Multiple disadvantage in employment

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A quantitative analysis

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Acknowledgements

1 Background and objectives

In 1973 only 2.5 million working-age adults in Britain were dependent on transfers, mostly social security benefits, from outside their immediate family. That is, they themselves were not in employment; and they did not have an employed partner either. The number had soared to 6.9 million by 1993 – one-fifth of the working-age population. In 2000, even after a seven-year period of economic growth and falling unemployment, the number was still 6.2 million – more than double the figure from the early 1970s.[1]

Whichever way you look at it, this is a cause for concern. The combination of fewer working families and more claimants puts a strain on the public purse – with the total expenditure on social security passing the £100 billion threshold for the first time in 2000/01 (DWP, 2002a). At the same time, the increasing number of people living on social security, instead of an earned income, widens inequality and increases poverty – according to official statistics, the number of non-pensioners living below half the national average increased from three million in 1979 to nearly nine million in 1992/93 (DSS, 1994). Whatever your point of view, it would be better if more families could earn their own living, without having to rely mainly on benefits.

The figures quoted in the first paragraph are based on a definition of employment in 'families', but they are closely similar to findings based on 'households' which have been the subject of widespread academic and political interest. Paul Gregg and Jonathan Wadsworth have been especially influential in bringing the issue of 'work polarisation' to public attention (Gregg and Wadsworth, 2000). Improved access to paid employment among married women has increased the number of two-earner households; but that trend has been offset by a substantial rise in the number of no-earner households. This growing divide between the 'work-rich' and the 'work-poor' was a focus for the analysis of the Commission on Social Justice set up under the auspices of the former Labour leader John Smith (IPPR, 1993); and the high proportion of working-age adults in no-earner households was said to be Tony Blair's 'favourite statistic' during the development of the current government's welfare to work policies. Since Conservatives had been concerned about growing levels of dependence on social security throughout their own term of office, these issues can be seen to be of high interest across the political divide – as well as to the families who experience disadvantage in the labour market, the obligation to claim benefits, and poverty.

The questions addressed in this study are not immediately concerned with why there are so many non-employed families in Britain. The number of people in or out of work at any time may be influenced as much by the demand for labour as by the characteristics of potential workers. Our interest is in the distribution of non-employment. Many of the characteristics of non-working families are sufficiently well known. Most striking, because they show up so clearly in benefit statistics, has been the growth

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1   The 1973 figure is grossed up from an analysis of the General Household Survey of that year. The figures for 1993 and 2000 are derived from a similar analysis of the Labour Force Survey; but they are entirely consistent with recent GHS data. As discussed later (Chapter 4), 'in employment' includes students and excludes people working fewer than 16 hours per week.

in the number of lone parents and of disabled people (DWP, 2002b). But other factors such as age, marital status, skill levels, ethnic group and variations in the demand for labour are also associated with non-employment. Each of these specific issues will be reviewed in the following pages, because covering them all within the same analytical framework provides an important basis for comparison between them. But rather than look at the associations with each of these characteristics in isolation, the analysis concentrates on combinations of factors to show the cumulative effects of 'multiple disadvantage'.

The phrase 'multiple disadvantage' has been used most widely as a form of outcome measure in relation to social exclusion and poverty (Berthoud, 1976; Whelan, and others, 2001). It is often applied at the individual level to mean the equivalent of 'multiple deprivation' at the area level, to describe people (or families) who experience several problems – low income, poor housing, no job, poor health, a crime record etc. Analyses of combinations of problems have been based on diverse sources such as the National Child Development Study (e.g. Wedge and Prosser, 1973), the General Household Survey (e.g. Berthoud, 1983) and the British Household Panel Survey (e.g. Burchardt and others, 2002). The immediate object of these analyses of multiple disadvantage has been to identify and describe people with many of the symptoms of poverty or exclusion, who are likely to suffer serious hardship as a result. The implication is that policy should focus on addressing this group's problems. It is often implied that the experience of multiple disadvantage is likely to reduce people's future

life chances (and especially those of their children), but the primary focus is on the problems, rather than on their consequences.

The analysis in this paper focuses instead on 'multiple disadvantage' as a measure of people's risk of labour market exclusion, rather than as an outcome. We know a great deal about the difficulties faced by particular groups in the search for work, whether the groups are defined by age, sex, ethnicity, location or whatever. But the effects of multiplicity itself have not been analysed in any detail. It is quite common for analysts to demonstrate that the risks associated with one particular disadvantage are more or less strong, depending on whether it is combined with another (potentially disadvantaging) characteristic of the individual concerned, such as impairment and age (Berthoud and others, 1993), ethnicity and sex (Modood and others, 1997) or location and other indicators (Buck and Gordon, 1987). Nevertheless, there has been no systematic review of the combined effects of pairs of disadvantages on job prospects. Still less has any analysis aimed to show what the cumulative effects are of adding more and more disadvantaging characteristics to someone's portfolio.

The research is designed to provide a systematic quantitative analysis of the economic prospects of men and women in Britain who face combinations of disadvantages. The analysis will not directly evaluate existing policies, nor point to the processes by which multiply disadvantaged individuals can be supported in their search for work. This is 'strategic' rather than 'applied' research, seeking a greater understanding of non-employment, so

that policy makers and practitioners can take the findings into account. In particular, the research should show:

- whether some groups of men and women are so disadvantaged that their prospects of employment are close to zero; or whether (in contrast) additive or exponential assumptions exaggerate the seriousness of their position

- which combinations of characteristics are especially problematic.

Other contributors to the Rowntree Foundation's research programme have taken a qualitative approach to the identification of multiple disadvantage (Lakey and others, 2001). This paper adopts a quantitative analysis. The chances of employment are calculated for a very large sample of men and women, first taking potentially disadvantaging characteristics one at a time, then looking at the effects of combinations of those characteristics. The technique used to make the calculations is known as 'logistic regression', but it is not necessary to understand how the calculation is done to follow the argument, which is expressed as far as possible in terms which could be understood by a reader with no statistical training. (Some technical points have been included, but are assigned to shaded boxes which the non-technician can skip.) The report is, though, unavoidably numerical, and readers who are seriously uncomfortable with numbers may prefer to read the concluding section (Chapter 11) which gives the answers to the question without going through any of the calculations.[2]

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2   A version of the concluding section is reproduced by the Joseph Rowntree Foundation in its *Findings* series, and is available on the JRF website.

2 Analytical framework

The concept of disadvantage is a flexible one, and researchers and policy makers have adopted a variety of perspectives in identifying characteristics associated with poor job opportunities. A qualitative study of multiply disadvantaged young people undertaken for the Joseph Rowntree Foundation at about the same time focused mainly on personal/behavioural characteristics such as drug abuse, problems with the law and so on (Lakey and others, 2001). The disadvantages defined for the current research have been derived from a broader range of characteristics intended to indicate individuals' position in the social structure. These 'harder' definitions are more appropriate for a quantitative analysis covering the whole population of working age, though of course the precise set of variables selected has been limited to those available in the Labour Force Survey data (see below). The variables used are:

- age
- family structure
- skill level
- impairment
- ethnic group
- labour demand.

It should be noted that this analysis is not trying to explain why the number of non-employed families is at its current level, in the sense of measuring underlying 'causes'. If that was the objective, then the use of a measure of labour demand which is directly based on unemployment statistics could be regarded as circular (in technical terms, 'endogenous'). So could the use of such variables as family structure and skill level, since it can be argued that people's behaviour (dropping out of education, becoming a lone parent) might be influenced by their labour market expectations. These would be serious problems if the aim was to estimate the determinants of the labour supply. Our objective is a simpler one: given a certain set of current characteristics, each of which is known to be associated with people's immediate chances of employment, do those with combinations of disadvantages fare better or worse than would have been expected if we had considered each of their characteristics independently?

So there are two essential steps:

- an initial analysis of the independent associations between each *individual* disadvantage and employment

- a second-round analysis examining the outcome of *combinations*.

There has been some discussion at a theoretical level, from which six hypothetical possibilities might be derived:

1 *Additive*: Each disadvantage reduces an individual's labour market prospects at the margin, independently of each other disadvantage, so that the overall effect is directly cumulative. If we assume for the sake of illustration that each specific disadvantage had the same effect, the additive assumption says that two disadvantages are twice as bad as one. This is probably the assumption that most people make in the absence of any more specific evidence. At a technical level, it is also the assumption built into multivariate regression equations which measure the effects of successive characteristics on the risk of non-employment.

2   *Combinations:* There are some combinations of disadvantage which have especially poor outcomes; there are other combinations which are less serious than might have been expected. Multiplicity itself is not an issue, but it is important to understand which particular combinations require the most urgent intervention.

3   *Independent*: This is the logical extreme version of the 'combinations' hypothesis. A particular combination of disadvantages is a unique experience which does not provide any lessons for other combinations. Thus the prospects of a black disabled woman (for example) are not simply derived from her ethnic group, her impairment or her gender, and direct analysis of this particular group is essential to understand the issues. In principle, this hypothesis implies that every possible cell of the matrix of disadvantages requires independent treatment.

4   *Exponential*: The presence of more than one disadvantage exacerbates the effects of both of them, so that job prospects plunge. The effect of two disadvantages is worse than the combined effects of each. This hypothesis is popular among political activists, who emphasise the poor prospects of client groups with multiple disadvantages, but there has been no general test of its validity.

5   *Logarithmic*: Any particular disadvantage reduces job prospects, but adding a second or a third does not make so much difference, because prospects are poor already. The effect of two disadvantages is not so serious as the combined effects of each.

6   *Class*: The logical extreme of the logarithmic hypothesis – a whole class of people faces disadvantage in the labour market. It is composed of a series of types of people who in one way or another are not white, male, mid-career, middle-class and so on. The fact that an individual belongs to this class on several counts simply confirms their disadvantage, but does not add to it. Two markers of disadvantage are no worse than one.

The basic analytical model will be a logistic regression analysis of individuals' probability of being in a non-earning family. Multivariate analysis is needed to sort out the independent effect of each potential disadvantage, if only because many of them will be associated with each other (age and impairment, for example). The *basic formula* is in the form:

Labour market position = a * age + b * family +… + f * labour demand + constant

This is effectively the 'additive' model of disadvantage referred to above.

The next step will be to consider all the possible *interactions* between types of disadvantage. There are 15 potential pairs of variables

… + g * age * family + h * age * skills +... + z * ethnic group * labour demand

but it is also necessary to consider triplets, quadruplets and so on up to a maximum of six. The 'combinations' theoretical model (see above) would be confirmed if many of these

interaction terms were significant, and operated in different directions. The 'independent' hypothesis would be indicated if the interaction terms were so strong as to eliminate the effects of single disadvantages.

A final stage will be to see whether including the *number* of disadvantages on the right-hand side of the equation makes a difference. The 'exponential' hypothesis would be supported if the probability of non-employment was positively associated with increasing numbers of disadvantages, over and above the effects of the six specific characteristics. The 'logarithmic' hypothesis would be supported if it was negatively associated with increasing numbers of disadvantages. The 'class' effect would be

supported if non-employment was entirely explained by the effects of a single disadvantage, with little contribution from a second or third.

