

Working paper

# Using the new Family Resources Survey question block to measure material deprivation among pensioners

by Stephen McKay

Department for Work and Pensions

Working Paper No 89

# **Using the new Family Resources Survey question block to measure material deprivation among pensioners**

Stephen McKay

A report of research carried out by the University of Birmingham on behalf of the Department for Work and Pensions

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# Summary

Deprivation indicators may be used to replace or supplement measures of income poverty. They have been used in academic surveys since the late 1960s, form a key part of the measurement of child poverty and have been included in the Family Resources Survey (FRS) since 2004-05 for that purpose.

This report takes the new material deprivation questions for older people, asked in the FRS since 2008, and proposes how to construct an overall measure of deprivation. It uses data from May 2008-March 2009, and applies a range of statistical analyses to compare different strategies to constructing such a measure. It looks at the implications of different choices in the design of the overall index of pensioner material deprivation.

## Selection of questions

The FRS question set was chosen after detailed background research. The suite of 15 questions forms an internally consistent scale. There are no statistical grounds for excluding any of them. They also seem to be measuring the same underlying concept. They may be said to be statistically reliable. There are different means of testing the validity of these questions. They are related to levels of income, in the expected manner. They also show that couples are less materially deprived than single people, and that homeowners experience less deprivation than tenants. There was no single association with increasing age – some of the items were more common among the older age group (making ends meet) whilst others were more common among younger pensioners (such as holidays and access to a car).

## The new follow-up questions

One of the distinctive features of the new FRS questions is the set of follow-up questions for why people lacked each of the different items, which go beyond low income to capture other reasons, like poor health and prioritising, that may be important for the older age group. Which of these distinct reasons should count as representing deprivation? A number of comparisons of the income levels of those giving different responses were made. To make more appropriate checks, a new income variable was needed that removed the value of disability benefits. The monetary reasons were the most strongly related to income (particularly those saying they didn't have the money for an item). The responses that attributed the lack of particular goods and services to health and disability also had quite strong links to income. Typically attracting the weakest links to income were those respondents mentioning that something was not wanted, irrelevant, or missing for 'other' reasons.

## Creating an overall measure

In terms of turning the individual questions into an overall measure of material deprivation, there are three main questions. Which of the follow-up codes to treat as deprivation? Whether to treat the lack of some items as being more important than others (prevalence weighting). And, third, whether to differentially weight the different response codes.

Somewhat broader measures of deprivation tended to perform better, in terms of their associations with income and capital, than the narrower measures. Prevalence weighting may not have any clear statistical advantages over a simple summed index, but has a clear conceptual logic and provides greater flexibility in establishing a threshold level of material deprivation. Differential weighting of the different follow-up questions adds complexity but does not generate a more valid scale.

Each of the scales examined, broader and narrower, showed the expected relationship with family size and income. Material deprivation levels were consistently higher for disabled people.

### Setting a threshold

At what point on the deprivation scale should we say that someone is deprived – how do we ‘draw the line’? Statistical approaches point towards a fairly inclusive definition, but detailed analysis of case studies would suggest a stricter test for material deprivation. Identifying the optimum threshold is perhaps less important the greater the extent to which the purpose is to track changes over time.

# 1 Introduction

## 1.1 Background: Poverty, living standards and deprivation indicators

Poverty is often measured by counting those families on relatively low incomes. A low income, whether relative to a fixed line or in comparison to other people's income, may be taken as measuring or indicating poverty.

An objection to this approach is that it is inherently **indirect**, and tells us little about how people are actually living, and if that experience really corresponds to poverty. There are also many methodological complications involved in the measure of income, including the correct treatment of housing costs (relative to housing-related benefits) and how appropriately to control for differences in family size (equivalisation). Alternatively we may attempt to measure poverty in more 'direct' ways using questions that measure living standards (Ringen 1988), with an unacceptably low standard of living defining poverty.

The aim of more direct measures of poverty, of which deprivation indicators are the most important example, is to capture living standards in an immediate way, without relying on income with its more proximate relationship to actual living standards. From this measure of living standards we capture poverty by identifying a low standard of living that would be widely regarded as being unacceptably low. An exclusive focus on people's incomes misses out important aspects of the experience of poverty.

