified system is essential if that system is also to be robust and durable. Without robustness and durability the other qualities will be short-lived.

Where eligibility criteria which are known to be problematic are included in systems being evaluated then this must be taken into account at the policy analysis stage. In the long term one would ideally like to be able to relate the quality of a criterion as being problematic to specific difficulties of implementation such as non-take-up, error rates and clearance times. This would

mean that the distributional consequences of problematic criteria could be embodied in the analysis of the distributional consequences of policy options as a whole.

The following chapter describes an analytic approach which, it is argued, may lead to added insights into the causes and possible remedies of those aspects of policy which manifest themselves in the form of difficulties for the operational system and, further, increase the involvement of policy makers and Local Office staff in the policy analysis debate.

Chapter 10

An Analysis of Regional Variations in Benefit Take-Up

10.1 Introduction

The previous chapter has discussed further the need mentioned in earlier chapters to link analysis of the operational system with policy issues. An analysis of the operational complexity of the various aspects of the benefit entitlement procedure was described. This chapter investigates the potential value and feasibility of another approach to studying the operational system. The approach studied in this chapter is to consider inter-regional differences in population characteristics and aspects of the implementation of the benefit system such as levels of take-up.

The chapter consists of three further sections. The following section motivates the work described. The analysis is presented in Section 3 and conclusions in Section 4.

10.2 Motivation

The social security system in Britain today is intended to be nationally equitable, treating all persons defined

as being of like circumstance in a uniform manner regardless of place of residence within the country. This in itself is sufficient justification for researching the existence of any regional differences and attempting to identify their causes and possible remedies. However, if such differences do exist and can be identified, then there is the potential for being able to derive explanations which might lead not only to a reduction in the regional variations in the quality of the service implementation but also to insights which might improve the performance of the operational system generally.

It is suggested, therefore, that an investigation of a wide range of factors at locational level such as differences in population characteristics, benefit take-up rates, administrative errors, staffing levels, etc, could be of potential value to policy analysis.

To this end, this chapter describes some work carried out on regional variations in the take-up of Child Benefit and One Parent Benefit - non-take-up of benefits being the single most important factor in causing distortions between eligible and recipient populations. An important aspect of the analysis is the presentation of the data on shaded maps, both to assist in data analysis and for presenting the results of the research.

The use of pictorial representations of data has become

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commonplace today, especially with the onset of the wide availability of computer graphics packages. Their value in being able to present a large amount of dry statistics in a more interesting and comprehensible form are obvious, the impact of pictorially presented data can be immediate and striking - indeed the analyst must ensure that the presentation of the data is not allowed to overemphasise the significance of those data.

It is an underlying theme of this thesis that the purpose of policy analysis in any field should be to raise the level of debate amongst policy makers. The analyst should first endeavour to understand the problem area using the best available information, but this should be regarded as the starting point in the analytic process. The second phase is to present the data and the analysts' interpretations of them to the policy makers - and indeed any other interested parties who have legitimate cause for access to them - in such a way that they can be fully appreciated by the recipients and such that they serve as a starting point and continuing focus for debate and dialogue between analysts and policy makers. This aspect of the policy analyst's work is crucially important for without it the earlier analytic efforts are seriously devalued.

It is suggested that the potential value of this pictorial approach for studying operational issues in

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policy analysis is particularly great. The potential contribution of Local Office staff to this aspect of policy making is considerable and it is suggested that this analytic approach significantly improves the prospects for their involvement.

The following section, then, describes a study of levels of take-up of Child Benefit and One Parent Benefit in the Local Authority Districts and Counties in England and Wales — the results of which were presented on a series of shaded maps.

10.3 A Study of Regional Variations in Take-up of Child Benefit and One Parent Benefit

This work was carried out by way of a pilot study to investigate the feasibility of analysing regional data in this manner. Encouraged by the results of this work further studies along similar lines are now in progress.

10.3.1 The Principal Eligibility Conditions for Child Benefit and One Parent Benefit

The principal conditions for eligibility to Child Benefit are very simple. Essentially a person must be responsible for a child, satisfy certain residence conditions and claim in the correct manner. A child is defined as a person who is either under 16 or who is 16 and under 19

and receiving primary or secondary education at a recognised educational establishment. 'Responsible for' essentially requires either that the child is living with the claimant or that the claimant is contributing more than the current rate of Child Benefit per week for the maintenance of the child. Child Benefit is not payable in respect of a child who is married, or entitled to Non-Contributory Invalidity Pension, or in prison, custody or care of a Local Authority, or boarded out by a Local Authority who are paying a boarding out allowance in respect of the child. The child must generally be resident in Great Britain and the claimant must be in Great Britain. There are exceptions to these conditions but they are not important for present purposes.

To be eligible for One Parent Benefit a person must be entitled to Child Benefit for a child who is living with him or her, the person must not be living with a spouse or living with anyone else as husband and wife, nor residing with a parent of the child. One Parent Benefit is not payable in respect of a child for whom child special allowance, guardian's allowance or an increase in retirement pension, widow's benefit or invalid care allowance is in payment. If a person receives an increase of any other benefit in respect of the child then the increase will be reduced by the amount of One Parent Benefit.

10.3.2 <u>Recipients of Child Benefit and One Parent Benefit</u>

The data on recipients of Child Benefit and One Parent Benefit are based on an analysis of a 30% sample of Child Benefit records on 5 April 1981 carried out by one of the Statistics divisions of the Department of Health and Social Security. The records were assigned to districts on the basis of the Local Authority in which the Post Office of payment of Child Benefit is situated. The statisticians responsible for the survey believe this resulted in 95% of persons being assigned to the area of their residence with the majority of the remaining 5% being allocated to an adjoining or nearby area when recipients choose to have their benefit paid at a Post Office away from their home address - such as a Post Office convenient to their workplace for instance. This factor will not have any significant effect on the results at the county level but does mean that district level analyses need to be treated with more caution. The data excludes 98,000 families (1.4% of the total) covering 116,000 children (0.9% of the total) where the Local Authority is not known.

The present analysis was based on the total number of dependent children for whom benefit was being received in the case of Child Benefit and the number of families in the case of One Parent Benefit. This is because Child Benefit is payable for each eligible child, whereas One

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Parent Benefit is paid in respect of the eldest child which qualifies.

10.3.3 Estimation of Eligible Populations for Child Benefit and One Parent Benefit

The estimates of the eligible populations are taken from the Census carried out on 5/6 April 1981. The data used in this analysis were extracted from the Small Area Statistics derived from a 10% sample of Census returns and held at the University of Manchester Regional Computer Centre. The relevant definitions used in this sample follow.

a. 'Dependent children' are children in families who are:

i.   under 16 years of age, or

ii.   under 19 years of age, never married and classified from the question on economic activity in the week prior to the Census as 'student'.

b. A 'student' is a person at school or a full-time student at an educational establishment not provided by an employer - this includes 'Government Training Courses'.

c. A 'family' consists of:

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i.   a never married couple with or without their never
        married children, or

ii.   a father or mother together with his or her never
        married children, or

iii.   grandparent(s) with grandchildren if there are no
        apparent   parents   of the grandchildren usually
        resident in the household.

Note   there is no age limit to 'child' in this definition.
Step   and adopted relationships, when specified as such,
were   not distinguished from blood relationships. Thus
'adopted son' or 'stepson' were coded in the same way as
'son', but 'foster son' was treated as unrelated.

d. 'Private households' include:

i.   children at boarding school, university, college,
        etc. if not married

ii.   adopted or foster children (however temporary)

iii.   spouses who work away from home, abroad, in forces,
       etc.

iv.   persons in an institution for less than 6 months

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(rough guide only);

but exclude:

i.   children in the forces or working abroad

ii.   a spouse who is separated but occasionally visits or
      never visits

iii. persons in an institution for more than 6 months
      (rough guide only).

Given   these   definitions   the   estimates   of   eligible
populations   required   for   this   analysis   were   made   as
follows.

a. Child Benefit - total number of 'dependent children'
in 'private households' in the given area.

b. One Parent Benefit - two estimates were used for One
Parent Benefit:

i.   total number of lone parent 'families' in 'private
      households' in the given area,

ii.   total number of 'private households' consisting of
      one   lone   parent   'family' with at least one
      dependent child.

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Note that neither of these definitions corresponds exactly to that required to establish eligibility to One Parent Benefit. Definition (i) does not specify that the child should be 'dependent' and definition (ii) requires that the household contains only one family. This means, therefore, that (i) overestimates the eligible population and (ii) underestimates it. However, whilst (i) gives an average take-up rate for England and Wales of 25.9% and (ii) gives an average rate of 49.1%, the two sets of take-up rates are so highly correlated (see Table 10.1) that for the purposes of the area-based analysis they may be regarded as being equally valid.

Table 10.1 <u>Regression of high estimate of take-up against</u>
<u>low estimate</u>

	County data	District data
Coefficient	1.92960	1.90872
Multiple correlation	0.997455	0.990768
F for regression	10371.4	21364.6
	(54 data points)	(401 data points)

The significance of the exclusion for eligibility to One Parent Benefit in respect of recipients of other benefits can be gauged from the following figures.

Number of families receiving One Parent Benefit in April

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1981 in England and Wales - 408,000.

Total number of one parent families enumerated in April 1981 Census in England and Wales - 1,574,000.

Total number of households containing one family consisting of a lone parent with dependent child(ren) in April 1981 Census in England and Wales - 831,000.

Guardian's Allowances in payment in December 1981 in Great Britain - 4,023.

Child's Special Allowances in payment in December 1981 in Great Britain - 893.

Widowed Mother's Allowances in payment in November 1981 in Great Britain - 79,000.

Non-Contributory Invalidity Pensions in payment for claimants under 20 years of age in May 1980 in Great Britain - 12,000.

Invalid Care Allowances for claimants under 20 years of age in payment in December 1981 in Great Britain - 116.

This gives a maximum number of exclusions on these grounds of some 96,000 children - this assumes that no child falls into more than one category and they all live

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in England and Wales. Even if all these cases were to be excluded from the eligible population the estimated take-up rates would only rise from 25.9% to 27.6% and from 49.1% to 55.5%. This compares somewhat unfavourably with the official estimate for December 1981 in Great Britain when 'about 70% of those standing to gain by claiming One Parent Benefit were receiving it' (DHSS, 1982: 261).

10.3.4 The Results

For the purposes of this pilot study the most important aspect of this project was perhaps the method of analysis. The results concerning take-up of Child Benefit were not anticipated to be of great inherent interest since take-up is more or less complete. The results relating to One Parent Benefit are of greater interest since take-up is certainly nowhere near complete and, it would seem, are considerably below the DHSS's own estimate of 70% and probably under 50%. This in itself is an important finding and should perhaps be viewed as an alarmingly low figure for a non-means-tested benefit.

A further interesting, general observation to emerge from the analysis, though not altogether unexpected, is the strong connection between areas of larger eligible populations with areas of high levels of take-up. The regressions for the district data are shown in Table

10.2.

Table 10.2 Regressions of Estimates of Take-up against
the Corresponding Eligible Population Estimates

	(i)	(ii)
Coefficient	0.345356 E-04	0.119758 E-03
Multiple correlation	0.743051	0.718237
F for regression	493.106	426.214

Column (i) low estimate of take-up against
high population estimate.
Column (ii) high estimate of take-up against
low population estimate.

This relationship is largely encapsulated by the
individual maps for districts and counties of take-up of
One Parent Benefit - see Figures 10.1 and 10.2. This is
because the geographically smaller districts and counties
are generally more densely populated both in general
terms and more particularly in terms of the eligible
populations for One Parent Benefit - see Figures 10.3 and
10.4. Figure 10.5 shows take-up of One Parent Benefit in
the Greater London Council area where it can clearly be
seen that those inner city boroughs commonly associated
with high deprivation and which contain larger numbers of
one parent families also achieve the higher levels of
take-up of One Parent Benefit.