It may help readers to follow the arguments if they know in advance what the conclusions of the analysis will be:

- there is strong evidence in support of the 'additive' hypothesis

- specific 'combinations' also contribute to an explanation of some people's experiences

- there is some slight indication of a 'logarithmic' effect.

3 Labour Force Survey data

The research reported here is based mainly on new analysis of original data from the Labour Force Survey (LFS). Interviews are conducted with all the adults in a sample of more than 60,000 households every year. In any one LFS, there is a substantial sample of individuals facing labour market disadvantage of one kind or another. On the other hand the sample of people experiencing certain rare forms of disadvantage (such as severe impairment, or membership of a particular ethnic group) is by definition small; and, obviously, the number reporting specific *combinations* of disadvantaging circumstances is smaller still. By adding together the results of nine consecutive surveys, it was possible to build up really big samples, including substantial numbers in small minority groups.

The Labour Force Surveys for each year between 1992 and 2000 were included. The LFS is conducted quarterly. Each wave of fieldwork recruits a new sample of households, which is then interviewed for five consecutive quarters. In order to avoid counting the same individuals twice, we used the spring quarter in each year; and rejected households who were being interviewed for the fifth time and had appeared in the data-set for the previous spring. (It was not necessary to exclude wave 5 respondents from the 1992 data, because we did not analyse the survey conducted the previous spring.) This procedure means that every household interviewed between spring 1992 and spring 2000 was included in the analysis, but with no duplication.

Each individual within each sample household was matched with his or her partner and/or children and details of his or her family structure recorded. Children and elderly people were then deleted from the data-set so that only adults aged 17 to 59 were analysed.

- Although many 16-year-olds are entitled to have left school and may be looking for work, many others would not have reached their school-leaving date when interviewed for the LFS during the spring quarter. Sixteen-year-olds were omitted from the analysis because it was very difficult to explain their current activities in terms of the same variables as appeared relevant across the remainder of the age range.

- A very high proportion of 60–64-year-olds are out of employment, as defined for this analysis – far more than could be explained simply as a continuation of the increasing disadvantage associated with age (illustrated in Figure A in Chapter 5). Many of them are 'retired'. The difficulty here is in defining negative outcomes. Women in this age range are more likely to have retired than men; men who have enjoyed professional and managerial careers are more likely to have retired than manual workers; both of these features are probably more associated with privileged pension arrangements than with labour market disadvantage. On the other hand, many *other* men and women in the 60–64 age range say they have 'retired' because they have been unable to find work. The age group has been excluded from the analysis because of the difficulty of coping with these variants within the same analytical framework as those in the main 'working age' range.

The eventual sample drawn from nine years of data, and excluding individuals for whom certain vital items of information were not known, consisted of 546,596 men and women aged 17 to 59. These represented 373,656 'families' from 248,564 'households'.

4 Defining outcomes

The starting point is to identify *individuals* who are 'not in employment'. But the standard simple distinction between workers and non-workers has been adapted in two ways:

- 'In employment' refers to those working at least 16 hours per week (either as an employee or self-employed). Part-time work of less than 16 hours is counted as non-employment. This is based on the administrative rules which stipulate that out-of-work benefits (such as jobseekers' allowance or income support) can be claimed by individuals working up to 15 hours, while in-work tax credits (such as working families' tax credit) can be claimed by those working 16 hours or more.

- 'In employment' also includes individuals who report education as their primary activity.[3] Of course this is not strictly speaking employment, and is not directly a labour market activity. On the other hand, it is can be interpreted as a positive economic activity, investing in human 'capital' whose 'dividend' can be obtained in the form of higher earnings later in life. Much policy discussion nowadays addresses the problems of young people who are 'not in employment, education or training' (NEET), and the definition here is consistent with that approach. Education is, in any case, clearly on the advantaged rather than the disadvantaged side of the socio-economic divide. It is the sons and daughters of better-off families who are most likely to prolong their studies (though there are some signs that members of minority ethnic groups stay on longer at school as a means of combating their disadvantage). Those who do continue in education are likely to have good employment prospects.

Economic positions have been defined for this analysis in terms of a whole family's economic situation, rather than on the basis of each adult's position separately. People are treated as 'in employment' *either* if they themselves are in work (or education); *or* if they are married to (or cohabit with) a partner who is in work (or education). So non-employment is defined as having neither a job, nor a partner with a job. An advantage of this measure is that it is very similar to the social security system's rules on eligibility for income support – single people are entitled to benefit if they are not in work; couples are entitled if neither partner is in work.

The family-level definition of non-employment used here is similar in concept to the 'non-working household' which has been the subject of much research and policy discussion over the past ten years or so (Gregg and Wadsworth, 2000). But a 'household' and a 'family' are not the same thing. A 'family' is defined as either an individual without a partner, or a couple, with or without dependent children. It is the same as a 'benefit unit', and the same as what used to be called a 'tax unit'

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3   The definition of economic activity used in the LFS gives priority to paid work. Respondents would be described as in education only if they were undertaking no paid work at all. So students who have a part-time job (fewer than 16 hours) may have been wrongly classified as non-employed in our analysis.

before independent taxation was introduced. A 'household' may contain more than one 'family' – often a couple with young-adult children who, having passed the age at which they are considered dependent, are now each treated as a family unit in their own right. So a 'non-working family' could live in a 'working household' if one of the other members of the household had a job. There are two advantages of using family rather than household as the basis for measuring non-employment:

- The members of a family are by law and custom much more likely to continue to live together, and to provide each other with mutual support, than members of a household who are not a family unit. Hence the treatment of the family as a unit for benefit purposes. This is a substantive advantage in the analysis.

- A family, consisting of not more than two adults (plus their dependent children), is much easier to classify in terms of composition, education and so on than a

whole household. This is a technical advantage for analysis.

Although the family will be treated as the unit of *account* for defining non-employment, the individual (aged 17 to 59) remains the unit of *analysis*. The equations show what proportion of individuals are in non-employed families – counting non-employed couples as two members of the sample.[4] Moreover four of the six sets of predictor variables – age, skill level, impairment and ethnic group – will still be measured at an individual level, so that we can report what proportion of (e.g.) 45-year-olds with O levels live in non-employed families, even though their partner may not be the same age or have the same educational background. The only predictor variable measured at the family level will be family structure itself. (The sixth predictor variable – labour demand – is defined on the basis of the region and the date of interview, and is identical for individuals and families.)

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4   Tests of statistical significance have taken account of the fact that two members of a couple necessarily have the same family-employment position, and should not be considered independent observations.

5 Disadvantaging characteristics

The overall average proportion of adults in non-working families (as just defined) is 17 per cent. This long section provides a detailed examination of each of the six potentially disadvantaging sets of circumstances, one at a time. It is common for analysts to use a standard set of variables in an equation – age and the square of age; sex, marital status and number of children; and so on – without detailed examination of their relationship with the dependent variable; and proceed direct to consideration of the equation as a whole. On this occasion, it is crucial to the second stage of the analysis (considering *multiple* disadvantage) to get the first stage right; and it is in any case of immediate interest to use the huge LFS samples to define each package of predictor variables in a way which best illustrates its relationship with labour market outcomes. So, for example, we examined the shape of the relationship between age and employment by plotting each year of age, before deciding, first, how to specify 'age' as a variable in the eventual equation, and second, how to define a cut-off point between 'disadvantaged' and other age groups. This detailed analysis has been undertaken for each of the six sets of predictor variables (age through demand for labour) in turn.

As each of the six sets of variables is considered, estimates will be presented of the variation in non-employment rates for the relevant variable, holding all the others constant.[5] This involves using the logistic regression equation to calculate the probability of non-employment for a member of the sample with a 'standard' set of characteristics for each of the five variables not currently under consideration. The standard characteristics are as follows:

Age	45
Family structure	Married couple with no children
Skill level	GCSE qualifications, skilled manual occupation
Impairment	No impairments
Ethnic group	White
Labour demand	Average unemployment rate ($8^1/_2$ per cent)

Note that none of these standard characteristics is disadvantageous, and this is reflected in a fairly low 'standard' non-employment rate of $3^1/_2$ per cent. The aim of the analysis is to identify characteristics associated with much higher levels of disadvantage.

Age

Labour market analysts commonly focus on the experiences of people at opposite ends of the age range – young and old. Teenagers who have left school have exceptionally high rates of unemployment (Coleman and Schofield, 2001; Blanchflower and Freeman, 1996), and this may be associated with the process of occupational search inevitable at the beginning of any career. On the other hand, it is only a specific sub-group of young people (those completing their education with few or no qualifications) who are under-occupied, if education is counted on

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5 All six sets of variables had been analysed in detail before any of them were written up. This means that each detailed analysis uses the same control variables for the other five sets of variables as will be used in the eventual combined analysis – even though the reader does not know at the start how they will be specified. The full equation is presented in Table 4.

the positive side. It can be argued that youth is not a source of disadvantage in its own right so much as a life-stage when the effects of other types of disadvantage become especially serious.

Among men and women at the opposite end of the standard 'working age' range, there is a very wide range of inequality. Many of the best-paid workers are in this age group; but there are also very high rates both of unemployment and of economic inactivity (Campbell, 1999; Disney and others, 1997). People over the age of 50 have high risks of redundancy, and poor prospects of returning to work once out of a job. Age is also associated with some of the other characteristics of interest here:

- Older people have lower levels of qualifications than people who have passed through the education system more recently; on the other hand the earlier generation did not place so much emphasis on the possession of qualifications.

- The risk of ill health and impairment increases with age (Grundy and others, 1999).

- Among ethnic minorities, it is the older people who are most likely to have been direct migrants to this country, and this is sometimes associated with lower fluency in English, lack of western qualifications and so on (Modood and others, 1997).

Figure A gives the estimated non-employment rate for the 'standard' individual,

Figure A Probability of being in a non-earning family, by age
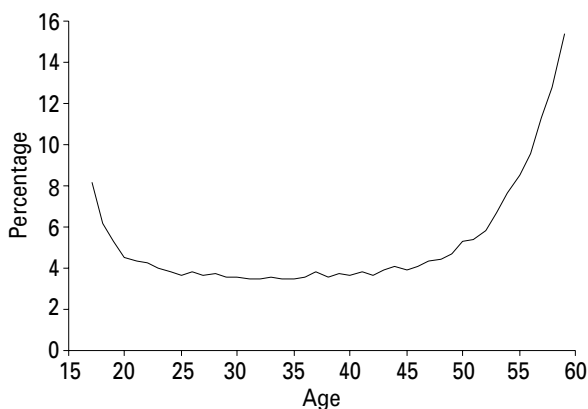
for each year of age between 17 and 59. The findings are derived from a multivariate regression equation in which all the other main effects on employment have also been taken into account, so that it is the independent effect of age which is being considered. The rate starts above average at age 17, but remains steady at about 4 per cent between the early 20s and the late 40s. Then it shoots up to 15 per cent by the age of 59.