Deprivation indicators have long been an important aspect of poverty measurement, either on their own or often in conjunction with low incomes. Pantazis *et al.* (2006) recommend material deprivation indicators as a rigorous scientific approach to the measurement of poverty. They have been used to look at poverty in the late 1960s (Townsend 1979), in the early 1980s (Mack and Lansley 1985), and at the end of the twentieth century (Gordon *et al.* 2000). Since 2004/05 their inclusion on the Family Resources Survey (FRS) has ensured more of a consistent time series against which to judge progress to reduce material deprivation.

However, the application of deprivation indicators to poverty among older people has been problematic. For a given level of income, older people are less likely than younger people to say that they **cannot afford** particular goods or services (McKay 2004). Levels of deprivation may also depend, to a greater extent than among younger people, on maintaining good health and having others around to assist with tasks. Overall: a measure of poverty based on deprivation indicators is likely to show rather lower levels of poverty among older people than income-based measures. Moreover these poverty rates may be **misleadingly** low for older people, and fail to realistically capture the deprivation of this group. A different approach to deprivation indicators designed for older people should yield more valid results.

### 1.2 New FRS deprivation indicators for older people

Given this background, in 2007 the Department for Work and Pensions (DWP) commissioned new research to establish a different set of deprivation indicators for older people (Legard *et al.* 2008, McKay 2008). This recommended both a particular set of questions for the FRS, and a new follow-up question not restricted to ‘cannot afford/do not want’. These questions have been running on the FRS since May 2008, and analysis appeared in the 2008/09 Households Below Average Income (HBAI) report (Adams *et al.* 2010), but these questions have yet to be converted into a working measure of deprivation.

It is the aim of this research to explore how to measure material deprivation among pensioners using the new material deprivation question block on the FRS. In particular, there is a need for analysis to explore the data in detail and to make recommendations on how a robust overall material deprivation measure for pensioners may be constructed.

The questions themselves attempt to measure material deprivation in different areas of older people’s lives. A full list of the 15 questions is shown in Appendix A to this report, but we may summarise the content. Some of the questions are narrowly financial, attempting to capture how well people make ends meet, and their resilience to changing circumstances – can they meet regular bills, could they meet an unexpected expense, and be able to replace their cooker. A number relate to social contact, including going out with friends, and meeting up with family. Further questions, on access to a telephone and a car, are part of making possible such social contact. Several questions then relate to the state of their home (damp-free, whether kept warm enough, in a good state of repair). A couple of questions look at quite basic aspects of living – having one good meal a day, and owning an appropriate coat. Overall, therefore, they cover a range of different domains of material deprivation.

It is important to consider some of the motivations behind indicators of this kind, and past literature, to help guide the selection of different questions to count as deprivation. For Gordon *et al.* (2000: p.7) the issue is one of being ‘*poor in terms of being unable to afford items that the majority of the general public considered to be basic necessities of life*’. Three pages later this is re-phrased as, ‘*whether people lack items that the majority of the population perceive to be necessities, and whether they have incomes too low to afford them.*’ It was an innovation of Mack and Lansley (1985) to define poverty as an enforced lack of socially perceived necessities. This is to reflect the role that choice may play in whether people have different goods and services, while Townsend (1979) had only looked at presence or absence of different goods and items.

Past literature tends to discuss both an ‘enforced lack’, which could cover a range of reasons (including disability) for not having particular items, but then often qualifies this as meaning an ‘inability to afford’ (where disability is less clearly included as being relevant to deprivation). Past studies are, therefore, not a definitive guide to what is to count as deprivation, and in particular whether the definition should be narrowly financial (‘cannot afford’) or extended somewhat more broadly (an ‘enforced lack’, that may cover a range of different situations).