This is to be expected since informal information systems

Figure 10.1
ONE PARENT BENEFIT TAKE-UP — COUNTIES

Eligible pop'n = lone parent families in private h'holds

- 27% and above
- 26–27%
- 25–26%
- 24–25%
- 23–24%
- 22–23%
- less than 22%
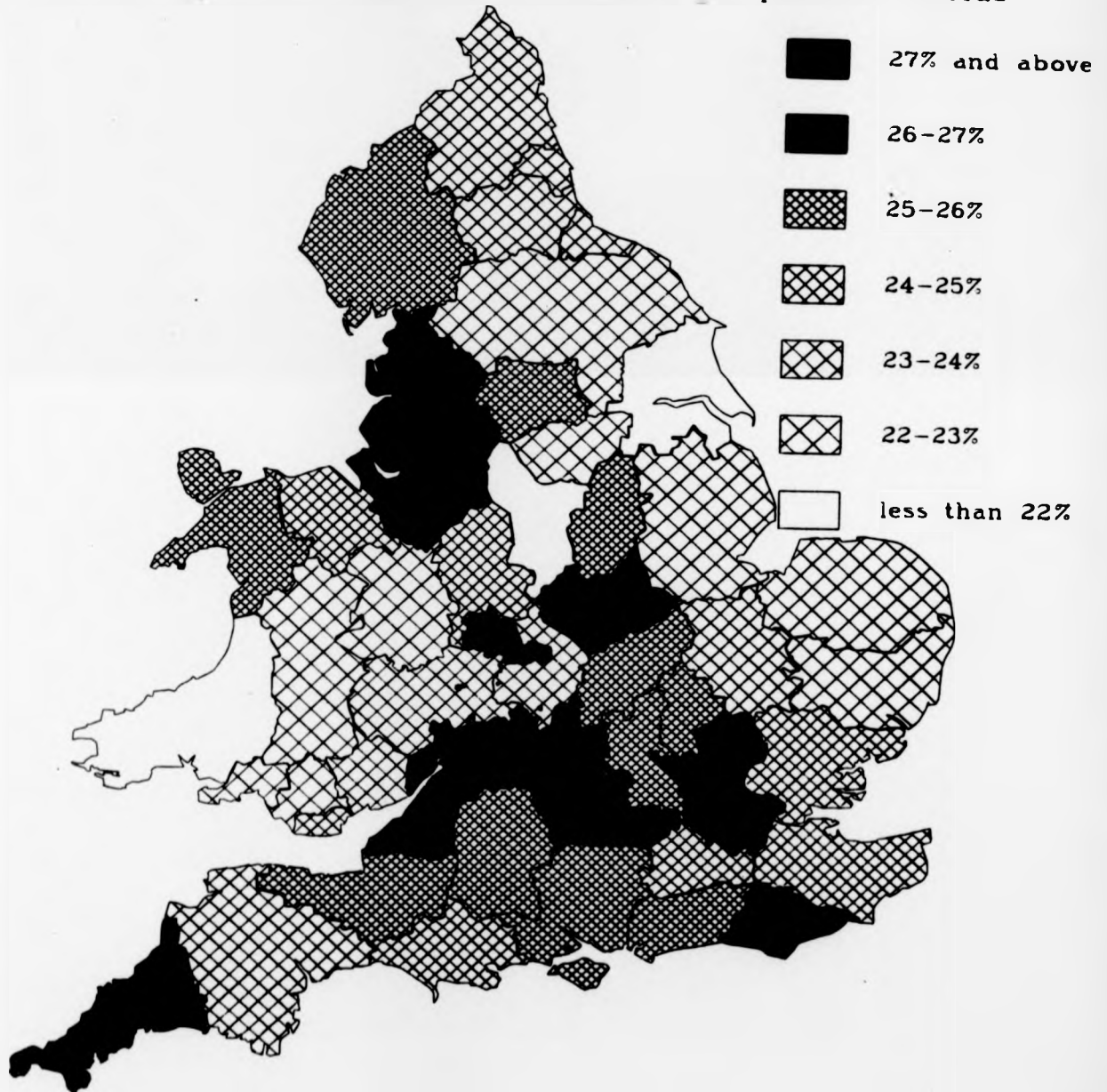
Figure 10.2
ONE PARENT BENEFIT TAKE-UP - DISTRICTS

Eligible pool one parent families in private households

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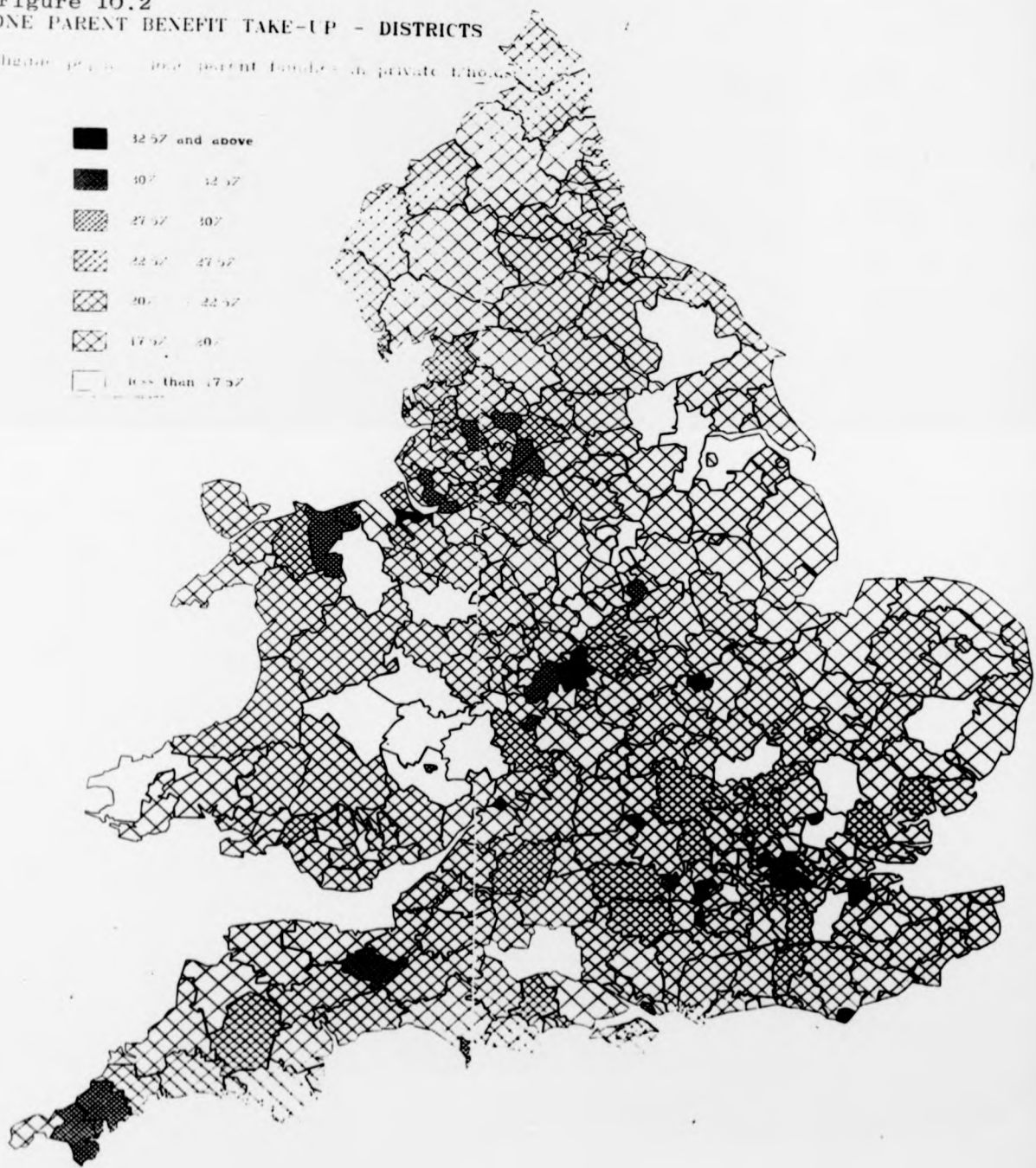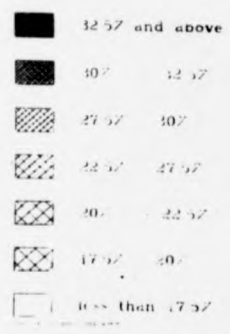
Figure 10.3
ALL ONE PARENT FAMILIES — COUNTIES

Legend:
- 50000 and above
- 30000 – 49999
- 20000 – 29999
- 15000 – 19999
- 10000 – 14999
- less than 10000

230c
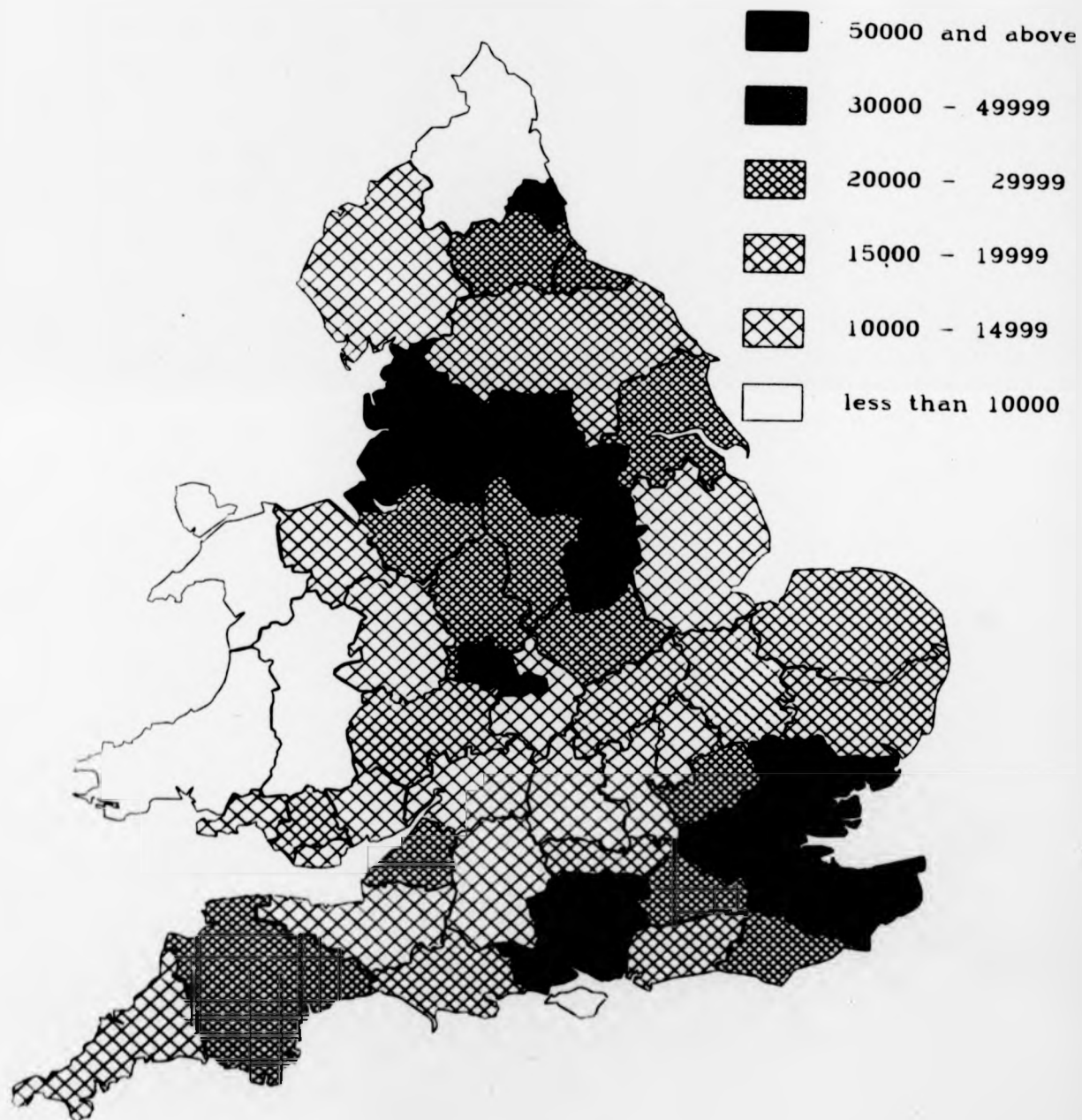
Figure 10.4
ALL ONE PARENT FAMILIES - DISTRICTS