It is important to reflect this pattern of variation across ages in the remainder of the analysis. Rather than treat age in years as a single variable, we have split it in three. One variable is measured as actual age between 17 and 20; the second is measured as each year of age between 20 and 49; the third measures age between 49 and 59. This device (known as a 'spline') allows the equation to capture both the flatness of the relationship across the lower-middle age range and the steepness of the relationship in the upper range.[6]

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6   This formula provided a closer fit with the data than the alternative formulation based on age and the square of age.

For each of the six sets of characteristics, we will eventually want to define a group of individuals who are 'disadvantaged' in comparison with others. This will be needed, first, so that we can count the number of disadvantages experienced by each member of the sample, and second, so that we can identify people with particular combinations of disadvantaging characteristics. In the case of age, the boundary line will be set at 50 – those aged 50 to 59 will be considered disadvantaged in this respect, though arguably it is not until the second half of that decade that people are much worse off than average.

Family structure

Patterns of family formation play a major role in the distribution of employment, and changes in both domains have had a strong influence on each other. Although it is common to compare the employment opportunities of women with men, it is within the family that the main gender variation occurs – not so much between women and men as between mothers and fathers, or wives and husbands (Berthoud and Gershuny, 2000). There has been a massive increase since the 1970s in the level of employment among

mothers in couples, but the rise in the number of two-earner families has been offset by (and may have been a cause of) the increasing number of no-earner families.

These trends have been caused in part by changes in family structure – a substantial increase in the number of men and women who live without a partner, and especially in the number of one-parent families (Rowlingson and McKay, 2002). Single people have high, and lone parents have very high, levels of non-employment, and these will figure largely in the following analysis.

There are substantial variations in employment *within* families, depending especially on gender and parenting responsibilities. But, as explained above, the primary interest of the analysis is in variations *between* families. For this purpose, families have been classified in terms of their marital status, and the age of their youngest child. More than half of adults in the age range are married; and more than half of married couples have dependent children (Table 1).[7] Although the number of cohabiting couples is rising, they still account for only a small proportion of the population, and of families with children. In fact there are more lone-parent families than

Table 1 Distribution of adults by family structure (global percentages)

	No dependent children	With dependent children
Married	27	31
Cohabiting	5	3
No partner (never-married, separated, divorced, widowed)	28	5

Note: The table is based on individuals aged 17 to 59, and counts a couple as two people.

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7   Defined, in accordance with social security rules, as aged less than 16, or up to 18 and in full-time education.

cohabiting couples with children.

Very few married couples are without a job – an estimated 3.7 per cent of couples with otherwise standard characteristics. And, although having children, especially young children, has a big effect on whether the couple has two jobs or just one, the proportion of married families with children with no job at all (as defined) remains very small. Figure B (solid line) shows, though, that there is a slight tendency for non-employment among married couples to be higher when there is a young child in the family.

Cohabiting couples without children are neither more nor less likely to have a job than their legally married counterparts. But the minority of parents who live together without marrying after having children have a much higher risk of non-employment, especially if the children are young (dotted line of Figure B). A

cohabiting couple with a baby are twice as likely to be out of work as a married couple with a baby, all other things being equal.

It is well known that lone parents are much less likely to have a job than couples with children. Figure C has had to use a different scale to show that an estimated 80 per cent of unpartnered women with a baby are dependent on transfers. The older the youngest child, the more likely a lone parent is to work.

It is less well known that adults living with neither a partner nor children also have a very high non-employment rate (17 per cent), relative to couples (4 per cent). Perhaps surprisingly, the analysis showed little difference in employment rates between men and women without a partner.[8] (There is, of course, considerable variation between men and women within couples, but that does not appear in our analysis of family-level employment.)

Figure B Probability of being in a non-earning family: couples by marital status and age of youngest child

Figure C Probability of being in a non-earning family: single people compared with couples, by age of youngest child

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8   For non-partnered adults with no children, the estimated non-employment rates are 16.0 per cent for women and 16.9 per cent for men.

Although having children and the age of the youngest child increase the risk of non-employment for all family types, the strength of the effect o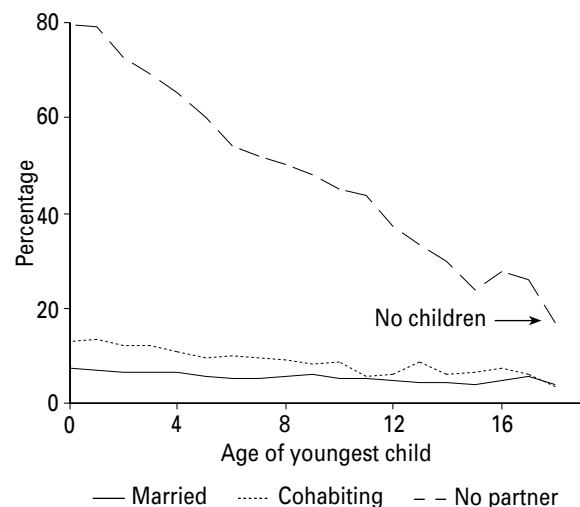f children varies according to the marital status of the parents. This is represented in the main logistic regression models by having separate age-of-youngest-child variables for each marital status. (There is very little difference between never-married single people, separated, divorced and widowed people, once other characteristics are taken into account, and these marital statuses have been combined as one.)

We need a summary definition of family disadvantage to take forward to later analysis. We have treated all individuals without a partner, whether with or without children, as having a high risk of non-employment; but those with and without children are shown separately.

Skill level

The term 'human capital' is used so frequently in the analysis of labour markets that economists have forgotten that it is a metaphor. The combination of education, training and on-the-job experience builds up an individual's stock of skills which pays a 'dividend' in terms of future job prospects and earnings.

Formal educational qualifications (GCSEs, A levels, degrees and so on) are designed to be of general value to potential employers, so they are relatively easy to record and classify in data such as the Labour Force Survey. Much labour market analysis relies entirely on the qualifications people obtained before their working career started, because the common

metric is available. A complication is that the number of people with qualifications at each level has increased steadily over the decades, so that qualifications which were once scarce are now plentiful, and this may affect the relative value of certificates across the age range.

Skills acquired through vocational training and on the job are much more difficult to summarise, but their influence on employment and earnings in the course of a career may be more substantial than original educational qualifications. The analysis here classifies skill level in terms of the occupation of each respondent's current or most recent job. Occupation would not be an appropriate predictor if we were analysing earnings, because the link between an occupational classification and earnings is so intrinsic that the measure of skill could not be treated as independent. The analysis assumes, though, that the relationship between occupation and employment is not circular – one could imagine a situation in which unskilled workers were in demand while there was a surplus of highly skilled workers.

The left-hand side of Table 2 confirms that those with no educational qualifications are almost five times as likely to be in a non-earning family as those with degrees, holding all other factors constant. The right-hand side of the table confirms that those in unskilled manual occupations are more than six times as likely to be non-employed as those in managerial or professional occupations. The measure of skill level in terms of occupation is a substantially more effective predictor of employment than the measure based on educational qualifications.

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Box A Imputing SEG

The LFS definition of socio-economic group is based on the current job of those currently in employment; and the last job of those not in work when they were interviewed. There is a small group of people who either have never had a job, or whose last job was so long ago that their occupation is not recorded. This group – about 11 per cent of the sample of individuals – causes a significant analytical difficulty. About a quarter are students (and therefore count within our definition of 'in employment'); almost all of the remainder are out of employment (many of them either full-time lone parents or disabled people). The problem is that their classification as 'no SEG recorded' is a direct consequence of their employment position, so that a measure of their employment position is meaninglessly circular. Although the problem occurs at the level of the individual, it still has an effect on measures of family-level non-employment.

There is no ultimately satisfactory solution to this problem. Where SEG was known, it proved a much more effective measure of skill level than educational qualifications on their own, so it was not appropriate simply to omit the variable. Omitting respondents whose SEG was unknown would have biased all the other estimates. Putting in a dummy variable for 'SEG unknown' was technically appropriate, but uninterpretable when we tried to analyse multiple disadvantage.

We therefore 'imputed' an SEG for each unknown case. A multivariate (ordered logit) analysis was used to 'predict' SEGs among the known cases, on the basis of the other variables included in the analysis (age, family etc.). The coefficients were then used to allocate probable SEGs to the unknown cases.

This difficulty obviously has some effect on the accuracy of the estimates of the association between skill level and family non-employment. On the other hand, we have established that the overall conclusions about the relative influence of skill level in comparison with other factors, or the contribution of low skills to multiple disadvantage, are not sensitive to the choice of solution adopted.

Table 2 Estimated probability of non-employment, by education and socio-economic group (logistic regression estimates)

	Educational qualifications			*Socio-economic group*	
	On its own (%)	Controlling for SEG (%)		On its own (%)	Controlling for education (%)
Degree	1.9	2.8	Management/professional	2.1	2.1
Further qualifications	2.9	3.3	Other non-manual	3.8	3.4
O level/GCSE	3.5	3.9	Skilled manual	4.7	3.9
Lesser qualifications	4.9	4.8	Semi-skilled	7.8	5.6
None	8.8	7.0	Unskilled	13.4	8.5

On each side of Table 2, the first column shows the relationship between non-employment and the variable under consideration, if that is the only measure of skill.

The second column on each side shows that each variable (education and SEG) retains a relationship with non-employment, after the other has been added to the analysis; so the best measure of skill levels would be based on both factors.

The full regression equations take account of both education and SEG, using the full fivefold classification in each case. The simple summary definition of skills disadvantage is as follows: unskilled occupation, whatever the level of qualifications, *or* semi-skilled occupation, with qualifications less than O level/GCSE.

Impairment

The rise in the number of people claiming incapacity benefits between the 1970s and 1990 has been one of the most striking, and among the most hotly debated, features of the social security system (Berthoud, 1998). There has been some evidence of an increase over that time in the number of people of working age with impairments, but it is also clear that the proportion of people with impairments out of work has increased even faster. It has been argued that the availability of benefits has contributed to this increase, and especially to a form of 'early retirement' among older people with poor job prospects; but alternative explanations have been put forward in terms of employers' increasingly selective and discriminatory recruitment policies.

Specialised studies have provided good measures of the relationship between impairment and employment in Britain (Berthoud and others, 1993; Grundy and others, 1999; Burchardt, 2000). As one would have expected, employment prospects are strongly related to the severity of people's impairments. The simple distinction between 'disabled' and 'not disabled' provided by the Labour Force Survey (see Box B) lacks this important information.

Much of the theoretical and political debate in this field requires a distinction to be made between a 'medical' and a 'social' model of disability (Oliver, 1990). It is not necessary to discuss our own view of this issue in detail here (see Berthoud and others, 1993), but the choice of terminology has been designed to take account of the important distinction between the physical or mental condition of the individual and the social/economic position which may be associated with that condition. We have used the words 'impaired' and 'impairment' to refer to a physical or mental condition; we have used the words 'disabled' and 'disability' to refer to the economic position of people who are unable to work because of their impairment. This specific allocation of terms would not be appropriate in wider analysis, but in this specific analysis of labour market disadvantage it usefully allows a distinction to be made: not all 'impaired' people are 'disabled', and disability may be mediated by such factors as age, family position and labour demand, as well as being directly associated with the severity of an individual's condition.