#### 1.2.1 Comparisons with the child poverty measure

The 2010 Child Poverty Act specifically mentions one aspect of child poverty measurement as being material deprivation combined with low income (Part 1 section 4)<sup>1</sup>. There is a well-established

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<sup>1</sup> The target is based on only having five per cent (or less) experiencing both material deprivation and having an income below 70 per cent of the median. The definition of material deprivation is to be established in Regulations.

measure of material deprivation for families with children. This is based on around 20 questions, half of them referring directly to children. Respondents are able to select from whether they have each item, don't have it through choice, or don't have it because they cannot afford them at the moment. The child poverty measure is based on those who respond that they cannot afford the different goods and services. An overall material deprivation score is formed by adding up these 'cannot afford' responses, weighted by the frequency of those who have each item (which is known as **prevalence weighting**).

In establishing a new measure of material deprivation among older people, it seems appropriate to compare any decisions made with this approach to measuring child material deprivation. Any changes in methodology would, therefore, need a clear rationale.

The introduction of a new measure of material deprivation, based on different questions, means that it is not possible to make direct comparisons of material deprivation between older people and the rest of the population. The argument for the new questions for older people is that, in any case, such comparisons were inherently misleading and did not adequately reflect poverty among older people. There are a couple of areas where direct comparisons may, perhaps, be made. The FRS continues to ask about whether people are able to keep their home adequately warm in winter, and if people are meeting a range of bills without falling into arrears. These questions provide some degree of comparability between older and younger populations, albeit based on relatively few questions. Of course, income data is also available for both groups, subject to well-known strengths and weaknesses.

## 2 Research aims

In this chapter we set out the desirable properties that should be found in an overall index of pensioner material deprivation. We also outline the different kinds of analysis that will be used to help identify the best combination of questions to arrive at that measure. A key part of the research challenge is the new set of follow-up question that probes the reasons why older people may be lacking a particular good or service.

### 2.1 Properties of a credible measure of pensioner deprivation

There are a number of criteria that must be met by any proposed measure of pensioner deprivation. First, it must be **reliable**. This means that the questions selected should all be measuring the same concept, and be related to each other. This kind of consistency may be evaluated using what is known as **reliability analysis**, which calculates measures of correlation between the selected questions and the putative overall index. In the most typical approach this generates an overall measure of reliability known as Cronbach's alpha. Where questions do not contribute to the reliability of the overall measure (or 'scale', in the literature that leans most heavily on psychology) there is a case for not including them in the measure.

It is also desirable that the questions are measuring one underlying concept (material deprivation) rather than two or more concepts. While the underlying concept of material deprivation may have this property, this may still be best measured by capturing information from a range of domains in different areas of life. The selected FRS questions look at a range of different information, covering food, the state of the home, the ability to participate in social activities and financial matters. To that extent the measure may also be described as being **multi-dimensional**, since it tries to tap into a number of different areas of finances and material deprivation.

One means of investigating whether there is a single underlying concept of deprivation is the use of factor analysis. This statistical method considers if the observed data is better represented by a single latent variable, or two or more. Calandrino (2003) undertook such an analysis for the Families and Children Study (FACS) questions, and this statistical method was also part of the selection of deprivation questions in the FRS for families with dependent children (McKay and Collard 2004). Results from this type of analysis are discussed in Section 4.1, with further statistical results in Appendix B.

Questions should also be **valid**, in other words that they do really measure deprivation rather than some other concept. The research process that was undertaken prior to the selection of the questions represents a strong case for the validity of the **individual questions**. This set of questions was selected only after extensive testing, mostly conducted with older people themselves. They were also affirmed by research involving the public as a whole, who were asked whether these goods and services were essentials for older people. The development of this set of questions following a number of research elements provides support for their validity.

In this project we will seek to further assess the validity of the questions by analysing them against such variables as income, savings and health. We would expect measures of deprivation to be negatively correlated with income (higher income, lower deprivation), quality of health, and perhaps other measures of resources (like value of property). The size of the statistical correlation between income and material deprivation is likely to be quite high (and statistically significant). It will be far from perfect, given differences in other characteristics (such as savings and money management skills), and because of the inherent differences between the concepts. Once an overall scale is constructed, it is then important to ensure that this aggregate measure is also valid. This should

mean that it is associated with other available measures of command over resources (income, savings, perhaps housing tenure).