■	20000 and above
■	10000 - 19999
▒	4000 - 9999
▤	3000 - 3999
▨	2000 - 2999
▨	1000 - 1999
□	less than 1000

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Figure 10.5 ONE PARENT BENEFIT TAKE-UP - GLC

Eligible pop'n = lone parent families in private h'holds

32.5% and above

30%   - 32.5%

27.5% - 30%

22.5% - 27.5%

20%   - 22.5%

17.5% - 20%

230e
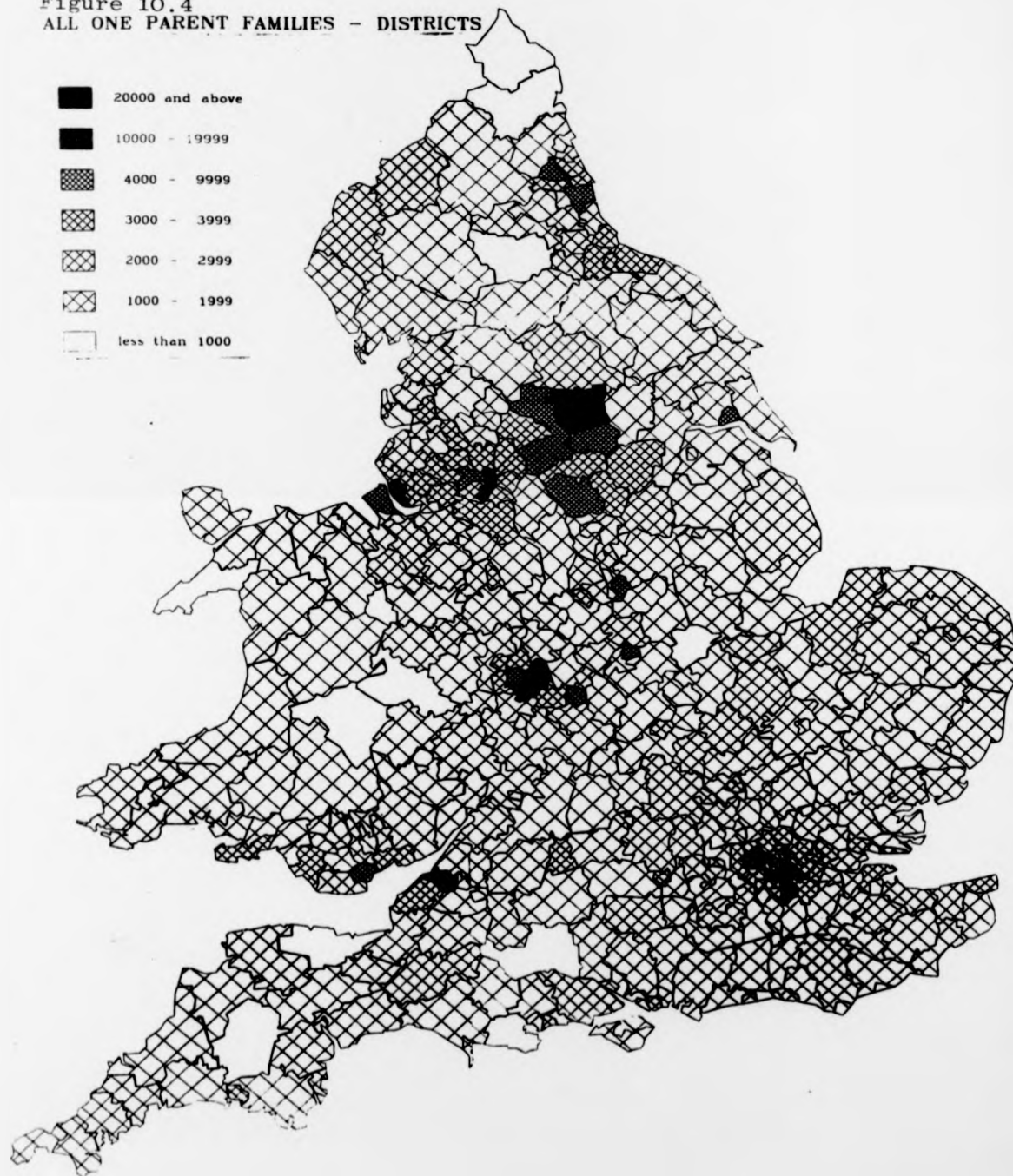
can be expected to be better in areas of higher density of eligible populations. Furthermore there is a greater presence of Welfare Rights Offices, Citizens' Advice Bureaux and other non-official sources of information to be found in urban areas. These factors should perhaps serve to emphasise the importance of this relationship when considering plans for any future campaigns by DHSS to increase take-up of benefits.

10.4 Conclusion

The purpose of the work described in this chapter was to investigate the feasibility of studying and presenting regional data on shaded maps. The results are encouraging and DHSS is sponsoring further work now being carried out along similar lines. It is envisaged that other benefits will be analysed similarly in the near future.

It is also envisaged that such an approach might lead to new insights into the causes of misimplementation of benefit policies and other operational difficulties. It is hoped that the approach would, in addition, enable an increased involvement on the part of Local Office staff in commenting on the operational implications of policy decisions.

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Chapter 11

A Role for Operational Research in the Analysis and
Evaluation of Social Security Benefit Policies

This chapter brings together the main conclusions of the work presented in this thesis.

A review of the historical development of the social security system has shown that comprehensive reform is far more difficult to achieve than piecemeal change. The consequence of this has been the present system which is confusing for claimants, excessively cumbersome to manage on a day to day basis and of which analysis and criticism at the policy level are made extremely difficult. The system is in need of radical revision. There is widespread support for reforming the system, but considerable diversity of opinion concerning the form such a reworking should take.

The review of the development of the system and the present environment both indicate the need for more strategic planning. Any reform should ideally be preceded by objective analysis based on the best possible information concerning existing and expected future circumstances. This should pave the way for a system which seeks to be more coherent; easier for claimants to

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understand; more easily administered; designed to cope with the problems of today and the future; and properly co-ordinated both internally, and also with the taxation system and the Government's other social and employment measures.

Although the definition of system objectives is usually considered a desirable step towards improving strategic planning, because of the controversial nature of many questions in this field, it would appear to be an infeasible goal. It is suggested that a prerequisite for achieving an improved social security system is, therefore, the design of an analytic system which allows the evaluation of policy alternatives against a broad and changing spectrum of objectives.

It is suggested that a database of the basic data required to assess the distributional implications for existing and potential claimants of present and possible alternative benefit policies should be developed. This would be constructed in such a way as to enable benefit evaluation analyses to be carried out without extended periods of primary analysis. Rather, such studies would involve the extraction and analysis of data from the database in such a manner as to comply as well as possible with the needs of policy makers - though not, of course, such as to support only their views.

It was also felt to be important that potential users of the analyses should be involved in the analytic process from as early a stage as possible with a view to building their commitment to the analyses, incorporating their expertise in the work and ensuring early analytic involvement in policy evaluation studies.

By considering the requirements of the output of the information system it was possible to identify certain qualities which were considered to be essential and desirable for the database to possess.

On the strength of this analysis there would appear to be a strong case for basing the information system on a survey of a representative sample of households from the general population covering the widest possible range of variables including income, housing, family structure, expenditure, employment histories, education and so on. The case for using such a general household survey is further strengthened by the experience of the Population Model which adopted the main alternative approach of bringing together data from a wide range of sources and which was dropped largely because of the great difficulties inherent in performing this task in a correct and consistent manner.

The most suitable general purpose survey available is the Family Expenditure Survey (FES). Although the FES is not

an ideal sole source of data on which to base an information system to analyse social security policies such a facility does not exist. It is concluded that the FES supplemented by other data does provide an acceptable source.

The weaknesses of the FES all suggest the need to supplement its data with more reliable, aggregate data. Indeed the qualities of data attainable from administrative statistics, specialised surveys and research projects, and general purpose surveys are found to be very much of a complementary nature. In particular administrative statistics are generally as accurate and as up to date as possible; specialised surveys and research projects provide valuable background knowledge and understanding; and the FES provides a sound framework to build the information system around.

It is concluded that these data sources should be combined in such a way as to exploit these strengths whilst reducing the significance of the weaknesses if possible.

Techniques known variously as iterative proportional fitting, multi-proportional matrix adjustment, the RAS method, the Furness method and entropy maximisation have been brought together at IIASA to infer migration patterns of population categories from aggregate data.

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These procedures provide the means to combine the data in the manner described and in a simple and coherent way. Furthermore the procedures fit well into an approach to policy analysis which requires the involvement and participation of experts from all relevant disciplines and potential users of the results of the analyses.

The same procedures can also be used to consider the distributional implications of expected and hypothesised values for aggregate variables and behavioural changes in future years. This facilitates a full testing of the sensitivity of alternative policies to possible changes in the environment. This is seen as another important aspect of the analysis.

An exercise to test the iterative proportional fitting algorithms demonstrated the potential value of exploiting all available information. Furthermore it displayed the ability of the approach to take account of dependency relationships even when there is not sufficient data to estimate equations to describe them or indeed where the existence of the relationship is not common knowledge. Further it would not be possible to include all such relationships in a single model even if they could be estimated.

To summarise, the use of iterative proportional fitting to enhance FES data with information from administrative

statistics and specialised sources, and to breakdown the
distributional implications of forecasts and hypothesised
scenarios is advocated. This approach provides the
opportunity to establish a readily available information
system upon which to base the initial evaluation of
social security policy alternatives on the best possible
information and understanding. For many purposes this
analysis will be sufficient but if, after such analysis,
more detailed studies are considered necessary then that
decision will be well-founded and the areas in need of
further investigation better identified.

The need to better understand the operational
implications of policy level decisions is seen as an
important element if the difficulties of the operational
system are to be alleviated. Accordingly work was done on
identifying those aspects of the procedures for assessing
benefit entitlement which have given rise to the most
problems and also on regional variation in benefit
take-up.

The problem of benefit complexity was addressed by
analysing the rate of generation of Decisions of the
Social Security Commissioners categorised according to
the aspect of the assessment procedure to which they
related.

The analysis provided two immediate results. The first is

a broad ranking of the categories according to the degree of difficulty which they have caused, the second is a classification of the categories into those which are persistently problematic and those which caused problems in the short term but became less problematic as the laws were more closely defined. Both sets of results proved to be well in accord with intuitive expectation.

If a future government considers the improvement of the operation of the social security system to be a high priority then either radically different ways of testing for those categories which fall into the classification of being both persistently and highly problematic - namely the tests for unemployment, the claiming process, trade disputes and incapacity for work - must be devised or else benefit assessment procedures should be framed so as to avoid them wherever possible in the reformed system. Those categories which have caused problems in the short term but not the long term - namely marriage, cohabitation and adult dependents, availability for work, reason for leaving previous employment and free in-patient treatment in hospital - should, if included in future schemes, exploit the experience accrued from the problems they have caused in the past. Those categories which have proved to be non-problematic in both the short and long terms should, of course, be used in preference to other criteria wherever this is feasible. In particular rules should aim for preference to be based on

facts supportable by documentary evidence.

The above analysis applied to non-means-tested benefits. Whilst means-testing was shown to be inherently more problematic and controversial there was evidence to suggest that a learning process was developing and that the kinds of problems experienced with non-means-tested benefits had not immediately caused problems when Supplementary Benefits became subject to the jurisdiction of the Social Security Commissioners in 1980. This is encouraging for those who advocate the introduction of a radically different system who might be discouraged by the experiences of the introduction of Housing Benefit in 1983.