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Box B LFS questions on impairment

Three different variables and combinations were used at various stages over the nine LFS years under analysis:

Year	Variables	Percent impaired	Risk of non-employment (%)
1992–95	Working restricted by health or disability	12.6	63
1996	Working restricted by health or disability *and* Health problems last more than a year	11.8	68
1997–2000	Health problems affect kind of work you can do *and* Health problems last more than a year	14.0	65

Note: Analysis refers to 17–59-year-olds. Non-employment defined here at individual level.

The impairment questions were not asked in the spring quarters of 1993, 1994 and 1995, but we were able to make use of the question sequence asked of the same individuals in the previous or subsequent quarter. In these years, therefore, the assumption is that people's impairments were unchanged over three months. Eight per cent of the sample in those three years, representing 3 per cent of the whole sample, could not be matched with a winter or summer quarter, and their impairment status is not known. These cases were not included in the analysis.

The simple LFS measure of impairment (see Box B) records 12.8 per cent of adults (aged 17 to 59) as impaired. This compares with 11.8 per cent of the same age group in the DWP's disability survey (Grundy and others, 1999, Table 2.1), using the much more detailed assessment of impairments; so 'impaired' in LFS terms seems to include slightly more people, with presumably less serious impairments, than the specialist survey. Another LFS question allows us, though, to get some indication of higher grades of severity: respondents were asked to list the conditions they suffered from.[9] A larger number of conditions does not necessarily mean a more serious level of

impairments, but the two measures are likely to be correlated. Only 7 per cent of the LFS sample report more than one condition. Just 1.4 per cent report five or more conditions, and are clearly severely impaired. Whereas 29 per cent of impaired people with a single condition report their personal economic activity as 'disabled', this rises to 80 per cent of those with five or more.

The multivariate analysis showed the combination of impairment and number of conditions provided a regular relationship with employment, even when the predictor is measured for *individuals* and the outcome at the *family* level. Five or more conditions multiplied

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9 'Conditions' refer to the medical cause of impairments (e.g. heart disease) rather than to the impairments themselves (e.g. inability to run).

the chances of family non-employment more than eightfold, compared with a non-impaired individual (Figure D).

The relationship is included in the multivariate equations by distinguishing impaired people from non-impaired people, and then by adding in a factor for the number of conditions reported. For summarising purposes, anyone reporting impairment was considered disadvantaged in this respect.

Figure D Estimated probability of non-employment, by impairment and number of conditions
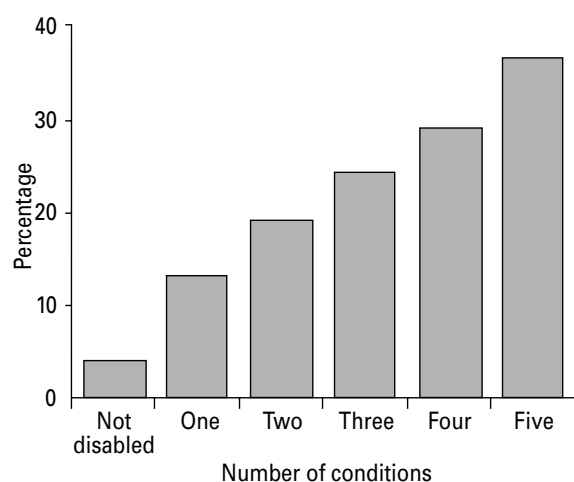
Ethnic group

It has been established for many years that members of minority ethnic groups face serious labour market disadvantages. But it has become clear over the past decade that there is significant diversity between minority groups, so that some remain disadvantaged while others are no worse off than white people (Owen and others, 2000; Modood and others, 1997). It is clear that 'ethnic minority' is not appropriate as an all-embracing category in labour market analysis.

Some ethnic variations in employment can be explained in terms of such characteristics as age on migration, knowledge of English and educational achievement (Berthoud, 1999). Disadvantages which remain after such 'legitimate' explanations have been taken into account are often attributed to discrimination, but the discrimination itself is not easily demonstrated, and the term 'ethnic penalty' has been used as a more open-ended term to describe the shortfall in some minorities' job prospect (Heath and Macmahon, 1995).

Only 6 per cent of the adults in the LFS sample were members of minority ethnic

Table 3 Distribution by ethnic group and estimated family non-employment rates (logistic regression estimates)

	Percentage of sample in this group	Estimated non-employment rate (%)
White	94.4	4.0
Caribbean	1.0	4.4
African	0.5	5.6
Indian	1.6	5.0
Pakistani	0.9	9.5
Bangladeshi	0.3	9.0
Chinese	0.3	4.1
Other minorities	1.1	6.2

groups. Even so, they divided into three distinct categories. Chinese people are not significantly different from their white equivalents. Caribbeans, Africans, Indians and a diverse group of people with 'other' ethnic origins are slightly worse off than whites. Pakistanis and Bangladeshis, though, have much higher non-employment rates than the white population, and can be considered seriously disadvantaged on this measure.

For more detailed analysis, ethnic minorities are classified in five groups: Caribbeans and Africans are treated together (and sometimes labelled 'black'); Pakistanis and Bangladeshis are also combined. Indians, Chinese and 'other' ethnic minorities remain separate, as they could not be usefully be combined. The simple measure of ethnic disadvantage still shows Caribbean/African, Indian and Pakistani/Bangladeshi families separately.

Demand for labour

One of the factors which would be expected to affect a family's chances of getting and keeping a job is the demand for labour. People are disadvantaged if they live in an area, or at a time, of high unemployment (Layard, 1999; Jackman and Savouri, 1999).

We have used the LFS data to calculate the unemployment rate in each region, at the time of each annual survey. This calculation is based strictly on 'unemployment', rather than the broader definition of 'non-employment' being used for the main analysis. The 'unemployment'

rate is defined as the number of people out of work *and looking for work*, divided by the number of people either looking for work or in work. (Less than half the members of non-employed families in the sample are also unemployed; the others are mainly disabled people or full-time mothers.) Across all the years covered by the analysis, the average unemployment rate ranged from 6.1 per cent (East Anglia) to 13.4 per cent (inner London).[10] Across all regions, the average unemployment rate peaked at 10.2 per cent in 1993, and fell continuously to 5.6 per cent in 2000. The full range of unemployment rates between specific regions and specific years was from 3.3 per cent to 17.3 per cent.

It can be argued that the formal unemployment rate used for official statistics seriously undercounts the true number of people who are denied work by scarcity of jobs (Beatty and others, 1997). That is accepted, and is one of the issues underlying the use of demand for labour in this general model of non-employment. But the requirement here is for an appropriate indicator of variations in labour demand between regions and between years, and the unemployment rate is a more sensitive indicator of such variations than broader measures. We tested the effect of adding in statistics on vacancies, but this did not improve the fit of the analytical model.

Another potential criticism is that using statistics on unemployment is logically circular, inevitably predicting the level of non-employment. But this analysis is not trying to

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10 'Regions' were defined for this analysis as the 12 standard regions of the UK, but with conurbations treated as distinct from the regions of which they are part. The North West, for example, was divided into Greater Manchester, Merseyside and the rest of the NW. The unemployment rates would no doubt explain a little more of the variance if it could be measured at a finer grain (e.g. counties or districts) but the LFS data were not coded to county level before 1996.

explain levels of non-employment; it is trying to explain why some people are in non-employed families and others are not. In that context, it seems legitimate to say that someone has a high chance of non-employment 'because' he or she lives on Tyneside, or 'because' he or she was observed at the height of a recession. We want to know how this aspect of the economic environment combines with other, personal, variables, in explaining the distribution of job chances.

The columns in Figure E show the full distribution of the ambient unemployment rate, plotted against the right-hand scale. Most members of the sample lived in regions where the unemployment rate in the relevant year was between 4 per cent and 9 per cent. But there was a tail of high-unemployment regions, up to 17 per cent, and the overall average was 8.5 per cent.

One would expect the proportion of people who are not working for reasons other than 'unemployment' (e.g. looking after children, disabled, retired) to be influenced by the availability of jobs. The solid line in Figure E shows a very regular relationship between 'regional unemployment' and 'family non-

employment' (plotted against the left-hand scale); but it is not as strong as might have been expected. As the unemployment rate trebles from 4 to 12 per cent, the estimated non-employment rate increases by less than double, from 3.1 per cent to 5.3 per cent.

For the main equations, the ambient unemployment rate can be treated as a linear continuous variable. 'Disadvantage' is defined in this context as living in a time/region in the top fifth of the distribution of unemployment rates – above 9.5 per cent.

Figure E Distribution of unemployment rates by region/year (columns, RH scale), and relationship with estimated family non-employment rate (solid line, LH scale)
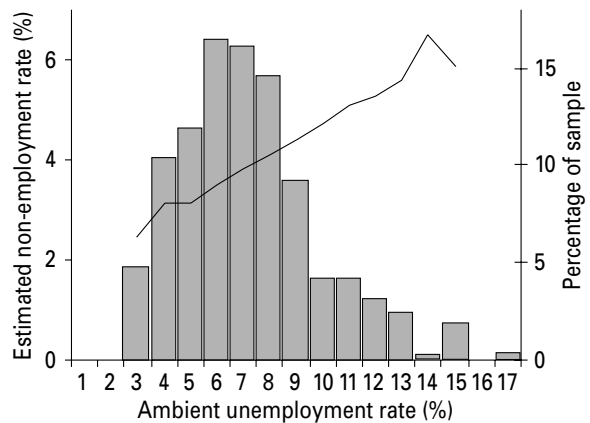
6 Adding disadvantages

Having examined the effect of each potential source of disadvantage, one at a time, it is now possible to consider the overall pattern of influences. The left-hand side of Table 4 shows the additive logistic regression equation on which the previous narrative has been based.[11] All of the relationships identified are highly significant, in the statistical sense of being unlikely to have occurred by chance in a sample of this size. The measure of fit (pseudo R^2 = 27.6%) is high for analyses based on data about individuals. If we use the equation to 'predict' which individuals would be non-employed, we would get it right 55 per cent of the time – three times as often as if we had to guess without the benefit of the equation. So the model is quite successful at distinguishing the characteristics of those in and out of employment. This is especially true when we take account of the fact that some of the main sources of variation in individuals' economic activities (age above 60, married women with children) have not been measured by the model.

So, following the variable-by-variable analysis in the previous section, the best prediction of the risk of living on a non-earning family is provided by assuming that:

- *Age*: The risk declines between 17 and 20, remains more or less steady between 20 and 49, and increases from 49 to 59.

- *Family structure*: Taking a couple with no children as the base case, the risk is higher for individuals without a partner, and higher for people with children,

depending on the age of the children and the marital status of the parent.

- *Skill level*: Taking an individual with O level/GCSEs and in a skilled manual job as the base case, the risk is consistently lower for people with better qualifications and skills, and higher for people with worse qualifications.