A key issue that must be confronted is whether lacked items should have equal weight or instead have a weight related to prevalence or some other concept – in addition, Section 6.2 discusses another potential weighting issue. It was the practice within the FACS series, and has become the practice with the child deprivation items, to weight the items on the basis of existing incidence. These weights may then either be fixed at that point in time, at least in the medium term, to help show changes in material deprivation over time. Alternatively, such weights may be updated in line with changing patterns of ownership.

## 2.2 Using the new follow-up questions

The above analytical suggestions assume we have a simple set of questions that may be summed in some manner (whether weighted or unweighted), such as a set of indicators for those unable to afford particular goods or services. This is the situation usually confronting analysts looking to construct measure of poverty and deprivation (for example, Gordon *et al.* 2000 and previous studies collecting data in a ‘Breadline Britain’ style manner). For such studies, those lacking an item are generally asked if that is because they don’t want it or cannot afford it (or the question about presence and reason for absence may be combined into one, such as the existing FRS deprivation questions for families).

With the new FRS block of questions on pensioner deprivation there is not a simple ‘cannot afford’ versus ‘do not want’ dichotomy of options. Instead there is a range of different responses that may be given. These run from ‘I do not have the money for this’, to not being a priority, to being affected by disability issues, or not being relevant for the individual. The research will, therefore, grapple with the different kinds of answers to the follow-up question. In particular, the key research question is how far may we infer deprivation from one or other of the other replies given. In principle it would be possible to treat several of the replies as constituting deprivation (not just, not having the money). Alternatively one might prefer to give a different weighting to some of the other questions – perhaps counting ‘1’ where someone is unable to afford, and some other value  $x$  (such as  $\frac{1}{2}$  or another value with  $0 < x < 1$ ) where one of the other replies is given. A transparent method would be needed for deriving such weights, such as the resulting coefficients from a regression of the different coefficients on income, or expert/public judgement of some kind. The research will consider which strategy provides the most robust overall measure, illustrating the advantages and disadvantages of different approaches. This analysis is shown in Chapter 5.

## 2.3 A threshold for identifying material deprivation

Having constructed a valid and reliable scale, the research will then consider identifying an appropriate cut-off point, or threshold, for separating the deprived from the non-deprived. Is there a line where the living standards of those either side of that line are quite different, with one group substantially more deprived than the other? It is important to acknowledge that there is a fair amount of ‘noise’ generated in creating dividing lines – many on low incomes do not appear to be deprived, while at least some of those on higher incomes show signs of material deprivation. Trying to identify an appropriate dividing line is partly a matter of judgement, and partly of statistical analysis, we will argue. It is possible to identify a cut-off point using regression analysis, such as through perhaps modelling income on the basis of different binary splits of deprivation, to find the line where deprivation most explains incomes. This was the approach, in essence, conducted in Gordon *et al.* (2000) to identify their cut-off for deprivation (equating to two or more items the person was unable to afford). This analysis is set out in some detail in Chapter 7.

# 3 Descriptive analysis

In this chapter we give a basic description of the new set of questions. We look at how many people lack the different items, and the reasons why some older people did not have them. We also record how often people gave more than a single answer for not having any given item. This sets the scene for the statistical analysis that follows in later chapters. It also serves as a reference point, enabling identification of which are the key items contributing to the overall measure of deprivation, and the relative frequencies of the different reasons why people may be lacking some of the key necessities about which they were asked.

There are fifteen relevant questions for older people. Fourteen relate to particular goods and items, and the reasons why people may not have them. The final question concerns whether people would be able to meet an **unexpected** expense of £200 and, if so, how they would manage to do so. This is fully enumerated in Appendix A to this report.

In Table 3.1 we show the proportion of benefit units, and of individuals within them, who have each of the items. These figures are contrasted with some recent evidence – the omnibus survey of the National Centre for Social Research (NatCen) held in 2008<sup>2</sup>. This survey was used to help select the FRS questions, along with other kinds of research (Legard *et al.* 2008, McKay 2008).