To exploit the results of this kind of analysis in the framing of a reformed, unified, coherent, simplified system is essential if these qualities are not to be short-lived.

Where eligibility criteria which are known to be problematic are included in policies being evaluated then this should be taken into account at the policy analysis stage. Ideally in the long term it would be possible to relate the quality of an eligibility rule being problematic to specific difficulties of implementation such as non-take-up and error rates. This would mean that the distributional consequences of problematic criteria

could be embodied in the analysis of distributional consequences of policy options as a whole. This is an area where further research effort could be of great potential value.

The feasibility of studying and presenting regional data on shaded maps was investigated. The results are encouraging and further work is being sponsored by DHSS. It is envisaged that the analysis of regional differences in indicators of operational performance such as take-up rates may, in addition to removing some of the differences in implementation between areas, lead to added insights into the causes of misimplementation of policies and hence possible improvements in the system at a national level. It is also hoped that the analytic approach will enable an increased involvement on the part of LO staff in commenting on the operational implications of policy decisions.

The philosophy underlying the approach to policy analysis expounded in this thesis is very similar to that advocated by Quade:

> Considering what can be done to increase understanding, the claims of what one can expect from public policy analysis should be rather modest. It can frequently reduce the complexity of problems to manageable proportions (manageable by judgment, that is) by identifying and clarifying those elements about which information exists or can be found. It can eliminate from consideration the

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demonstrably inferior alternatives and sometimes find one that all interested parties can accept even though they are not fully satisfied. By making information available and laying bare hidden assumptions and value preferences, public analysis can widen the area of informed judgment. It can counter the purely subjective approach on the part of advocates of a program by forcing them to defend their line of argument and talk about the specifics of the situation rather than merely express their personal opinions with statements of noble purpose, thereby raising the quality of public discussion.

Policy analysis is valuable because it can help a decision-maker by providing information through research and analysis, isolating and clarifying issues, revealing inconsistencies in aims and efforts, generating new alternatives, and suggesting ways of translating ideas into feasible and realizable policies. Its major contribution may be to yield insights, particularly with regard to the dominance and sensitivity of the parameters. It is no more than an adjunct, although a powerful one, to the judgment, intuition, and experience of decision-makers... (Quade, 1982: 11-12).

If the policy choices can be brought within the understanding of analysts, they can be brought within the understanding of those who must make the legal decision. The task of analysis is to bring together knowledge from all the various diciplines that can help and to present at least some of the risks and implications of the possible choices. (Quade, 1982: 20).

Given the nature of the development of the social security system to date and the state of the system at present it would seem that any properly directed analytic assistance could be of considerable value. It is hoped that this work might make some contribution to this cause. In particular it is hoped that the notion of using iterative proportional fitting to enhance FES data to establish an information system for benefit policy

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analysis might be adopted. Also further research should be carried out to develop the work presented here to enable the inclusion of an analysis of expected implementation problems of the various alternatives at the policy evaluation stage.

Appendix 2.1 Glossary

<u>Class I Contributions</u> - currently 9% for employees and entitle the contributor to all relevant benefits. There are three other classes of contribution but payment of these does not entitle the contributor to all National Insurance benefits.

<u>Lower earnings limit</u> - when earnings reach the lower earnings limit the employee has to start paying Class I National Insurance Contributions. The lower earnings limit is usually adjusted every April.

<u>Period of Interruption of Employment (PIE)</u> - a PIE is made up of 2 or more days of unemployment in any 6 consecutive days (excluding Sundays), or 4 or more consecutive days (excluding Sundays) of incapacity for work. PIEs separated by less than 8 weeks 'link' to form a single PIE.

<u>Poverty trap</u> - the consequence of the high implied marginal tax rates which result from the compounding of income tax, National Insurance contributions, and withdrawal of benefits around the official poverty line and which means increases in gross income lead to only minimal increases or even decreases in net income.

<u>Relevant Tax Year (RTY)</u> - the last complete tax year

prior to the start of the benefit year in which the initial claim is made. Tax years run from 6 April to 5 April, benefit years start on the first Sunday in January and usually end on the first Saturday in the following year.

Replacement ratio - the ratio of income received when out of work to that received when in employment, either previous or prospective.

Take-up is the percentage of those entitled to a benefit who actually claim and thence receive it.

Total Income Support (TIS) is defined in Social Assistance as:

for those in work -

gross earnings less income tax, NI contributions, rent, rates and work expenses, plus Child Benefit, Family Income Supplement, rent rebates, rate rebates, free school meals, and free welfare milk;

and for those out of work -

NI Benefit less rent and rates, plus Earnings Related Supplement, Supplementary Benefit (including rent and rates), Child Benefit, any Family Income Supplement still

payable, rent rebates, rate rebates, free school meals and free welfare milk (tax rebates were ignored).

Unemployment trap - the narrowing of the difference between incomes in and out of work which makes a return to work financially unrewarding.

Appendix 3.1   Variables, Structure and Data Sources of Population Model

Variable name	Variable Descriptions	Type of Sample	Variable set if this variable takes given value	Dependent variables of Sampling Distribution	Data Sources
SEX	Male or female	Stratified	-	-	Sick: S/IV40,NCIP61, ASE (MD cases) Unemployed: UBS3
AGE	Age last birthday	Stratified	-	SEX	
DATE	Number days after base date at which claim made	Simple random	-	-	Social Security Statistics 1977, 3-36
MARST	Marital Status: single, widowed, divorced, separated or married	Simple random	-	SEX, AGE	Sick: S/IV61 & S/IV40 & ASE (MD cases) GAD Marital Status projections Unemployed: UBS3
SAGE	Spouse's age	Simple random	MARST ≠ single	SEX, AGE	1971 Census
TSWID	Time since widowed	Simple random	MARST = widowed	Minimum (AGE, SAGE), SEX	
TSSD	Time since separated or divorced	Simple random	MARST = separated or divocred	Minimum (AGE, SAGE), SEX	PCS Marriage & divorce statistics
NKIDS	Number of children	Simple random	MARST ≠ single	SEX, AGE, MARST	Sick: S/IV40, ASE Unemployed: UBS3, ASE

	Description	Method	Condition	Determined by	Source
$AKID_1$	Age of oldest child	Simple random	$NKIDS = 1$ or more, SEX = female	$NKIDS$, AGE	OPCS birth statistics 1976
			$NKIDS = 1$ or more, SEX = male	$NKIDS$, $SAGE$	Child Benefit Statistics 1977
			$NKIDS = 1$ or more, $MARST$ = widow	$NKIDS$, $AGE/SAGE$, $TSWID$	
			$NKIDS = 1$ or more, $MARST$ = sep./div.	$NKIDS$, $AGE/SAGE$, $TSSD$	
$AKID_n$	Age of nth eldest child	Simple random	$NKIDS = n$ or more, as $AKID_1$	$(NKIDS-n)$, $AKID_{n-1}$, $TSWID/TSSD$	Child Benefit Statistics
EMPCLASS	Employment class – employee or self-employed	Simple random	–	SEX, $MARST$	Labour Force Survey 1976
ACTS	Economic activity status	Simple random	SEX = male	AGE, $MARST$	Labour Force Survey 1976
			SEX = female, $NKIDS = 0$	$NKIDS$	General Household Survey 1976:6.1,6.2
			SEX = female, $NKIDS \geq 1$	$NKIDS$, $AKID_{NKIDS}$	
EMPTYPE	Employment type – full or part time, sick or unemployed	Fixed	$ACTS$ = active	Set according to type of run, e.g. unemployed	–

UEREG	Unemployment registration	Fixed	EMPTYPE = unemployed or sick and unemployed	= 1	-
UREASN	Reason for unemployment	Simple random	EMPTYPE = unemployed or sick and unemployed	SEX, AGE, MARST	UBS3
EDSTAT	Education status (student, school-leaver, other)	Simple random	ACTS = active	AGE	Employment Gazette
WKSCHL	Number of weeks since leaving school	Fixed	EDSTAT = school leaver	= 15	-
VACST	Vacation status of student	Fixed	EDSTAT = student	= term time	-
SEMPCLASS	Spouse's employment class - employee or self-employed	Simple random	MARST ≠ single	SEX, MARST	Labour Force Survey 1976
SACTS	Spouse's economic activity status	Simple random	MARST ≠ single, SEX = female	AGE, MARST	Labour Force Survey 1976
			MARST ≠ single, SEX = male	NKIDS, $AKID_{NKIDS}$	GHS 1976: 6.1,6.2

SEMPTYPE	Spouse's employment type - full or p/t sick or unemployed	Simple random	SACTS = active, SEX = female	SAGE, MARST	S/IV40, NCIP61, ASE
			SACTS = active, SEX = male	$AKID_{NKIDS}$	GHS 1976, Cohort Study of Unemployed Men
SUEREG	Spouse's unemployment registration	Simple random	SEMPTYPE = unemployed or sick and unemployed	SEX, MARST	GHS 1976
SUREASN	Reason for spouse's unemployment	Simple random	SEMPTYPE = unemployed or sick and unemployed	SEX, SAGE, MARST	UBS3
SEDSTAT	Spouse's education status	Simple random	SACTS = active	SAGE	Employment Gazette
SWKSCHL	Number of weeks since spouse left school	Fixed	SEDSTAT = school-leaver	= 15	-
SVACST	Spouse's vacation status	Fixed	SEDSTAT = student	= term time	-

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	Description	Sampling	Condition	Predictors	Source
EHT	Employment history type	Simple random	EMPTYPE ≠ working, ACTS = active	SEX, AGE, MARST, NKIDS, EMPTYPE	
DCSTATE	Duration of current state	Simple random	EHT = set	EHT, EMPTYPE	Sick: SB20, IV20, S/IV24, SB61, IV61, NCIP61, ASE, S/IV3, NCIP3 (all 1977) Unemployed: UBS3, Employment Gazette
$PSTATE_1$	Previous employment state - employed or unemployed, sick or well, active or inactive	Simple random	EHT = set	EHT, EMPTYPE	
$DPSTATE_1$	Duration of $PSTATE_1$	Simple random	EHT = set	EHT, $PSTATE_1$	
$PSTATE_n$	Employment status n states previously	Simple random	EHT = set, n < 30	EHT, $PSTATE_{n-1}$	
$DPSTATE_n$	Duration of $PSTATE_n$	Simple random	EHT = set, n < 30	EHT, $PSTATE_n$	
SEHT	Spouse's employment history type	Simple random	SEMPTYPE ≠ working, SACTS = active	SEX, AGE, MARST, NKIDS, SEMPTYPE	
SDCSTATE	Spouse's duration of current state	Simple random	SEHT = set	SEHT, SEMPTYPE	Sick: SB20, IV20, S/IV24, SB61, IV61, NCIP61, ASE, S/IV3, NCIP3 (all 1977) Unemployed: UBS3, Employment Gazette
$SPSTATE_1$	Spouse's previous employment state	Simple random	SEHT = set	SEHT, SEMPTYPE	
$SDPSTATE_1$	Duration of $SPSTATE_1$	Simple random	SEHT = set	SEHT, $SPSTATE_1$	

Variable	Description	Method	Condition	Value	Source
SPSTATE$_n$	Spouse's employment state n states previously	Simple random	SEHT = set, n < 30	SPSTATE$_{n-1}$	Sick: SB20, IV20, S/IV24, SB61, IV61, NCIP61, ASE, S/IV3, NCIP3 (all 1977) Unemployed: UBS3 Employment Gazette
SDPSTATE$_n$	Duration of SPSTATE$_n$	Simple random	SEHT = set, n < 30	SPSTATE$_n$	
PTHR	Part-time hourly rate	Simple random	EMPTYPE = part-time working EDSTAT = other	-	New Earnings Survey 1977F
PTWHW	Part-time weekly hours worked	Simple random	EMPTYPE = part-time working EDSTAT = other	-	
NWWAGE	Normal weekly wage (indexed to base date)	Fixed	EMPTYPE = part-time working EDSTAT = other	= PTHR * PTWHW	-
		Simple random	EMPTYPE = set ≠ p/t working EDSTAT = other	SEX, AGE, EMPTYPE	New Earnings Survey, Employment Gazette, Cohort Study
NWWE	Normal weekly work expenses (indexed to base date)	Simple random	EMPTYPE = working EDSTAT = other	-	New Earnings Survey Cohort Study
CWWAGE	Current weekly wage	Fixed	EMPTYPE = working EDSTAT = other	= NWWAGE * (WINF**(DATE/365)) (WINF = annual wage inflation rate + 1)	-