- *Impairment*: Any impairment increases the risk of non-employment; multiple conditions increase the risk further.

- *Ethnic group*: Caribbeans, Africans, Indians and 'other' minorities have an increased risk; Pakistanis and Bangladeshis have a seriously increased risk; Chinese are no different from white people.

- *Demand for labour*: The higher the regional unemployment rate at the time, the greater the risk of non-employment.

The relative contribution of the six sets of variables to explaining why one person is a member of a non-earning family and another is not is best indicated by the 'standardised group coefficients' in the second column of Table 4. These take account of both the scale of the effect on individuals with particular characteristics and the number of individuals with such characteristics (see Box C). It is clear that family structure is the most important influence – primarily the high non-employment rates of individuals living without a partner, and especially of lone parents. Lack of marketable

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11 The regression coefficients shown in Table 4 are not directly interpretable in terms of the regression estimates shown in each of the preceding series of tables. The latter are calculated by summing the coefficients for a standard case, and converting that to a predicted probability using the formula: P=1/(1+exp(-(B))) where B is the sum of the coefficients

Table 4 Additive logistic regression analysis of family non-employment (logistic regression coefficients)

Full additive specification	Specific coefficients	Standardised group coefficients	*Itemised disadvantages*	Increased risk (%)
Age (spline)		**0.36**		
Per year between 17 and 20	−0.26		Over 50	+7
Per year between 20 and 49	0.00			
Per year between 49 and 59	0.14			
Family structure		**0.85**		
Has a partner	0.00		No partner, no kids	+13
No partner	1.47		Lone parent	+45
Age of child* (if married)	0.03			
Age of child* (if cohabiting)	0.09			
Age of child* (if no partner)	0.16			
Skill level		**0.63**		
Degree	0.63		Low qualifications	
A level etc	0.21		and skills	+13
GCSE/O level	0.00			
Lower qualifications	−0.17			
No qualifications	−0.34			
Management or professional	−0.63			
Other non-manual	−0.15			
Skilled manual	0.00			
Semi-skilled	0.39			
Unskilled	0.84			
Impairment		**0.60**		
Any impairment	1.04		Any impairment	+20
For each condition	0.32			
Ethnic group		**0.11**		
White	0.00		Caribbean/African	+5
Caribbean/African	0.18		Indian	+5
Indian	0.24		Pakistani/Bangladeshi	+11
Pakistani/Bangladeshi	0.90		Other minority	+6
Chinese	0.01			
Other minority group	0.46			
Demand for labour		**0.21**		
For each percentage point of			High unemployment	
the unemployment rate	0.08		(above 9.5%)	+6
Constant	1.35	**−2.09**	None of these	4%
Pseudo R²	27.6%	27.6%	Pseudo R²	23.6%

* Age of child is calibrated per year by which the youngest child is aged less than 18.
Note: All coefficients are significant, except Chinese.

Box C Standardised group regression coefficients

As discussed in the previous section, each of the predictor variables in the multivariate analysis is based on a series of detailed measures. Age, for example, is defined in three elements – age up to 20, between 20 and 49, and 49 to 59 – in order to capture the different strengths of the link between age and employment at different stages. Family structure requires four sub-variables, skill level as many as eight.

Standardised group coefficients (SGCs) have been developed to provide a single estimate of the strength of the relationship between each *group* of variables and the outcome measure, which is comparable (a) between variable-groups within any equation, and (b) between the same variable-group across equations. They are calculated in four stages:

1. A full logistic regression equation is run, with all the detailed sub-variables in each variable-group.
2. A score is calculated for each respondent showing his or her position on each variable-group. This is the sum of his or her values on each sub-variable, multiplied by the coefficient on that sub-variable from the full equation.

   e.g. agescore = age1720*coeff(age1720)

                  + age2049*coeff(age2049)

                  + age4959*coeff(age4959)

3. The scores on each variable-group are then standardised (Z-scores) so that all six have the same mean (0) and the same standard deviation (1).
4. The logistic regression equation is then rerun, using the standardised values for each variable-group instead of the detailed sub-variables. Note that this equation produces exactly the same measures of fit (log-likelihood, pseudo R^2) as the original detailed equation. SGCs are the coefficients derived from this second equation. They can be interpreted as the increase in the logistic probability function associated with one standard deviation increase in the distribution of the grouped variable.

skills is the second most important set of influences, followed closely by impairment. Age, the level of demand in the labour market and ethnic group are all relevant, but less important than these three.

On the right-hand side of Table 4, each of the complex variables from the left-hand side has been simplified to a minimum number of categories. So, rather than calculate the effect of each year of age across the complete range, the basic analysis simply identifies those over 50 as 'disadvantaged'. This simplification is necessary so that we can count how many disadvantages

each member of the sample faces, in the analysis of 'multiple disadvantage'. The figures can be interpreted in terms of the increased percentage risk associated with each disadvantage, compared with individuals who have none of them. So, if people with no disadvantages have only a 4 per cent risk of non-employment (penultimate figure in the table) those over 50 – but with no other disadvantages – have a (4% + 7% =) 11% risk. Lone parents (with no other disadvantages) have a risk of (4% + 45% =) 49%. And so on.

It is striking that the new logistic regression equation based just on these simple definitions is still quite effective at predicting non-employment – the pseudo R^2 of 23.6 per cent is not very much less than the 27.6 per cent obtained by the more detailed specification.

We are now in a position to approach the central questions for the research. The calculation of risk derived from the logistic regression equations in Table 4 is 'additive' – that is, each of the six characteristics is assumed to have an independent effect on people's overall risk. What happens when more than one disadvantage occurs in combination? The following sections address this in three ways:

- looking at particular *combinations* of disadvantages, taken in pairs, triplets and so on

- counting the *number* of disadvantages experienced by each individual

- considering the experience of people with a high *cumulative* risk.

7 Combinations of disadvantage

The primary interest here is in the effect of particular groups of potentially disadvantaging characteristics, rather than in the number of such characteristics. Given that (for example) being over 50 and living alone with neither partner nor children are both disadvantaging characteristics, what happens to those who are over 50 *and* live alone? Do those two items of information provide an adequate explanation of people's chances of non-employment? Or does the combination itself increase or decrease their risk?

An initial issue is the extent to which such combinations occur. An overall picture of simple (paired) combinations can be provided by cross-analysing each of the itemised measures of disadvantage by all the others. The result, in Table 5, shows that there are indeed some combinations which occur *more frequently* than would be expected if the disadvantages were mutually independent. In particular:

- People with impairments have relatively low skill levels.

- A high proportion of Caribbeans and Africans are either lone parents or live in high unemployment areas.

- Low levels of skill are common among Pakistanis and Bangladeshis.

On the other hand, there are some types of disadvantage which are rather *unlikely* to be found in combination. In particular:

- Over 50s and Indians are unlikely to be lone parents.

While certain combinations of disadvantage are more common than would be expected by chance, it is difficult to conclude that disadvantages are systematically related to each other. Look at the upwards and downwards pointing arrows in Table 5, which indicate the strength and direction of the associations. Out of a possible 152 arrows, there are 24 up and 16 down. The pattern of combinations does not suggest that having one particular disadvantage increases an individual's risk of having all the others.

The logistic regression model was extended to examine the effects of combinations by adding a further sequence of variables (known technically as 'interaction terms') representing each possible combination of disadvantages. That is, for example, in addition to the three variables covering age, and the eight covering skill level (see Table 4), another element was included to represent individuals who were *both* over 50 *and* lacked skills. The results can be interpreted as showing how much more (or less) likely people are to be in a non-earning family if they experience both of these disadvantages together than might have been expected simply from adding together the effects of each of the two factors.

Analysing pairs of disadvantages is obviously more complex than looking at each characteristic in isolation. The problem is compounded by the fact that as well as pairs, there are possible triplets (e.g. over 50, no partner or kids, low qualifications and skills), and quadruplets and other possible combinations up to the maximum of six. An analysis of all the possibilities showed, though, that combinations of four or more variables did not add to the accuracy with which the model could predict outcomes (see Box D). But 20 of the 38 possible pairs and 8 of the 68 possible triplets were significant. It would be laborious to consider each of these in turn, but the eight most important combinations are illustrated in Table 8.

Table 5 Proportion of individuals with each disadvantage who also had each other disadvantage (column percentages)

	Average	Over 50	No partner, no kids	Lone parent	Low qualifications and skills	Impaired	Black	Indian	Pakistani/ Bangladeshi	Other minority	High unemploy- ment
Over 50	20	×	13↓	4.3↓↓		38↑	13↓		11↓	10↓	
No partner, no kids	28	18↓	×	×							
Lone parent	4.9	1.0↓↓	×	×	9.5↑		17↑↑	2.4↓↓			
Low quals and skills	17	34↑		34↑	×	36↑↑			45↑↑		
Impaired	13	24↑			27↑↑	×					
Black	1.5	0.9↓		5.2↑↑			×	×	×	×	3.4↑↑
Indian	1.6			0.8↓↓			×	×	×	×	
Pakistani/Bangladeshi	1.2	0.6↓			3.0↑↑		×	×	×	×	1.9↑
Other minority	1.1	0.6↓					×	×	×	×	1.8↑
High unemployment	21						48↑↑		34↑	35↑	×

The table reads as follows (from the top left, reading left to right): 20 per cent of all individuals aged 17 to 59 are over 50; only 13 per cent of individuals with no partner and no kids are over 50; just 4.3 per cent of lone parents are over 50; as many as 38 per cent of impaired people are over 50; and so on. ↑↑ = more than 2 times average; ↑ = more than 1 1/2 times average; ↓ = less than 2/3 average; ↓↓ = less than 1/2 times average. Cells where the proportion was between 2/3 and 1 1/2 times the average left blank.

Box D Adding interaction terms to the logistic regression model

The logistic regression equation can take account of combinations of disadvantages by adding extra sets of predictor variables representing individuals who report both of two disadvantages, all of three, and so on up to all six together. With a simple matrix of six disadvantaging factors, there would be 64 (2^6) possible combinations (1 x 0, 6 x 1, 15 x 2, 20 x 3, 15 x 4, 6 x 5 and 1 x 6). But the need to treat single people as a separate family type from lone parents, and to distinguish between four distinct disadvantaged minority groups, gave us ten disadvantaged categories, and a more complex set of possible combinations. In practice, it was not possible to distinguish between minority ethnic groups in the analysis of higher-order interaction terms because many of the theoretical cells were empty. The first row of Table 6 shows the number of combinations used in the analysis of interactions, where all possible combinations of the ten characteristics were tabulated up to the third level of interactions, but minority ethnic groups were pooled for levels four, five and six.

A sequence of equations was run: the full additive model with no interactions; the same plus pairs of disadvantages; the same with pairs and triplets; and so on up to the complete sequence of between one and six items. The fit of the equation (pseudo R^2) increased very slightly when second-order interactions were included, and even more slightly when the third-order interactions were added as well. There were no further significant improvements in the model when combinations of four or more disadvantages were considered.