For a number of the questions, ownership levels exceed 90 per cent (comfortably so, in some cases). Some 99 per cent of older people had at least one filling meal each day, and almost as many enjoyed access to a telephone when they needed it. There were six question areas where ten per cent, or greater, did not have the items in question, specifically:

- having their hair done or cut regularly;
- access to a car or taxi;
- able to replace their cooker;
- out socially at least once a month;
- a holiday away from home;
- being able to meet an unexpected expense of £200.

Because these were the least likely to be enjoyed by older people, their absence will form the larger element of those facing material deprivation.

In many of the examples with high levels of ownership, such as paying bills, access to a telephone and having a warm coat, the responses from FRS 2008/09 are a little above those given by respondents aged 60+ in the omnibus survey. Conversely, those with ownership levels in the high 80s seem to have shown some apparent decline from the testing phase (such as an annual holiday, and being able to meet a sizeable unexpected expense, or being able to replace a broken cooker).

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<sup>2</sup> The interviews for the NatCen omnibus took place between 17th January and 10th March 2008.



**Table 3.1 Numbers having each item among older people**

Question/item	Have this item: FRS		
	Among benefit units	Proportion of individuals	NatCen omnibus 2008 (aged 60+) <sup>1</sup>
At least one filling meal a day	99.0	99.2	..
A telephone to use, whenever	98.6	98.9	97
Heating, electrics, plumbing	98.0	98.2	95
Have a warm waterproof coat	97.6	97.8	96
Home kept in a good state of repair	95.7	96.3	96
Are you able to pay regular bills	95.7	95.9	92
Home kept adequately warm	95.5	95.6	..
See your friends/family at least ...	94.4	94.6	95
A damp-free home	94.3	94.5	95
Have your hair done or cut regularly	88.4	89.1	91
Access to a car or taxi	88.1	90.2	91
Able to replace your cooker	87.9	89.3	94
Out socially at least once a month	72.6	72.7	64
A holiday away from home	56.4	60.0	67
Able to meet an unexpected expense of £200	85.6	86.9	89

<sup>1</sup> It is important to point out that there are some minor but potentially significant differences in wording between the 2008 Omnibus and the FRS questions.

A key innovation of this set of questions is in the follow-up questions. Once the whole set has been asked, respondents are then asked for why they do not have particular of the items. Eight different responses are available, and the full wording for these is shown in the Appendix A. Table 3.2 shows a full break-down of the different response codes used for each question. As may be seen, there is a diverse range of responses, with the most common answers ranging from health problems, to not having the money, to 'other' reasons.

For some observations on the extent of missing data, and the implications, see Appendix C to this report.

**Table 3.2 Deprivation items and reasons why items are lacking (modal category underlined)**

Item	Lacking Per cent	No money		Not priority		Health		Too much trouble		No other person		Not wanted		Not relevant		Other	
		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Are you able to pay regular bills	4.3	<u>286</u>	17	2	-	4	-	7	24								
Have a warm waterproof coat	2.4	<u>78</u>	55	13	3	2	16	12	12								
Able to replace your cooker	12.7	<u>844</u>	54	8	5	12	4	19	33								
A damp-free home	6.0	119	54	5	33	46	3	13	<u>184</u>								
See your friends or family at least ...	5.4	39	51	84	54	21	10	<u>133</u>	108								
Have your hair done or cut regularly	11.4	<u>252</u>	250	52	91	20	92	40	108								
Heating, electrics, plumbing	2.0	71	15	6	8	17	1	4	39								
A holiday away from home	43.7	891	542	<u>1146</u>	506	243	238	30	227								
Home kept in a good state of repair	4.1	<u>170</u>	47	27	26	23	1	11	46								
At least one filling meal a day	1.0	18	9	<u>24</u>	22	2	6	1	10								
Out socially at least once a month	28.3	353	437	<u>797</u>	352	136	214	61	129								
A telephone to use, whenever	1.6	<u>51</u>	32	10	3	3	15	2	7								
Access to a car or taxi	11.9	<u>329</u>	203	128	42	54	69	27	77								
Home kept adequately warm	4.5	<u>248</u>	38	5	4	4	1	-	64								

**Table A: Whether can meet an unexpected expense, and how they would meet it**

Would you be able to pay an unexpected expense of £200	Own income – cut back		Own income, no cut backs		Savings		Credit		Friends		Other	
	Unable (%)	903	1684	201	3443	111	37					
	15.4	903	1684	201	3443	111	37					

The numbers are unweighted, while the percentages are appropriately based on the weighted data.