	Description	Distribution	Condition	Value	Source
PWWAGE	Previous weekly wage prior to current claim	Fixed	EMPTYPE = set EDSTAT = other	$= \text{NWWAGE} * (\text{WINF}** \dfrac{\text{DATE}-\text{DCSTATE}}{365})$	-
TSICKPAY	Type of sick pay scheme - full pay, half pay, flat rate, none	Simple random	EMPTYPE = sick and unemployed	SEX, AGE	DHSS Survey of Occupational Sick Pay Schemes 1974
DSICKPAY	Duration of sick pay scheme	Simple random	TSICKPAY ≠ none	SEX, MARST, TSICKPAY	GAD3
OCCPENS	Occupational pension	Simple random	AGE > 60, SEX = male	EMPTYPE	Sick - 0 E - Cohort study
			AGE > 55, SEX = female	EMPTYPE	Sick - 0 E - Furness
BRASP	Basic rate of pay as % of full rate	Fixed	SEX = male	= 75.4	
			SEX = female	= 89.4	
SPTHR	Spouse's part-time hourly rate of pay	Simple random	SEMPTYPE = p/t working SEDSTAT = other	-	New Earnings Survey 1977
SPTWH	Spouse's part-time weekly hours worked	Simple random	SEMPTYPE = p/t working SEDSTAT = other	-	

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Variable	Description	Type	Condition	Value	Source
SNWWAGE	Normal weekly wage of spouse (indexed to base date)	Fixed	SEMPTYPE = p/t working SEDSTAT = other	= SPTHR*SPTWHW	New Earnings Survey 1977
		Simple random	SEMPTYPE ≠ p/t working SEDSTAT = other OR MARST = widow, SEX = female	SEX, AGE, SEMPTYPE	New Earnings Survey, Employment Gazette, Cohort Study
SNWWE	Spouse's normal weekly work expenses	Simple random	SEMPTYPE = working SEDSTAT = other	-	Cohort Study, New Earnings Survey
SCWWAGE	Spouse's current weekly wage	Fixed	SEMPTYPE = working SEDSTAT = other	$= \text{SNWWAGE}*(\text{WINF}**(\frac{\text{DATE}}{365}))$	-
SPWWAGE	Spouse's previous weekly wage prior to current claim	Fixed	SEMPTYPE = set SEDSTAT = other	$= \text{SNWWAGE}*(\text{WINF}**(\frac{\text{DATE}-\text{SDCSTATE}}{365}))$	-
STSICKPAY	Spouse's type of sick pay	Simple random	SEMPTYPE = sick and employed SEDSTAT = other	SEX, SAGE	DHSS Survey of Occupational Sick Pay Schemes 1974
SDSICKPAY	Duration of spouse's sick pay scheme	Simple random	STSICKPAY ≠ none	SEX, MARST, STSICKPAY	GAD3
SOCCPENS	Spouse's occupational pension	Simple random	AGE > 60, SEX = female	EMPTYPE	Sick - 0
			AGE > 55, SEX = male	EMPTYPE	E - Cohort Study

SBRASP	Spouse's rate of pay as % of full rate	Fixed	SEX = female SEX = male	= 75.4 = 89.4	New Earnings Survey 1977D
HOUSEST	Household status - householder or not	Simple random	-	SEX, AGE	ASE
TENTYPE	Tenure type - owner occupied, rented furnished, rented unfurnished	Simple random	HOUSEST = householder	MARST, NKIDS, EMPTYPE, PWWAGE + SPWWAGE	Family Expenditure Survey 1976
RATES	Weekly rates (gross)	Simple random	HOUSEST = householder	TENTYPE, PWWAGE + SPWWAGE	
RENT	Rent or mortgage interest if owner occupied	Simple random	HOUSEST = householder	TENTYPE, PWWAGE + SPWWAGE	Family Expenditure Survey 1977
MWOPT	Married women's NI option	Simple random	MARST = married, SEX = female, EMPTYPE = set, EDSTAT = other	EMPTYPE, AGE, NKIDS	General Household Survey 1976
			MARST = married, SEX = male, SEMPTYPE = set, SEDSTAT = other	SEMPTYPE, SAGE, NKIDS	

Appendix 5.1 Measures of Inequality of Income

1. The Gini Coefficient

The Lorenz curve plots the cumulative percentage of the population against the percentage of total personal income. The Gini coefficient measures the proportion of the area below the line of complete equality, that is the 45 degree line, which is above the Lorenz curve. Thus the higher the Gini coefficient the greater the degree of inequality.
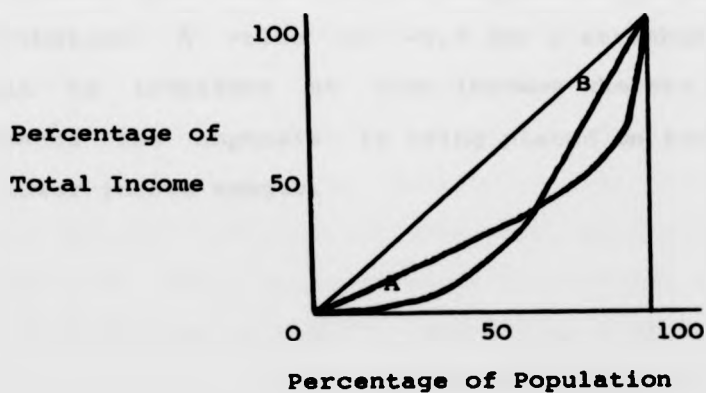
The obvious weakness with such a measure is that it does not express where the percentage shares are most deficient, that is curves A and B whilst describing very different distributions can have identical Gini coefficients.

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2. The Atkinson Measure of Equality

The Atkinson measure is defined as

$$E = \frac{(\overline{y}^{\alpha})^{\frac{1}{\alpha}}}{\overline{y}}$$

where α represents the weight attached by society to inequality in the distribution.

Piachaud (1982) uses values for α of -0.5, -1.0 and -2.0. The higher the value of E the greater the equality of distribution. A value of -0.5 for α attaches a greater weight to transfers at high incomes whereas -2.0 for α indicates the emphasis is being placed on inequality in the lower income ranges.

Sample Design of the Family Expenditure
Survey as at 1979 and described in Kemsley et al (1980)

The FES uses a four stage, stratified, rotating design in
which the primary sampling units (PSUs) are 455 of the
459 administrative areas of Great Britain, made up of the
boroughs of London, Edinburgh, Glasgow, Dundee, Aberdeen
and the district councils. The secondary units are
electoral wards, and tertiary units addresses and finally
households.

The PSUs are stratified by region, population density and
an economic indicator based on rateable value. The
regional factor divides the region into 16 major strata.
The second factor then divides them into Metropolitan
areas and the district councils into three bands
according to population density - the bounds between
bands chosen such that there are approximately equal
numbers of PSUs in each band. This yields 44 strata in
which PSUs are arranged in descending order of the third
stratification factor - for England and Wales this is the
proportion of domestic properties with rateable value
over 400 pounds, in Scotland the proportion of industrial
rateable value to total rateable value. The intermediate
strata are then divided into 168 minor strata
approximately equal in size in such a way that selection
of one PSU from each of these minor strata should ensure
a sample which is regionally representative and with

distribution by area type as faithful as possible - the divergence between the 'expected' and 'actual' distributions being caused by the need for integral numbers of PSUs in each stratum.

In each quarterly period the sample consists of one PSU from each of the 168 strata. The PSUs are selected randomly and independently and with probability proportional to size of the population. Each PSU then contributes 16 addresses to the final sample so that the distribution of addresses is close to the correct regional distribution.

Once selected a PSU is used for four consecutive quarters and then replaced by another PSU from the same stratum. The 168 are divided into four sets of 42, each representative of the whole, so that in each quarter 42 PSUs are selected from one of these four sets. Thus if X_i represents the ith selection from set X, the following is the rotation pattern:

Quarter	Sets					
j	A_i	B_i	C_i	D_i	}	In any 12 month
j+1	A_{i+1}	B_i	C_i	D_i		period 7 sets
j+2	A_{i+1}	B_{i+1}	C_i	D_i	}	(294 PSUs)
j+3	A_{i+1}	B_{i+1}	C_{i+1}	D_i		are in use.
j+4	A_{i+1}	B_{i+1}	C_{i+1}	D_{i+1}		
j+5	A_{i+2}	B_{i+1}	C_{i+1}	D_{i+1}		

Occasionally it is necessary to change the frame which means that for three quarters the sample is selected from a combination of old and new frames and hence areas can

be omitted or double-counted. However, by regarding the sample of a minor stratum as being a random selection from an infinite population of areas then the old and new frames become equally random choices from the same infinite population and the sample during the transitionary stage can still be regarded as representative.

The four sets of 42 are also used in a process designed to ensure that there is no systematic allocation of the quarterly samples into monthly samples.

Having selected the quarterly sample of PSUs the secondary stage is to select four wards from each PSU with probability proportional to size of the electorate at the time of selection. The four wards selected are allocated at random to the quarters for which the PSU remains in the sample. Finally 16 addresses are selected at random from the electoral registers of the chosen wards. If an address is reselected within 13 months then it is rejected and another selection made. The final sample is restricted to domestic households so residents of hotels, hostels, hospitals and other institutions are excluded.

Some 5% of addresses selected contain more than one household. At the address selection stage, if the elector chosen is the first on the register at that address and

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there are less than four surnames registered at that address, then the address is selected. If there are four or more surnames at the address and the elector selected is the first on the register with that surname then the address is selected - thus increasing the probability that the address is selected on the assumption that four or more surnames on the electoral register at one address is an indicator of the presence of more than one household. At the interview stage at these 'pre-sampled multi-household' addresses the interviewer then identifies the number of households at the address and consults a table which determines the household or households to be chosen - each has a probability of selection inversely proportional to the number of surnames. This usually identifies a single household to be interviewed, although sometimes none or more than one is selected. Further addresses will reveal themselves to be multi-household at the interview stage, if there are more than three the interviewer takes a random sample - each interviewer is limited to a total of twenty households so the increase in households to be interviewed as a result of 'concealed multi-households' may lead to a slight under-representation of multi-household addresses in the final sample for inner-city areas.

Some selected addresses are excluded from the final sample because they are empty, demolished, or not within

the coverage of the survey. This latter cause is usually a result of the address not being a domestic household or sometimes because domestic expenditure is closely tied with commercial expenditure.

As a result of these various factors the original 'intended' sample of 10,752 households a year yielded effective samples of 10,080 in 1976, 10,145 in 1977 and 10,135 in 1978.

Each annual report gives estimates of sampling errors. 'Formula 1' gives standard errors derived from the single stage random formula, 'formula 2' is an approximation of the true value taking into account the multi-stage design and rotation - the ratio of 'formula 2' to 'formula 1' is an estimate of the design factor. The higher design factors are associated with those variables susceptible to regional clustering - in particular housing expenditure had a mean design factor of 1.98 for the years 1969-1976.

Appendix 7.1 Uniqueness, Existence and Convergence of

Solution to Procedure A

This proof is adapted from Macgill (1977) which applies to
a more general form of procedure A.