In order to identify the specific combinations of interest, second- and third-order interaction terms were retained if they remained significant at the 1 per cent level after all the non-significant interactions had been removed. This yielded the 20 pairs and eight triplets recorded in Table 6. The eight most important combinations illustrated in Table 7 were selected if their regression coefficient was 0.4 or higher, *and* the combination represented at least 0.05 per cent of the sample.

Table 6 Analysis of interaction terms

Number of disadvantages (n)	1	2	3	4	5	6
Number of possible combinations	na	38	68	35	11	2
Pseudo R^2 if 1–n interactions allowed	27.6	27.9	28.0	28.0	28.0	28.0
Number of significant interactions at this level in final model	na	20	8	0	0	0

Some of the paired combinations turned out to have important consequences.

- Table 5 showed that many lone parents lacked qualifications and skills. It is now clear that lack of skills is especially disadvantageous for this group.

On the other hand, there are some pairs of disadvantage which have *less* serious effects than might have been expected on the basis of each element separately:

- Older Caribbeans and Africans are significantly less likely to lack employment than would have been expected on the basis of the combination of their age and ethnic group.

- Single Pakistanis and Bangladeshis without dependants have an unexpectedly low level of non-employment.

- It has already been shown that Caribbean, African and 'other' minority communities include a higher-than-average number of one-parent families (Table 5). It turns out, though, that black lone parents are much less likely to be out of work than their white equivalents. That is not to say, though, that black lone parents are not disadvantaged – their non-employment rate is still very high at 55 per cent (68 per cent minus 13 per cent).

Table 7 Effect of taking account of specific combinations of disadvantages in the prediction of non-employment (logistic regression estimates)

			Proportion predicted if disadvantages are independent (%)	Change in prediction, with interaction terms (%)
Pairs				
Over 50	Black		42	−9
No partner, no kids	Pak/Bang		46	−10
Lone parent	Low quals and skills		79	5
Lone parent	Black		68	−13
Lone parent	Other minority		71	−6
Triplets				
Over 50	No partner no kids	Impaired	78	4
Over 50	Low quals and skills	Pak/Bang	71	11
No partner, no kids	Low quals and skills	Pak/Bang	71	−15

The table should be interpreted as follows. Respondents who are both over 50 and black would be expected to have a 42 per cent chance of being in a non-employed family if the additive model using independent characteristics was used. When interaction terms were added to the model, the predicted risk for people with this pair of disadvantages reduced by 9 percentage points (i.e. to 33 per cent).

Note: See Box D for more detailed explanation.

Certain combinations of *three* disadvantages also have particular effects:

- Among older people, two sub-groups – single people with impairments and Pakistanis and Bangladeshis with low skills – have exceptionally high levels of risk, 82 per cent in both cases.

- In contrast, single Pakistanis and Bangladeshis with low skills were less disadvantaged than might have been expected.

As well as looking at specific combinations of characteristics, we are also interested in the more general issue: do combinations tend on the whole to exacerbate or to reduce the effects of disadvantages experienced one at a time? Combinations of four or more do not add to our understanding of why one person is non-employed and another is not (Box D). The 20 significant pairs and eight triplets raise the measure of fit of the equation from 27.6 per cent to 28.0 per cent. Across the sample as a whole, the correlation between the risk estimated by the additive model and the risk estimated by the interactive model is 0.992 (out of a maximum of 1.000). The analysis of combinations undoubtedly helps, but it does not make much difference.[12]

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12 Analysis of combinations makes more difference for some specific groups than for others. The correlation between the additive and the interactive predictions falls to 0.955 for Caribbeans and Africans and to 0.948 for Pakistanis and Bangladeshis. As illustrated in Table 7, these minority groups exhibit patterns distinct from those observed in the population as a whole; some combinations increase their disadvantage, but others reduce it.

8 Number of disadvantages

The previous section concentrated on specific combinations of characteristics which might have increased or decreased people's risk of non-employment, compared with the simple additive assumption. Although some such combinations were identified, an overall conclusion was that particular pairs and triplets of disadvantages were not especially important in helping distinguish between high and low levels of risk; and that combinations of four or more made no contribution. We now ask whether the *number* of disadvantages reported made any difference, regardless of what particular basket of items was involved. The first column of Table 8 shows that the majority of the population under study (17–59-year-olds) falls into at least one of the potentially disadvantaging categories identified in the previous pages. One disadvantage is the single most common position, and two problems are not uncommon. But less than 10 per cent of the sample face three problems or more, declining to a mere 0.02 per cent (2 in 10,000) with all six – older, unpartnered, unskilled, impaired members of minority ethnic groups living in areas of high unemployment. This 0.02 per cent (just 106 members of our huge sample) may

seem small, but actually it represents 8,000 adults in the United Kingdom.

Does multiplicity matter? The second column of Table 8 shows what proportion of individuals with any given number of disadvantages are in non-employed families, as defined throughout this analysis. Not surprisingly, the greater the number of disadvantages, the greater the level of non-employment – from just 3 per cent of individuals with no problem, up to an appalling 91 per cent of those with six problems. The third column of the table shows the risk of non-employment for the same people, derived from the additive logistic regression equation already presented. The actual risks are almost identical to the predicted risks. The additive model pitches the prediction of non-employment just slightly too high for those with three or more disadvantages; but this bias is corrected by the interactive model. This strongly suggests that multiplicity, itself, has little effect, though there are some signs that very large numbers of elements might be very slightly less serious than might otherwise have been expected.

The actual rate of non-employment (second column of Table 8) is plotted against the number

Table 8 Counting disadvantages

	Proportion of all individuals (column percentages)	Proportion not in employment (row percentages)	Risk predicted by additive model (%)	Risk predicted by interactive model (%)
No disadvantage	31	3	4	4
One	40	13	13	13
Two	20	28	28	28
Three	7	52	53	53
Four	2	74	75	74
Five	0.3	87	88	86
Six disadvantages	0.02	91	94	91

of disadvantages in Figure F (solid line). If the curve had started flat and then steepened, that would have supported the 'exponential' hypothesis outlined in Chapter 2; if it had started steep and then flattened, the logarithmic hypothesis would have been indicated. In fact the curve is slightly S-shaped – starting flat, then steepening, then flattening again. It is

difficult to use this S-shape to support any of the theories discussed at the beginning of this paper. Arguably, it is a straight line which is forced to bend at either end because the probability of non-employment cannot be less than zero nor greater than 100 per cent.

The risk of non-employment is affected by which actual disadvantages each individual faces, as well as by the number of them. The dotted line in Figure F illustrates what happens if we use the simple additive model to predict outcomes, but allow the result to vary according to the number of items contributing to the total (see Box E). Given that some disadvantages (e.g. lone parenthood) have a big effect, while others (e.g. black) have a small one (see Table 4), it would be possible to reach a predicted risk of (say) 17 per cent with one major disadvantage, two middle-sized ones or three minor ones. The curve suggests that having two small disadvantages has a slightly better outcome than having one bigger one, three slightly better still, and so on. But the difference in outcome attributable to the count of items is very small in relation to other influences on non-employment.

Figure F Probability of non-employment, by number of disadvantages
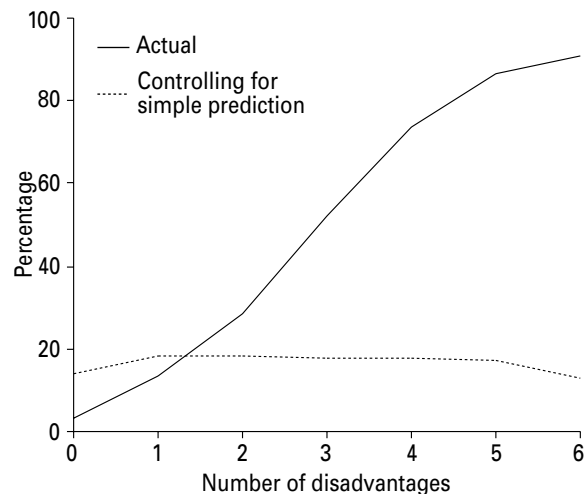
See Box E for explanation of 'controlled' estimates.

Box E Analysing the predicted outcome by number of disadvantages

The dotted line in Figure F is calculated as follows:

- The simple additive model of non-employment was run.
- The sum of the coefficients was calculated for each respondent. Rerunning the model using this sum of coefficients as the sole predictor would produce exactly the same set of predictions as the full model.
- The model was then run using the sum of coefficients just described, and a series of dummy variables representing each possible number of disadvantages. The fit (pseudo R^2) improved very slightly (from 27.6% to 27.8%).
- Estimated probabilities were calculated for each number of disadvantages, using as a standard case a person whose sum of coefficients would have produced an estimate of 17 per cent (the sample average). It is these estimated probabilities which are shown in Figure F.

9 Cumulative risk

Another line on the same question is to consider the cumulative risk rather than simply the number of disadvantages. The logistic regression equation (with interactions) can be used to calculate the predicted risk of non-employment for each member of the sample. Once each respondent's risk has been calculated, it is possible to compare high-risk groups with low-risk groups. Figure G is based on grouping the entire sample into 100 equal groups (centiles), with the 1 per cent of the sample with the lowest predicted risk on the left, and the 1 per cent with the highest risk on the right. The graph clearly shows that the actual proportion of people in non-earning families is almost exactly the same as the predicted risk, at all levels of risk. If the non-employment had been exacerbated at high levels of cumulative risk, there would have been an upwards bend in the curve; if problems had been less serious than expected at high levels of risk, there would have been a flattening of the curve.[13] The astonishingly straight line in Figure G suggests, again, that multiplicity is not an issue.

The worst-off 1 per cent of individuals have both a predicted and an actual risk of non-employment as high as 95 per cent. The fact that both estimates are identical suggests that the additive model with interaction terms provides an adequate summary of the distribution of risk; but that abstract conclusion is of little interest to the individuals concerned: hardly any of them have an earned income, and most of them have no realistic prospect of one.

Figure G Actual compared with predicted risk of family non-employment: centiles of the distribution of risk
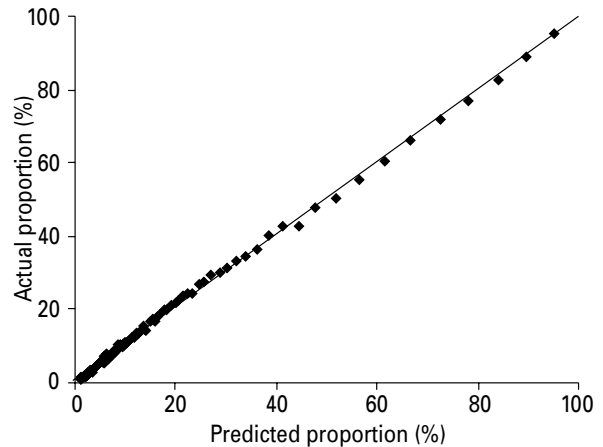

Rather than focus on multiplicity, it is useful to concentrate instead on variations in levels of risk, as calculated by the logistic regression model. Two key statistics about the distribution of family non-employment were mentioned almost in passing much earlier in this paper. One (page 11) was that the overall proportion of individuals in non-employed families is 17 per cent. The other (page 24) was that the predicted risk for a 'standard' individual (aged 45, in a partnership with no children, middle-level skills, no impairments, white, living in an area of average unemployment) is 4 per cent. This gap between the average and a typical value is characteristic of a highly skewed distribution – illustrated in Figure H. Although hardly anyone has a predicted risk below 1 per cent, the most common estimate is just 2 per cent. Half of all individuals face a risk of less than 8 per cent.