## 12 Descriptive analysis

Rather than stating just one reason why people did not have each of the goods listed, they were able to give as many reasons as they thought applied to them. In most cases they gave just one reply, but it was not uncommon to provide several reasons and this varied depending on the item in question – see the distributions in Table 3.3. More than ten per cent of those lacking the following items (holiday; home in good repair; one daily meal; socialising) gave two or more reasons why they did not have each of them.

**Table 3.3 Number of reasons for not having each item among older people**

	<i>Unweighted numbers of benefit units</i>					
	<b>Number of reasons why the item is absent (for example, health, no-one to help, cannot afford)</b>					
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>2+ (%)</b>
Are you able to pay regular bills	293	7				2.3
Have a warm waterproof coat	164	1				0.6
Able to replace your cooker	813	10	2			1.5
A damp-free home	375	7	2			2.3
See your friends/family at least ...	343	21	3	4		7.5
Have your hair done or cut regularly	761	30	2			4.0
Have heating, electrics, plumbing	141	2	3			3.4
Have a holiday away from home	2,463	341	67	12	3	14.7
Home kept in a good state of repair	272	25	4	3		10.5
Have at least one filling meal a day	70	6	2			10.3
Out socially at least once a month	1,595	196	41	7		13.3
A telephone to use, whenever	96	5				5.0
Access to a car or taxi	768	47	6	1		6.6
Home kept adequately warm	289	22	1			7.4
Ways of being able to meet an unexpected expense of £200	5,187	246	20	3		4.9

## 4 The reliability and validity of the individual material deprivation questions

### 4.1 Reliability analysis of the main ownership questions

In this chapter we assess the internal consistency, or reliability, of the main material deprivation questions. The method used is known as **reliability analysis**, and this assesses how far the questions are measuring the same underlying concept. Taken together, adding up the **presence** of each of the 15 goods/services forms a consistent (reliable) scale of material well-being. Each question is correlated with the sum of the remaining 14 questions – they appear to be measuring the same thing. The overall level of reliability, Cronbach's  $\alpha = 0.7$ , is at a modest but acceptable figure. It was not possible to improve the level of reliability by removing any of the main 15 questions – as indicated by the right-hand column of Table 4.1.

**Table 4.1 Reliability analysis for the 15 main questions.**

	Scale mean if item deleted	Corrected item-total correlation	Cronbach's Alpha if item deleted
Are you able to pay regular bills	15.48	.310	.670
Do you have a warm waterproof coat	15.50	.222	.679
Would you be able to replace your cooker	15.40	.482	.642
Do you have a damp-free home	15.47	.221	.678
Do you see your friends or family	15.47	.204	.680
Do you have your hair done or cut regularly	15.41	.314	.668
Do you have heating, electrics, plumbing	15.50	.288	.676
Do you take a holiday away from home	15.09	.360	.669
Is your home kept in a good state of repair	15.48	.344	.667
Do you eat at least one filling meal a day	15.51	.156	.684
Do you go out socially once a month	15.25	.331	.671
Do you have a telephone to use	15.51	.228	.680
Do you have access to a car or taxi	15.40	.308	.668
Is your home kept adequately warm	15.48	.271	.674
Able to pay an unexpected expense	15.38	.489	.639

*Overall alpha = 0.685*

This provides good evidence of the internal consistency of the questions in the new FRS block on material deprivation for older people.

**Factor analysis** may also be used to consider the number of different underlying dimensions being represented by the questions. Do the questions seem to be measuring the same underlying concept, or two or more different concepts? More technically minded readers might find it useful to consult Appendix B to this report, which presents the key results from the factor analysis. Overall, however,

the factor analysis was certainly consistent with the material deprivation questions measuring the same underlying factor (material deprivation). This one underlying factor was able to explain over 20 per cent of the total variation in the material deprivation question. Other factors were only able to explain much less variation, but with some evidence that housing deprivation formed a slightly separate dimension to material deprivation as a whole.