The form taken in this proof will be the derivation of
$M^* = (m^*_{ij})_{m \times n}$ from

$$m^*_{ij} = A_i B_j m_{ij} \qquad (1)$$

where A_i, B_j are row and column multipliers to be determined
iteratively from

$$A_i = \frac{M_i}{\sum\limits_j B_j m_{ij}} \qquad (2)$$

$$B_j = \frac{N_j}{\sum\limits_i A_i m_{ij}} \qquad (3)$$

It will be shown that this procedure derives a unique
solution to the problem of obtaining a non-negative m x n
matrix M^* with predefined row and column totals M_i, N_j
($\sum\limits_{i=1}^{m} M_i = \sum\limits_{j=1}^{n} N_j$) so that the entries m^*_{ij} of M^* are
biproportional to those of a matrix $M = (m_{ij})_{m \times n}$.

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This procedure can be primed by assigning any positive values to the B_j's in (2) or to the A_i's in (3), but setting $B_j = 1$, $\forall_j$ in (2) will result in the above procedure being the same as procedure A and will produce the same sequence of matrices $M^{(k)} = (m_{ij}^{(k)})_{m \times n}$.

Note also that since $m_{ij} = 0 \Rightarrow m_{ij}^* = 0$ the same proofs would apply to procedure B.

Uniqueness

Suppose $\exists\ M_1^* = (a_i b_j m_{ij})_{m \times n}$, $M_2^* = (A_i B_j m_{ij})_{m \times n}$, solutions to this procedure, and suppose $a_1 b_1 m_{11} > A_1 B_1 m_{11}$, $m_{11} \neq 0$. Note we may assume $m_{11} \neq 0$ for if not then M can be rearranged accordingly. We may also assume $b_1 = B_1 = 1$, since any of the row and column multipliers can be multiplied by a positive constant providing the remainder are altered accordingly. Finally we assume $n \geq m$, if not M can be transposed.

$$\therefore\ M_1^* - M_2^* = \begin{bmatrix} (a_1-A_1)_{m_{11}} & (a_1 b_2-A_1 B_2)_{m_{12}} & (a_1 b_n-A_1 B_n)_{m_{1n}} \\ (a_2-A_2)_{m_{21}} & (a_2 b_2-A_2 B_2)_{m_{22}} & (a_2 b_n-A_2 B_n)_{m_{2n}} \\ \rule{2cm}{0.4pt} & & \\ (a_m-A_m)_{m_{m1}} & (a_m b_2-A_m B_2)_{m_{m2}} & (a_m b_n-A_m B_n)_{m_{mn}} \end{bmatrix}$$

with all row-sums and column-sums equal to zero.

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$$\therefore \quad a_1 > A_1, \ m_{11} \neq 0, \ (a_1 - A_1)m_{11} + \sum_{j=2}^{n} (a_1 b_j - A_1 B_j)m_{1j} = 0$$

$\therefore \quad (a_1 b_j - A_1 B_j)m_{1j} < 0$, some j or else we have a contradiction.

We may assume $j = 2$, thus $1 < \dfrac{a_1}{A_1} < \dfrac{B_2}{A_2}$ $(m_{12} > 0)$.

Now $(a_1 b_2 - A_1 B_2)m_{12} < 0$, $\displaystyle\sum_{i=1}^{n} (a_i b_2 - A_i B_2)m_{i2} = 0$.

$\therefore \quad (a_i b_2 - A_i B_2)m_{i2} > 0$, some i or else we have a contradiction.

We may assume $i = 2$, then $m_{22} > 0$, $1 < \dfrac{a_1}{A_1} < \dfrac{B_2}{b_2} < \dfrac{a_2}{A_2}$

$$\therefore \quad (a_2 - A_2)m_{21} + (a_2 b_2 - A_2 B_2)m_{22} > 0 \quad (m_{21} \geq 0), \text{ and}$$

$$(a_2 - A_2)m_{21} + \sum_{j=2}^{n} (a_2 b_j - A_2 B_j)m_{2j} = 0.$$

$\therefore \quad (a_2 b_j - A_2 B_j)m_{2j} < 0$, some j or else we have a contradiction.

We may assume $j = 3$, then $m_{23} > 0$, $\dfrac{a_2}{A_2} < \dfrac{B_3}{b_3}$.

This argument can be persued until $i = 1$, where either

a) $i_1 = m$, in which case $a_i > A_i \ \Psi_i$, $m_{i1} \geq 0 \ \Psi_i$, $m_{11} > 0$,

$$\therefore \sum_{i=1}^{m} (a_i - A_i)m_{i_1} > 0, \text{ contradicting } M_1 - M_1 = 0;$$

or

b) $i_1 < m$, $j = i_1 + 1$ and $(a_{i_1} - A_{i_1})m_{i_1 1} + \sum_{j=2}^{n}(a_{i_1}b_j - A_{i_1}B_j)m_{i_1 j} > 0$,

thus contradicting $N_{i_1} - N_{i_1} = 0$;

or

c) $i_1 < m$, $j = i_1$ and $\sum_{i=1}^{m}(a_i b_{i_1} - A_i B_{i_1})m_{i i_1} < 0$, contradicting

$M_{i_1} - M_{i_1} = 0$.

Therefore if a solution to the procedure exists then it will be unique.

Existence

For $M^* = (m^*_{ij})_{m \times n}$ to exist it is necessary that a matrix with row and column totals M_i, N_j and with $m^*_{ij} = 0$ wherever $m_{ij} = 0$ exists. This requires $\sum_{i=1}^{m} M_i = \sum_{j=1}^{n} N_j$ and if $m_{i_1 j_1} = 0$ then $M_{i_1} \leq \sum_{j \neq j_1} N_j$, $N_{j_1} \leq \sum_{i \neq i_1} M_i$.

These latter conditions prevent attempts to generate a matrix such as $\begin{bmatrix} m^*_{11} & m^*_{12} \\ m^*_{21} & 0 \end{bmatrix}$ with $\sum M_i = \sum N_j = 3$, $M_1 = 1$, $M_2 = 2$, $N_1 = 1$, $N_2 = 2$.

That is, $\begin{bmatrix} m^*_{11} & m^*_{12} \\ m^*_{21} & 0 \end{bmatrix} \begin{matrix} 1 \\ 2 \end{matrix}$ with $m^*_{12} \geq 0$ which is clearly not possible.

$\begin{matrix} 1 & 2 \end{matrix}$

Provided these conditions are satisfied the adjustment is said to be 'consistent'. If the adjustment is consistent

then the procedure will be globally convergent and hence
a solution exists.

Convergence

The approach of the proof is to establish the limits

$$\lim_{k \to \infty} \frac{A_i^k}{A_i^{k-1}} = 1 \text{ for all } i, \quad \lim_{k \to \infty} \frac{B_j^k}{B_j^{k-1}} = 1 \text{ for all } j$$

where k numbers the iterations.

<u>Theorem</u> Suppose $M = (m_{ij})_{m \times n}$ is a given non-negative
matrix with at least one positive element in each row and
column and $M_i(i = 1, \text{---}, m)$, $N_j(j = 1, \text{---}, n)$ are
given, strictly positive numbers. Suppose also that A_i^k
and B_j^k are sequences defined by

$$A_i^k = \frac{M_i}{\sum\limits_j B_j^{k-1} m_{ij}} \qquad i = 1, \text{---}, m \qquad (4)$$

$$B_j^k = \frac{N_j}{\sum\limits_i A_i^k m_{ij}} \qquad j = 1, \text{---}, n \qquad (5)$$

where $B_j^0(j = 1, \text{---}, n)$ are positive numbers and $k = 1, 2, \text{---}$.
Then the sequences of matrices defined by

$$(m_{ij}^{2k-1})_{m \times n} = (A_i^k B_j^{k-1} m_{ij})_{m \times n} \qquad (6)$$

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$$(m_{ij}^{2k})_{m \times n} = (A_i^k B_j^k m_{ij})_{m \times n} \qquad (7)$$

tend to a common limit, $M^* = (m_{ij}^*)_{m \times n}$ say, as $k \to \infty$ if and only if the following conditions hold,

$$\sum_i M_i = \sum_j N_j \qquad (8)$$

and for any $m_{i_1 j_1} = 0$, $m_{i_1 j_1} \in M$,

$$M_{i_1} \leq \sum_{j \neq j_1} N_j \qquad (9)$$

$$N_{j_1} \leq \sum_{i \neq i_1} M_i \qquad (10)$$

(Note, given (8) then (9) and (10) are complementary)

Strategy for Proof

Lemma 1 will show that the sequences $\{\max_i (A_i^k / A_i^{k-1})\}$ and $\{\min_i (A_i^k / A_i^{k-1})\}$ are monotonically decreasing and increasing respectively and that the equivalent B_j sequences behave correspondingly.

Lemma 2 will show that these sequences are bounded and hence attain finite limits.

Lemma 3 will show that if any of (8), (9), or (10) is violated then these limits cannot equal unity.

Lemma 4 will show that if (8), (9) and (10) hold then these limits will necessarily be unity.

<u>Proof</u>

<u>Lemma 1</u> Given A_i^k and B_j^k as defined in the theorem, then

$$\underset{i}{\text{Max}} \frac{A_i^{k+1}}{A_i^k} \leq \underset{i}{\text{Max}} \frac{A_i^k}{A_i^{k-1}} \; , \; \underset{i}{\text{Min}} \frac{A_i^{k+1}}{A_i^k} \geq \underset{i}{\text{Min}} \frac{A_i^k}{A_i^{k-1}} \; ,$$

$$\underset{j}{\text{Max}} \frac{B_j^{k+1}}{B_j^k} \leq \underset{j}{\text{Max}} \frac{B_j^k}{B_j^{k-1}} \; , \; \underset{j}{\text{Min}} \frac{B_j^{k+1}}{B_j^k} \geq \underset{j}{\text{Min}} \frac{B_j^k}{B_j^{k-1}} \; .$$

<u>Proof of Lemma 1</u>

$$A_i^{k+1} = \frac{M_i}{\sum_j B_j^k m_{ij}} \qquad \text{(from (4))}$$

$$\therefore \; \frac{A_i^{k+1}}{A_i^k} = \frac{M_i}{\sum_j A_i^k B_j^k m_{ij}} \qquad \forall_i$$

$$= \frac{M_i}{\sum_j A_i^k B_j^{k-1} (\frac{B_j^k}{B_j^{k-1}}) m_{ij}} \qquad \forall_i (B_j^{k-1} \neq 0 \; \forall_j , k)$$

$$\leq \frac{M_i}{\underset{j}{\min}(\frac{B_j^k}{B_j^{k-1}}) \sum_j A_i^k B_j^{k-1} m_{ij}} \qquad \forall_i$$

$$= \frac{1}{\underset{j}{\min}(\frac{B_j^k}{B_j^{k-1}})} \qquad \forall_i \; \text{(from (4))}$$

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$$\therefore \quad \max_{i} \frac{A_i^{k+1}}{A_i^k} \leq \frac{1}{\min\limits_{j} \dfrac{B_j^k}{B_j^{k-1}}} \cdot$$

Similarly

$$\min_{j} \frac{B_j^k}{B_j^{k-1}} \geq \frac{1}{\max\limits_{i} \dfrac{A_i^k}{A_i^{k-1}}}$$

$$\Rightarrow \quad \max_{i} \frac{A_i^{k+1}}{A_i^k} \leq \max_{i} \frac{A_i^k}{A_i^{k-1}}$$

Other parts of lemma proven similarly.

Thus these sequences are monotonic.

Lemma 2 The decreasing sequences $\{\max\limits_{i}(\frac{A_i^{k+1}}{A_i^k})\}$ and $\{\max\limits_{j}(\frac{B_j^{k+1}}{B_j^k})\}$ are bounded below and the increasing sequences $\{\min\limits_{i}(\frac{A_i^{k+1}}{A_i^k})\}$ and $\{\min\limits_{j}(\frac{B_j^{k+1}}{B_j^k})\}$ are bounded above.

Proof of Lemma 2

Let $\min\limits_{i}(\dfrac{A_i^2}{A_i^1}) = K$ (K finite)

But $K \leq \max\limits_{i}(\dfrac{A_i^{k+1}}{A_i^k})$ $\forall_k$

$\therefore$ K is a lower bound for $\{\max\limits_{i}(\dfrac{A_i^{k+1}}{A_i^k})\}$.