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13   In fact there is a slight undulation in the straight line. Techniques for amplifying the undulation show that the actual probability of non-employment is slightly above prediction at about the 14 per cent point, and slightly below the prediction at about 50 per cent. Again, there is no clear interpretation of this undulation in terms of the hypotheses under consideration.

Figure H Distribution of predicted risk of family non-employment
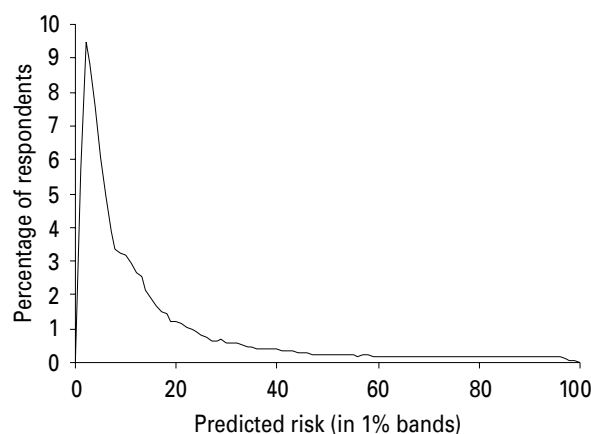
Three-quarters are below 20 per cent. On the other hand, the remaining quarter of all individuals have a non-employment risk in excess of 20 per cent – that is, at least ten times the typical (modal) value of 2 per cent. Nearly one in ten were recorded with a risk in excess of 50 per cent – more likely to live on benefits than on earnings. And, as has already been seen, a few people have a risk above 90 per cent – that is, their chance of earning their living (directly or in a partnership) is close to zero. Multiple disadvantage may not be an issue in the sense of altering the shape of the relationships; but cumulative disadvantage clearly does represent an issue in the sense of building up huge economic problems for individuals with combinations of disadvantaging characteristics. The additive assumption built in to standard analytical models is bad enough.

It is logically obvious that the kinds of people facing very high levels of risk tend to report each of the six types of disadvantage discussed throughout this paper – because it was those disadvantages which contributed to the formula by which risk has been calculated.

Even so, a detailed analysis of the high-risk group may contribute to an understanding of disadvantage. Table 9 defines as 'high-risk' those LFS respondents whose chance of non-employment is calculated to be greater than 50 per cent. Taking the first line of the table as an example:

- 14 per cent of over-50s are at high risk. This is a measure of the *vulnerability* of a category.

- 32 per cent of high-risk individuals are over 50. This is a measure of the *contribution* of a category to the overall scale of the problem.

The statistics in Table 9 are fairly sensitive to the choice of boundary lines between disadvantaged and non-disadvantaged categories in each domain. If disadvantage had been defined as 'over 55', rather than as 'over 50', then the measure of vulnerability would have been higher (21 per cent compared with 14 per cent), but the measure of contribution would have been lower (22 per cent compared with 32 per cent). The same logic applies to all the categories listed in the table.

With that caveat in mind, there are still some striking conclusions to be drawn. Although less than one-tenth of all adults in the age range under analysis (17 to 59) are at high risk, no fewer than two-thirds of lone parents are highly disadvantaged. So are nearly half of people with impairments – even though the definition includes many people with low levels of severity. These are very high levels of vulnerability, caused in part by the direct influence of lone parenthood and impairment on employment prospects, and in part by the

Table 9 Profile of individuals whose risk of non-employment is greater than 50 per cent

	Vulnerability Proportion of this category who are 'high-risk' (row percentages)	Contribution Proportion of the 'high-risk' group who are in this category (column percentages)
Over 50	14	32
No partner, no kids	13	40
Lone parent	68	36
Low qualifications, low skill	31	59
Impaired	45	63
Black	20	3
Indian	9	2
Pakistani/Bangladeshi	27	3
Other minority	13	2
High unemployment area	14	32
Average proportion	9	
Average number of disadvantages		2.7

combination of those characteristics with other disadvantages such as lack of skills.

On the other hand, by no means all of the disadvantages identified by the initial analysis are so closely associated with vulnerability, as defined for Table 9. Over-50s, individuals living on their own and people in high unemployment areas all have above-average rates of non-employment, but they tend not to be linked so strongly with other disadvantages, and so are not closely associated with high levels of risk. It is also interesting to see that Indians, whose specific coefficients in the logistic regression equations were virtually identical to those of Caribbeans and Africans, are much less vulnerable than black people to high levels of risk, because they do not share other disadvantaging characteristics (such as poor education or lone parenthood).

The right-hand column of Table 9 turns the same figures the other way round, to show what contribution each specific disadvantage makes to the composition of the high-risk group. Of course, high risk arises from combinations of disadvantages, so that the sum of the contributions is much higher than 100 per cent – in fact, as the figure at the foot of the column shows, the average high-risk individual cumulates 2.7 disadvantages. More than three-quarters of them are disadvantaged in the family arena (no partner, no kids, plus lone parents); nearly two-thirds have impairments; more than half have low skills. In contrast, ethnic minorities (a small proportion of the whole population in any case) make only a small contribution to the number of high-risk individuals.

10 Lone parents – a policy application

This analysis has been aimed mainly at what may seem almost an abstract question: whether a large number of disadvantages has more or less serious effects on non-employment than might have been expected from the known impacts of single disadvantages. The policy issues – what strategies or tactics may be appropriate to enable multiply disadvantaged individuals to earn their own living – have been in the background rather than the forefront of the discussion. But it may be helpful to end with an illustration of how analysis of this sort might contribute to policy debates.

Lone parents have been chosen for this illustration for two reasons. First, they are the most disadvantaged single group identified in this analysis: lone parenthood shows the single biggest association with an individual's risk of non-employment (Table 4); and lone parents are the most vulnerable to the very high cumulative rates of risk reported in Table 9.

Second, lone parents are currently the subject of major policy initiatives in Britain. The government's official target is that as many as 70 per cent of lone parents should be in employment by 2010, compared with less than 50 per cent in the late 1990s.[14] Translating the 70 per cent target into our own metric, the aim is to reduce non-employment among one-parent families to 30 per cent.

What this analysis helps to show is that no group of people should be thought of as an undifferentiated category, with a common probability of non-employment. People's risk varies substantially, depending on a wide range of their characteristics. In the case of lone parents, a key source of variation is the age of their youngest child. Figure C showed a systematic reduction in non-employment risk as the youngest child grew older. The relationship is illustrated again as the solid line in Figure I: 80 per cent of lone parents with a baby are non-employed, falling to only 30 per cent of those whose youngest child is nearly of an age to be treated as a non-dependant.[15]

The question for policy is: how would the probabilities illustrated in the graph need to change in order to achieve the 30 per cent target? Should the government shape its services and incentives to reduce non-employment among mothers with pre-school children to the same level as that currently observed among mothers of sixth-formers? Such an outcome is illustrated by the horizontal dashed line on the graph – 'Target 1'. Or should policies aim to reduce non-employment among mothers of older children to zero – 'Target 2', illustrated by the sloping dotted line? Even if that could be achieved, it would still be necessary to reduce the rate among mothers of very young children from 80 to 60 per cent, in order to reach the 30 per cent overall non-employment target.

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14 Standard official analyses of the Labour Force Survey count any work at all (even a couple of hours a week) as 'employment'. It is generally assumed that progress towards the target will be measured on that basis. The definition of employment used in this analysis, excluding employment of fewer than 16 hours per week, but including full-time education, is surely a more appropriate definition in terms of the underlying policy objectives. That does not mean, though, that jobs of fewer than 16 hours per week should be discouraged; there is good evidence that 'mini-jobs' provide lone parents with an important stepping stone towards full-time work (Iacovou and Berthoud, 1999).

15 It is not clear how women on maternity leave have reported their current employment status. The graph does not suggest that mothers of newborn babies are very different from those with one-year-olds.
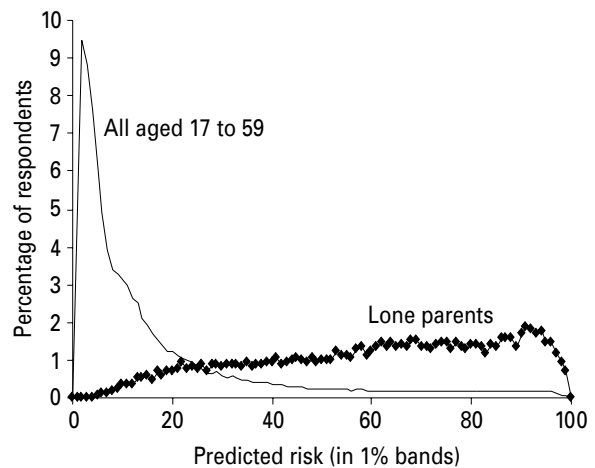
Figure I Non-employment rates among lone parents, by age of youngest child: current and target distributions[16]

Figure J Distribution of cumulative risk of non-employment: lone parents compared with all adults aged 17 to 59
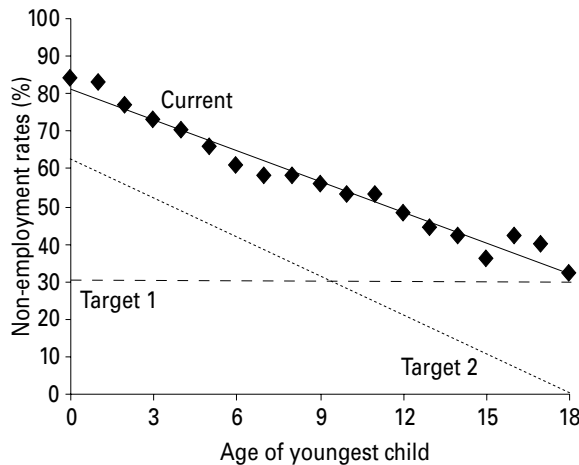
Having no partner and having young children are disadvantages in their own rights, but this study reminds us that lone parents have other characteristics, too. All of the other types of disadvantage included in the study are represented in this group, though relatively few lone parents are over 50 (Table 5). A significant proportion of them have low qualifications and skills (Table 5), and this seems to be especially harmful to their prospects (Table 7). A high proportion are of Caribbean or African descent (Table 5), although the very high level of attachment to the labour market among Caribbean women (Owen and others, 2000) means that this is not a disadvantaging factor for lone parents (Table 7).