Other cases proven similarly.

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Thus the sequences are monotonic increasing (decreasing) and bounded above (below).

$\therefore$ the sequences attain finite limits.

Suppose $\lim\limits_{k \to \infty} \max\limits_{i} \left(\dfrac{A_i^k}{A_i^{k-1}} \right) = W.$

Then given $\epsilon > 0, \exists\, k_1$ s.t. $k > k_1 \Rightarrow \left| \max\limits_{i} \left(\dfrac{A_i^k}{A_i^{k-1}} \right) - W \right| < \epsilon$ and

$$\left| \max\limits_{i} \left(\dfrac{A_i^{k+1}}{A_i^k} \right) - W \right| < \epsilon.$$

But, from proof of lemma 1,

$$\max\limits_{i} \left(\dfrac{A_i^k}{A_i^{k-1}} \right) \geq \dfrac{1}{\min\limits_{j} \left(\dfrac{B_j^k}{B_j^{k-1}} \right)} \geq \max\limits_{i} \left(\dfrac{A_i^{k+1}}{A_i^k} \right).$$

$$\therefore \quad \max\limits_{i} \left(\dfrac{A_i^k}{A_i^{k-1}} \right) - W \geq \dfrac{1}{\min\limits_{j} \left(\dfrac{B_j^k}{B_j^{k-1}} \right)} - W \geq \max\limits_{i} \left(\dfrac{A_i^{k+1}}{A_i^k} \right) - W.$$

$$\therefore \quad \left| \dfrac{1}{\min\limits_{j} \left(\dfrac{B_j^k}{B_j^{k-1}} \right)} - W \right| < \epsilon \qquad \forall k > k_1$$

$$\therefore \lim\limits_{k \to \infty} \min\limits_{j} \left(\dfrac{B_j^k}{B_j^{k-1}} \right) = \dfrac{1}{W}.$$

Thus if $\lim\limits_{k \to \infty} \max\limits_{i} \left(\dfrac{A_i^k}{A_i^{k-1}} \right) = W$ then $\lim\limits_{k \to \infty} \min\limits_{j} \left(\dfrac{B_j^k}{B_j^{k-1}} \right) = \dfrac{1}{W}$ and

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Similarly if $\lim_{k\to\infty} \min_i (\frac{A_i^k}{A_i^{k-1}}) = \sigma$ then $\lim_{k\to\infty} \max_j (\frac{B_j^k}{B_j^{k-1}}) = \frac{1}{\sigma}$.

Lemma 3   Let $\lim_{k\to\infty} \max_i (\frac{A_i^k}{A_i^{k-1}}) = W$ and $\lim_{k\to\infty} \min_k (\frac{A_i^k}{A_i^{k-1}}) = \sigma$.

If the conditions of the theorem are violated then $w > 1$ or $\sigma < 1$ and hence there is no convergence.

Proof of Lemma 3

Suppose that condition (8) does not hold, s.t. $\sum_j N_j < \sum_i M_i$.

From (4) and (5),

$$\sum_j N_j = \sum_i \sum_j A_i^{k-1} B_j^{k-1} m_{ij}, \quad \forall k,$$

and $\sum_i M_i = \sum_i \sum_j A_i^k B_j^{k-1} m_{ij} \quad \forall k$

$$= \sum_i \sum_j \frac{A_i^k}{A_i^{k-1}} A_i^{k-1} B_j^{k-1} m_{ij} \quad \forall k (A_i^{k-1} \neq 0 \forall_i, k)$$

$$\therefore \max_i \frac{A_i^k}{A_i^{k-1}} \sum_i \sum_j A_i^{k-1} B_j^{k-1} m_{ij} \geq \sum_i M_i \quad \forall k$$

$$\therefore \max_i \frac{A_i^k}{A_i^{k-1}} \sum_j N_j \geq \sum_i M_i \quad \forall k \qquad\qquad (11)$$

$$\therefore \max_i \frac{A_i^k}{A_i^{k-1}} \geq \frac{\sum_i M_i}{\sum_j N_j} > 1 \quad \forall k$$

$$\therefore \lim_{k\to\infty} \max_i \frac{A_i^k}{A_i^{k-1}} = W > 1 \quad \text{and there is no convergence.}$$

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Similarly if $\sum\limits_{j} N_j > \sum\limits_{i} M_i$ then it can be shown that $\sigma < 1$ and again there is no convergence.

Now suppose condition (9) does not hold, s.t. $m_{i_1 j_1} = 0$ and

$$M_{i_1} > \sum\limits_{j \neq j_1} N_j, \text{ say.}$$

From (4), $M_{i_1} = \sum\limits_{j} A_i^{k+1} B_j^k m_{i_1 j}.$

$\therefore$

$$\frac{M_{i_1}}{\sum\limits_{j \neq j_1} N_j} = \frac{\sum\limits_{j} A_{i_1}^{k+1} B_j^k m_{i_1 j}}{\sum\limits_{j \neq j_1} N_j} = \frac{\sum\limits_{j \neq j_1} A_{i_1}^{k+1} B_j^k m_{i_1 j}}{\sum\limits_{j \neq j_1} N_j} \qquad (m_{i_1 j_1} = 0)$$

$$< \frac{\sum\limits_{i} \sum\limits_{j \neq j_1} A_i^{k+1} B_j^k m_{ij}}{\sum\limits_{j \neq j_1} N_j} = \frac{\sum\limits_{i} \sum\limits_{j \neq j_1} (\frac{A_i^{k+1}}{A_i^k}) A_i^k B_j^k m_{ij}}{\sum\limits_{j \neq j_1} N_j} \qquad (A_i^k \neq 0)$$

$$\leq \max\limits_{i} (\frac{A_i^{k+1}}{A_i^k}) \; \frac{\sum\limits_{i} \sum\limits_{j \neq j_1} A_i^k B_j^k m_{ij}}{\sum\limits_{j \neq j_1} N_j}$$

$$= \max\limits_{i} (\frac{A_i^{k+1}}{A_i^k}) \qquad\qquad \text{(from (5))}$$

$\therefore$

$$\max\limits_{i} (\frac{A_i^{k+1}}{A_i^k}) > \frac{M_i}{\sum\limits_{j \neq j_1} N_j} > 1.$$

$\therefore$ W > 1 and again there is no convergence. Conditions (10) are complementary and there is no need to repeat the proof for these.

<u>Lemma 4</u>   If the conditions of the theorem are satisfied
then $W = \sigma = 1$ and convergence to $M^* = (m^*_{ij})_{m \times n}$ will be
achieved.

<u>Proof of Lemma 4</u>

From (11), $\displaystyle \max_i \frac{A_i^k}{A_i^{k-1}} \geq \frac{\sum_i M_i}{\sum_j N_j} = 1$

$\therefore \quad W \geq 1.$

Similarly it can be shown that $\sigma \leq 1$.

Moreover $W > 1 \Rightarrow \sigma < 1$, for suppose $\displaystyle \lim_{k \to \infty} \frac{A_i^k}{A_i^{k-1}} = W_i \geq 1 \; \forall_i$,

$W_i > 1$ for some i.

Now $\displaystyle \sum_i M_i = \sum_i \sum_j A_i^k B_j^{k-1} m_{ij}$ $\qquad$ (from (4))

$\displaystyle = \sum_i \sum_j \left(\frac{A_i^k}{A_i^{k-1}}\right) A_i^{k-1} B_j^{k-1} m_{ij}$ $\qquad$ $(A_i^{k-1} \neq 0 \; \forall_i, k)$

$\displaystyle > \sum_i \sum_j A_i^{k-1} B_j^{k-1} m_{ij}$

$\displaystyle = \sum_j N_j$ $\qquad$ (from (5),

contradicting $\displaystyle \sum_i M_i = \sum_j N_j$.

$\therefore \quad \displaystyle \lim_{k \to \infty} \frac{A_i^k}{A_i^{k-1}} < 1$ some i and in particular $\displaystyle \lim_{k \to \infty} \min_i \frac{A_i^k}{A_i^{k-1}} = \sigma < 1$.

But $\lim_{\substack{k\to\infty \\ i}} \max \dfrac{A_i^{\,k}}{A_i^{\,k-1}} = W$, $\lim_{\substack{k\to\infty \\ j}} \max \dfrac{B_j^{\,k}}{B_j^{\,k-1}} = \dfrac{1}{\sigma}$

$\therefore$ $A_i^{\,k} \to \infty$ and $B_j^{\,k} \to \infty$ as $k \to \infty$ for some i ($i \in I$ say) and some j ($j \in J$ say).

If $m_{ij} \neq 0$ some $i \in I$, $j \in J$ then $m_{ij}^{(k)} \to \infty$ as $k \to \infty$ contradicting $m_{ij}^{(k)}$ bounded by M_i, N_j.

If $m_{ij} = 0$ $\forall_i \in I$, $j \in J$ then $m_{i_1 j_1} \neq 0$ some $i_1 \in I$, $j_1 \notin J$.

Moreover $A_{i_1}^{\,k} \to \infty$ as $k \to \infty$ so $B_{j_1}^{\,k} \to 0$ as $k \to \infty$ s.t. $m_{ij}^{(k)}$ remain within bounds M_i, N_j.

Let $J^1 = \{j \mid B_j^{\,k} \to 0 \text{ as } k \to \infty \}$
Let $J^{11} = \{j \mid j \notin J^1\}$.

Thus $(i, j) \in I \times J^{11} \Rightarrow m_{ij} = 0$ and $I \times J \leq I \times J^{11}$.

Applying condition (9) to $I \times J^{11}$,

$$\sum_{i \in I} M_i \leq \sum_{j \in J^1} N_j \qquad (12).$$

From (4), $\displaystyle\sum_{i \in I} M_i = \sum_{i \in I} \sum_j A_i^{\,k} B_j^{\,k-1} m_{ij} = \sum_{i \in I} \sum_{j \in J^1} A_i^{\,k} B_j^{\,k-1} m_{ij}$

(since $m_{ij} = 0$ $\forall (i,j) \in I \times J^{11}$)

From (5), $\displaystyle\sum_{j \in J^1} N_j = \sum_{j \in J^1} \sum_i A_i^{\,k} B_j^{\,k} m_{ij} = \sum_{j \in J^1} \sum_{i \in I} A_i^{\,k} B_j^{\,k} m_{ij} +$

$+ \displaystyle\sum_{j \in J^1} \sum_{i \in I^1} A_i^{\,k} B_j^{\,k} m_{ij}$

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where $I^1 = \{i \mid i \notin I\}$.

If $W > 1$, $\sigma \ll 1$ then for $j \in J^1$, $B_j^{\ k} \to 0$ as $k \to \infty$ and
$\sum\limits_{j \in J^1} \sum\limits_{i \in I^1} A_i^{\ k} B_j^{\ k} m_{ij} \to 0$ as $k \to \infty$ ($i \in I^1 \Rightarrow A_i^{\ k}$ finite as

$$k \to \infty).$$

Thus $\sum\limits_{j \in J^1} N_j = \sum\limits_{j \in J^1} \sum\limits_{i \in I} A_i^{\ k} B_j^{\ k} m_{ij}$, and since $B_j^{\ k} < B_j^{\ k-1}$ for $j \in J^1$

then $\sum\limits_{j \in J^1} N_j = \sum\limits_{j \in J^1} \sum\limits_{i \in I} A_i^{\ k} B_j^{\ k} m_{ij} < \sum\limits_{j \in J^1} \sum\limits_{i \in I} A_i^{\ k} B_j^{\ k-1} m_{ij} = \sum\limits_{i \in I} M_i$,

contradicting (12).

$\therefore \quad W = \sigma = 1$ and convergence is achieved.

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Appendix 7.2 The Entropy of a Probability Distribution

(See Shannon and Weaver, 1949:49)

Events x_1, ——, x_n occur with probabilities p_1, ——, p_n.

Shannon asks if $\exists$ $H(p_1, $ ——$, p_n)$, a measure of uncertainty contained in the distribution p_1, ——, p_n.

Shall require three properties of H:

i) H be continuous in the p_i.

ii) If $p_i = \frac{1}{n}$ for all i then H should be a monotonic increasing function of n, that is if the events are equally likely then the more events there are the more uncertainty will exist.

iii) If an event is divided into sub-events, then the H should be the weighted sum of the individual values of H - that is if x_j can occur as x_{j_1}. ——, x_{jm_j} with probabilities p_{j_1}, ——, p_{jm_j} then $H(p_{11}, $——$, p_{nm_n}) = H(p_1, $ ——$, p_n) +$
$+ p_1 H(p_{j_1}, $ ——$, p_{jm_j}) +$ —— $+ p_n H(p_{n_1}, $ ——$, p_{nm_n})$.
If these conditions hold then $H = -k \sum_{i=1} p_i \log p_i$
(k > 0, constant).

<u>Proof</u>

Let $A(n) = H(\frac{1}{n}, ---, \frac{1}{n})$.

From (iii), $A(s^m) = A(s) + A(s^{m-1}) = 2A(s) + A(s^{m-2}) = mA(s)$

Similarly, $A(t^n) = nA(t)$

Can choose n arbitrarily large and find m s.t.

$$s^m \leq t^n < s^{m+1} \qquad (s,t \text{ integers} > 1).$$

$\therefore$ $m \log s \leq n \log t < (m + 1) \log s$

$\therefore$ $\frac{m}{n} \leq \frac{\log t}{\log s} < \frac{m}{n} + \frac{1}{n}$

$\therefore$ given any $\epsilon > 0$, $\exists$ m, n s.t. $|\frac{m}{n} - \frac{\log t}{\log s}| < \frac{\epsilon}{2}$.

From the monotonicity of $A(n)$, $A(s^m) \leq A(t^n) < A(s^{m+1})$.

Hence given any $\epsilon > 0$ $\exists$ m, n s.t. $|\frac{m}{n} - \frac{A(t)}{A(s)}|$ $< \frac{\epsilon}{2}$.

$\therefore$ given any $\epsilon > 0$, $|\frac{A(t)}{A(s)} - \frac{\log t}{\log s}| < \epsilon$

$\therefore$ $A(t) = k \log t$, $k > 0$ to satisfy (ii).

Now suppose x , ---, x_n occur with probabilities $p_1 = \frac{n_1}{\sum\limits_{i=1}^{n} n_i}$,
n_i integers.

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From (iii), $k \log \Sigma n_i = H(p_1, \underline{\quad}, p_n) + k \Sigma p_i \log n_i$.

$\therefore \quad H = k(\Sigma p_i \log \Sigma n_i - \Sigma p_i \log n_i) \qquad (\Sigma p_i = 1)$

$\qquad = -k \Sigma p_i \log \dfrac{n_i}{\Sigma n_i}$

$\qquad = -k \Sigma p_i \log p_i$.

Note if p_i are incommeasurable they may be approximated by rationals and continuity condition means that same expression holds for H.

H is therefore a unique measure of the uncertainty or "entropy" contained in a probability distribution.

Appendix 9.1 Claimants for Benefits 1948-1982

YEAR	1. UB	2. SB	3. NCIP	4. MB	5. MA	6. CB	7. GA	8. CSA	9. DG	10. WB	11. WA
1948	(1346)	2984		(369)	(56)	3285	1.5				
1949	2736	6948		738	112	(375)	2.0		609	60	(80)
1950	2796	7300		748	124	(375)	1.6		(181)	53.9	(80)
1951	2479	7545		752	143	499	1.5		(181)	57.9	(80)
1952	3584	6587		747	153	502	1.4		(194)	56.2	80
1953	2849	7376		(747)	(153)	495	1.4		201	59.1	100
1954	2606	7173		(737)	(196)	484	1.4		211	56.2	80
1955	2322	7919		737	196	482	1.3		225	59.7	80
1956	2611	7762		761	164	485	1.1		238	60.4	84
1957	2575	9609		773	174	484	1.6		258	63.1	84
1958	3518	7887		807	187	502	1.6	0.2	269	66.0	80
1959	3002	8768		819	188	550	1.5	0.2	287	62.8	80
1960	2447	8319		834	188	584	1.6	0.2	303	61.8	88
1961	2489	9152		857	198	603	1.4	0.3	331	63.5	84
1962	3451	9002		898	211	632	1.3	0.3	347	64.8	84
1963	3396	9336		909	216	644	1.4	0.4	373	65.3	80
1964	2436	8998		920	217	656	1.6	0.4	375	63.2	88
1965	2364	9565		941	234	658	1.4	0.4	396	66.1	80
1966	2633	10925		924	245	637	(1.4)	0.5	420	53.0	80
1967	3275	10048		910	250	621	(1.4)	0.5	414	60.4	(80)
1968	3117	10608		879	245	624	(1.5)	0.6	458	62.9	(90)
1969	3098	11411		869	243	610	(1.5)	0.6	468	69.0	(100)
1970	3159	10632		822	233	593	(1.4)	0.7	506	56.0	(100)
1971	3570	8801		825	241	575	(1.5)	0.8	510	79.0	(120)
1972	3360	9764		822	247	528	(1.5)	0.8	523	75	(130)
1973	2793	10022		726	222	477	(1.6)	0.9	521	75	(130)
1974	3218	9863		671	216	437	(1.5)	0.9	544	75	164
1975	4427	9601		637	217	424	(1.5)	1.0	561	75	154
1976	4775	10745	133	634	253	397	(1.5)	1.1	565	75	154
1977	4600	10151	6.5	582	244	3270	(1.4)	1.2	567	75	146
1978	4384	11167	6.3	587	277	466	(1.4)	1.2	583	75	150
1979	4271	10788	6.5	622	317	493	(1.4)	1.4	593	75	102
1980	5131	9376	8.1	659	351	484	(1.4)	1.4	593	75	130
1981	4912	7569	10.4	654	365	413	(1.3)	1.4	591	75	114
1982	5101	6905	N/Av	606	330	448	(1.3)	1.4	597	75	114

Notes

All figures in thousands. Bracketed figures estimated – see below.

1. **Unemployment Benefit (UB)**.

New claims (100% count) including second and subsequent claims in same year. Commences July 1948.

a. Estimated by divding number of claims from July 1948 to July 1949 (2727) by 2.

2. **Sickness Benefit (SB)**.

New claims (100% count) including second and subsequent claims in same year. Commenced July 1948.

3. **Non-Contributory Invalidity Pension (NCIP)**.

New claims (100%) count. Commenced November 1975. 1976 figure includes 1975 claims.

4. **Maternity Benefit (MB)**.

Number of awards for maternity grants – counting multiple births as one award.

b. Estimated by dividing figures for 1949 by 2.

c. Estimate based on 1952 and 1955 data – basis of award changed at this time.

5. **Maternity Allowance (MA)**.

Number of awards of maternity allowances.

6. **Family Allowance / Child Benefit (CB)**.

1946-1977 – number of new claims received from families plus additional claims received from families already receiving allowances plus claims for revival of allowances following a break in entitlement.

1978-1982 – additions to number of families receiving Child Benefit during year.

d. Commenced August 1946 – claims for 1946 and 1947 included in 1948 figure.

e. Claims for July 1949 to December 1950 averaged over 1949 and 1950.

7. **Guardian's Allowance (GA)**.

Number of awards made in year. Commenced July 1948.

Estimated for 1966 to 1982.

f.   Figure for 1948 represents awards made from July 1948 to June 1949. Figure for 1949 represents awards from July 1949 to December 1950.

8. Child Special Allowance (CSA).

Allowances in payment at 31 December - number of children. Commenced November 1957.

9. Death Grant (DG).

Number of grants paid in year. Commenced July 1949.

g. July - December.

h. Estimates based on reported costs of payments.

10. Widow's Benefit (WB).

Number of awards made excluding widow's allowance in year to 31 March. Commenced July 1948.

11. Widow's Allowance (WA).

Number of awards made in year to 31 March. Commenced July 1948.

i. 452,000 in payment on 30 June 1949 mostly converted from previous widow's pension scheme. Figure used refers to new claims in first year of scheme.

Appendix 9.2 Sources of Statistics on Numbers of Claims

1. Social Security Statistics 1972/.../1983, HMSO.

2. Report of the Ministry of National Insurance for the period 17th November 1944 to 4th July 1949, HMSO, Cmd. 7955.

3. Second Report of the Ministry of National Insurance for the period 5th July 1949 to 31st December 1950, HMSO, Cmd. 8412.

4. Third Report of the Ministry of National Insurance for the year 1951, HMSO, Cmd. 8635.

5. Fourth Report of the Ministry of National Insurance for the year 1952, HMSO, Cmd. 8882.

6. Report of the Ministry of Pensions and National Insurance for the year 1953, HMSO, Cmd. 9159.

7. Report of the Ministry of Pensions and National Insurance for the year 1954, HMSO, Cmd. 9495.

8. Report of the Ministry of Pensions and National Insurance for the year 1955, HMSO, Cmd. 9826.

9. Report of the Ministry of Pensions and National Insurance for the year 1956, HMSO, Cmnd. 229.

10. Report of the Ministry of Pensions and National Insurance for the year 1957, HMSO, Cmnd. 493.

11. Report of the Ministry of Pensions and National Insurance for the year 1958, HMSO, Cmnd. 826.

12. Report of the Ministry of Pensions and National Insurance for the year 1959, HMSO, Cmnd. 1133.

13. Report of the Ministry of Pensions and National Insurance for the year 1960, HMSO, Cmnd. 1458.

14. Report of the Ministry of Pensions and National Insurance for the year 1961, HMSO, Cmnd. 1764.

15. Report of the Ministry of Pensions and National Insurance for the year 1962, HMSO, Cmnd. 2069.

16. Report of the Ministry of Pensions and National Insurance for the year 1963, HMSO, Cmnd. 2392.

17. Report of the Ministry of Pensions and National Insurance for the year 1964, HMSO, Cmnd.2686.

18. Report of the Ministry of Pensions and National Insurance for the year 1965 HMSO, Cmnd. 3046.

19. Report of the Ministry of Social Security for the year 1966, HMSO, Cmnd. 3338.

20. Report of the Ministry of Social Security for the year 1967, HMSO, Cmnd. 3693.

21. Annual Report of the Department of Health and Social Security for the year 1968, HMSO, Cmnd. 4100.

22. Annual Report of the Department of Health and Social Security for the year 1969, HMSO, Cmnd. 4462.

23. Department of Health and Social Security Annual Report 1970, HMSO, Cmnd. 4714.

24. Annual Report of the Department of Health and Social Security for the year 1971, HMSO, Cmnd. 5019.

25. Department of Health and Social Security Annual Report 1972, HMSO, Cmnd. 5352.

26. Department of Health and Social Security Annual Report 1973, HMSO, Cmnd. 5700.

27. Department of Health and Social Security Annual Report 1974, HMSO, Cmnd. 6150.

28. Department of Health and Social Security Annual Report 1975, HMSO, Cmnd. 6565.

29. Department of Health and Social Security Annual Report 1976, HMSO, Cmnd. 6931.

30. Department of Health and Social Security Annual Report 1977, HMSO, Cmnd. 7394.

Appendix 10.1 Notes to Child Benefit and One Parent
Benefit District Level Maps

1. City of London was left blank in all maps due to the
exceptional nature of its population.

2. Peterborough recipients were divided between
Peterborough and Huntingdon districts in proportion to
the estimates of the eligible populations due to an
irregulatity in recipient data for these districts.

3. Sedgefield and Teesdale recipients were combined and
distributed between the two districts in proportion to
the estimates of the eligible populations due to an
irregularity in data for these districts.

4. Data for the districts in the county of Hereford and
Worcestershire appear to be exceptionally confused and
the results of the analysis for this county should be
treated with due caution.

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