The analysis of cumulative risk illustrated in Figure H showed that a very large proportion of adults of working age were at the low-risk end of the spectrum – the most common single

probability of non-employment was only 3 per cent. Figure J compares this with the distribution of risk among lone parents, taking account both of their characteristics as lone parents (including the age of their youngest child) and of their other characteristics (skills, impairment and so on). Hardly any lone parents are to be found among the very low-risk categories occupied by the majority of the population. Few are below the 20 per cent line. Whereas the population at large is strongly concentrated at one end of the scale, lone parents are spread out across the range 20 per cent to 90 per cent. Indeed, the peak rate of risk for lone parents is just over 90 per cent.

Given this widely spread distribution of risk among lone parents, and the large proportion of them with very high probabilities of non-employment, where should policy focus its attentions? Should the priority be to move high-

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16 This figure plots the actual percentage of lone parents who are non-employed. Figure C showed the estimated percentage, on the assumption of otherwise standard characteristics.

risk families into the medium-risk category; or to move medium-risk families towards low risk.

The analysis cannot answer this question directly, but a comparison over the nine-year period covered by the data shows an interesting trend which may suggest an appropriate strategy. The overall proportion of lone parents who were non-employed fell fairly steadily from 70 per cent in 1992 to 56 per cent in 2000. The model suggests that about half of this trend can be attributed to the effect on lone parents of the fall in the national unemployment rate. But the remaining one-third seems to represent a genuine trend among lone parents' employment prospects, independent of the demand for labour. (The recent batch of policies intended to encourage one-parent families into the labour market would not have time to have had much effect by spring 2000, so we are observing a pre-policy trend, not the outcome of intervention.)

An important question is: who were the lone parents whose prospects improved? Was there a rapid return to work among those whose prospects were already fairly good? Or was it the most disadvantaged members of the group who benefited most from the trend?

We addressed this question by dividing the sample of lone parents into three equal-sized groups, based on their risk of non-employment calculated from the multivariate model. The 'low-risk' group would have had older children, good educational qualifications and job skills and so on. The 'high-risk' group would have had younger children, poor qualifications and perhaps an impairment. Note that for this calculation the model was confined to personal and family characteristics – the variables capturing variations in employment rates were not used, because they varied systematically

over the time period under consideration.

The year-on-year trend in non-employment rates was then calculated for each of the three groups of lone parents (Figure K). As many as 37 per cent even of the 'low-risk' group were non-employed in 1992 (so they were not a low-risk group other than in comparison with other lone parents). The rate had fallen to 29 per cent by 2000 – a fall of almost exactly one percentage point each year. The high-risk group started with a non-employment rate of 92 per cent, and also recorded a fall averaging 1 per cent per year. A more encouraging way of putting the same figures, though, is to say that the proportion of hard-to-place lone parents in work doubled over the period. The biggest movement, though, was in the middle of the range: lone parents here reduced their non-employment rate by getting on for two percentage points per year.

Figure K Estimated non-employment rates among lone parents, by risk level: 1992 and 2000
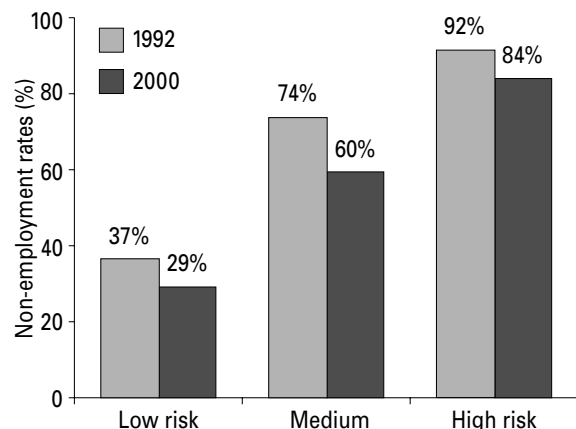
Note: Low-, medium- and high-risk groups are defined in terms of thirds of the distribution of risk among lone parents, using the interactive model, but omitting labour demand variables. Rates for 1992 and 2000 are estimated from the trend calculated for all nine years in the sequence.

What has happened in the past does not necessarily give guidance for targeting policy in the future. This analysis shows, though, that movement into work has by no means been confined to lone parents who already have relatively favourable characteristics. There has been a significant improvement in the job chances of many seriously disadvantaged families. This suggests that policy could effectively address the barriers to employment faced by such families, rather than writing off their chances as impossible.

11 Review and conclusions

More than five million British men and women of working age are in non-working families – double the number observed in the 1970s. Most of them live on social security benefits, and many of them are in poverty.

This study is based on detailed analysis of a sample of 550,000 individuals (aged 17 to 59), collected from a nine-year sequence of Labour Force Surveys (1992 to 2000). The research focused on the characteristics associated with family non-employment, defined as men and women who:

- are not working at least 16 hours per week, nor are in full-time education

- and do not have a working partner either.

About 4 per cent of 'typical' (non-disadvantaged) men and women are non-employed by this definition. But because many individuals do face disadvantages, the average risk is much higher, at 17 per cent.

Six sources of disadvantage

An initial analysis was designed to develop precise measures of the characteristics associated with non-employment. Six types of disadvantage have been identified. They are listed in Table 10 in the order of their importance in helping to explain variations in job prospects (from most important to least important).

Table 10 Summary of six characteristics associated with non-employment

Characteristic	Detailed measure	Simple measure
Family structure	Taking a couple with no children as the base case, the risk is higher for individuals without a partner; and higher for people with children, depending on the age of the children and the marital status of the parent	1. No partner, no kids 2. Lone parent
Skill level	Taking an individual with O level/GCSEs and in a skilled manual job as the base case, the risk is consistently lower for people with better qualifications and skills, and vice versa	Low quals and skills
Impairment	Any impairment increases the risk of non-employment; multiple conditions increase the risk further	Impaired
Age	The risk declines between 17 and 20, remains more or less steady between 20 and 49, and increases from 49 to 59	Over 50
Demand for labour	The higher the regional unemployment rate in the survey year, the greater the risk of non-employment	High unemp. rate (> 9.5%)
Ethnic group	Caribbeans, Africans, Indians and other minorities have an increased risk compared with whites; Pakistanis and Bangladeshis have a seriously increased risk; Chinese are no different from whites	1. Black 2. Indian 3. Pak/Bang 4. Other minorities

Adding these detailed measures together provides quite an accurate analysis of the probability that any particular individual is in a non-employed family.

Six hypotheses about multiple disadvantage

The main aim of the research, though, was to find out whether simply adding the effects of specific disadvantages together is the best way of assessing risk. What happens when people face two or more disadvantages? Six possible answers to the question can be considered:

- *Additive*: The effects of each disadvantage can just be added together.

- *Combinations*: Specific combinations of disadvantage have effects which increase or decrease risk, compared with the additive assumption.

- *Independent*: Every combination of characteristics has its own pattern of risks, without regard for any other combination.

- *Exponential*: The risk of non-employment rises faster and faster as the number of disadvantages increases.

- *Logarithmic*: The risk of non-employment rises less and less rapidly as the number of disadvantages increases.

- *Class*: Having one disadvantage imposes a high risk of non-employment; extra disadvantages make no further difference.

Combinations

We looked first to see what happened when every possible combination of disadvantages – from single items, through pairs and triplets up to combinations of six – was specified as a distinct option. The risk of non-employment associated with specific combinations of four, five or six disadvantages is not significantly different from what would be expected on the basis of their component parts. But eight of a possible 68 triplets, and 20 out of a possible 38 pairs, do have significant effects. To take two of the most important examples:

- Lone parents of Caribbean or African descent face a lower risk of non-employment (55 per cent) than would have been predicted on the basis of their family structure and ethnic group (68 per cent).

- Older Pakistanis and Bangladeshis with low qualifications and skills have an even higher risk of non-employment (82 per cent) than might have been expected from adding up the influences of those three characteristics (71 per cent).

In general, though, pairs and triplets have relatively little influence on the distribution of non-employment, compared with the separate influences of the six primary characteristics. Thus there is some support for the combinations hypothesis, but it is not as strong as the additive assumption.

Number of disadvantages

Two-thirds of adults in the age range under analysis have at least one of the characteristics associated with disadvantage. Nearly a tenth are multiply disadvantaged, with at least three problems. But only one in 5,000 (106 members of the sample) has a full set of six disadvantages. As expected, the more disadvantages facing any individual, the more likely he or she is to be non-employed. The range of divergent risks is surprisingly wide, though – from a risk of just 4 per cent among those with no disadvantages to 91 per cent among those with six. The simple additive model comes close to predicting these variations accurately, but there are some signs that the level of risk may be slightly *lower* than expected for people with multiple disadvantages. This latter finding provides weak support for the logarithmic hypothesis.

Cumulative disadvantage

Once the effects of combinations have been taken into account, the analytical model is extremely effective at estimating the probability that any individual will be non-employed – at very high levels of risk as well as at the lower end of the distribution. Of course, most individuals have a low risk. But the study strikingly identified individuals with very high levels of risk – nearly one-tenth of the population have characteristics which give them a risk in excess of 50 per cent, including a small number with risks well into the 90s. These people's chances of having either a job or a working partner are close to zero.

Lone parents – a policy application

It is useful to show how these results can contribute to the analysis of policy. Lone parents have been chosen for this illustration, partly because they have a very high risk of non-employment, and partly because the government has set itself the target of reducing the non-employment rate for lone parents to just 30 per cent. The study reminds us that the risk is not fixed for the group as a whole – it varies *between* lone parents, depending in part on their family characteristics (the age of their children) but also on the other disadvantages (such as impairment or lack of skills) which they might also face. Lone parents are widely spread across the range of risk between 20 per cent and 90 per cent. There was a fairly steady fall in the level of non-employment among lone parents between 1992 and 2000 (partly because of increased demand for labour). The analysis shows that this improvement in lone parents' prospects affected the most disadvantaged as well as the least disadvantaged members of the group – the biggest improvement was in the middle of the distribution of risk.

Discussion

The research has shown that variations in risk of non-employment can largely be explained just by adding together the independent effects of each contributory factor, rather than by any of the more complex formulae that were considered. The *additive* model is effective on its own. Our ability to describe the pattern of non-employment is slightly improved by taking account of pairs of disadvantage, and of triplets, so there is some evidence in support of the

combinations model, in which specific sets of disadvantages have unexpected outcomes. There is also some evidence for a weak *logarithmic* effect, in which multiple disadvantages are not quite as serious as might have been expected on the basis of simple addition.

This is a fairly straightforward conclusion. The pattern of non-employment risks is not as complicated as some have argued. This is convenient for analysts, whose common assumption of a straight additive model has been largely justified. It is also helpful to policy analysts, who can be reassured that addressing the hindrances to employment associated with one kind of disadvantage will yield dividends without having to worry too much about its links with all possible other disadvantages. Some specific combinations do require special attention though.

Perhaps the most striking finding of the research is the huge disparity in risks – between the 'typical' figure for non-disadvantaged individuals of about 3 per cent, through the 'average' figure for the population as a whole of 17 per cent, and on to the high levels of 50 or even 90 per cent. People with very high risks of non-employment probably spend long periods without earnings, and their difficulties cry out for policy initiatives. The positive news, though, is that high levels of risk are sensitive to changes in the economy, and this may imply that they are susceptible to changes of policy.

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