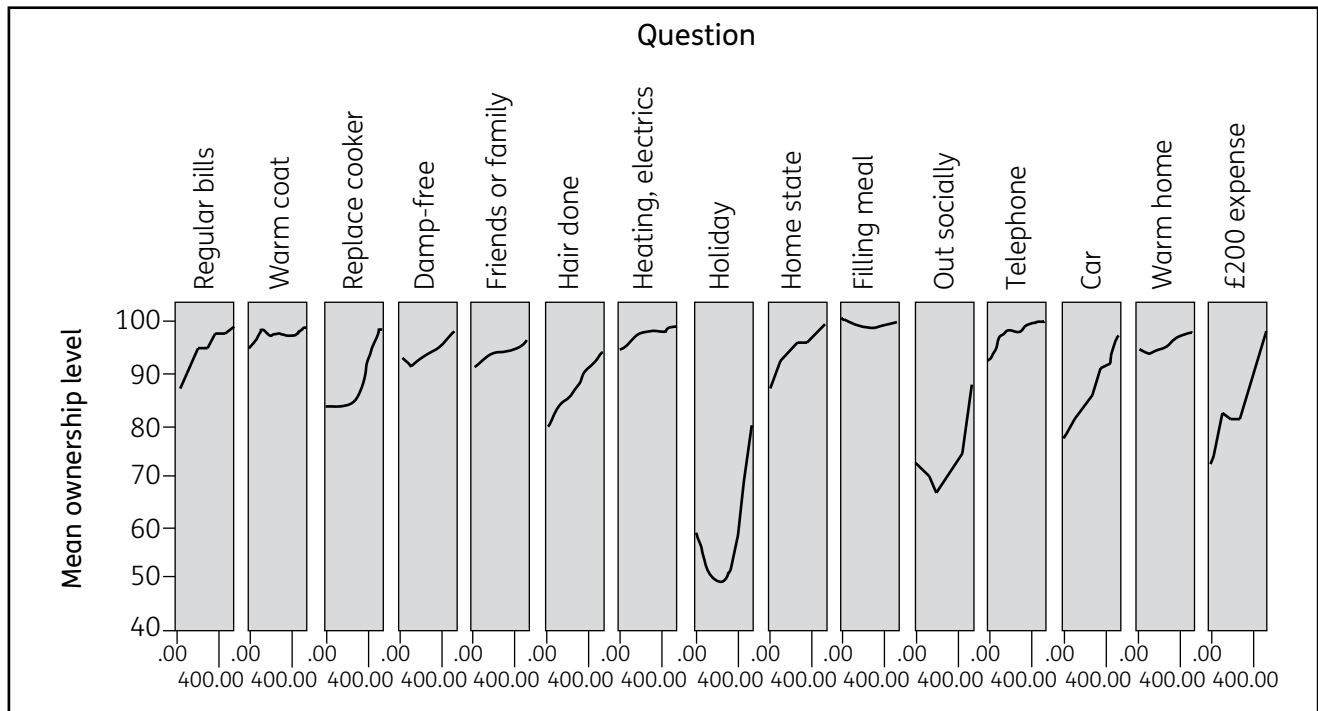
### 4.2 Validity of the material deprivation questions

In addition to internal consistency, we would like the material deprivation questions to be measuring the right concept – of low standards of living. We would expect that measures of deprivation would be correlated with other measures of economic status – such as income – although we should not expect the overlap to be too great (Perry 2003). Indeed, if the overlap was very high there would be no need for deprivation indicators to be used in addition to income, the latter alone would suffice. So we should expect a strong association between income levels and deprivation indicators, without too strong a relationship between them.

In Figure 4.1 we plot the relationship between income (equivalised, and measured for benefit units) and ownership of each of the 15 main items of the deprivation block. In each case, with the exception of having one filling meal each day which 99 per cent of older people were doing, ownership rises with higher incomes. In some cases the increase is quite dramatic – having a holiday, being able to meet a large expense – while the link is rather more shallow for having access to a telephone and having a warm enough home. This tends to affirm there is a substantial link between income and deprivation, though not to the same extent for each question.

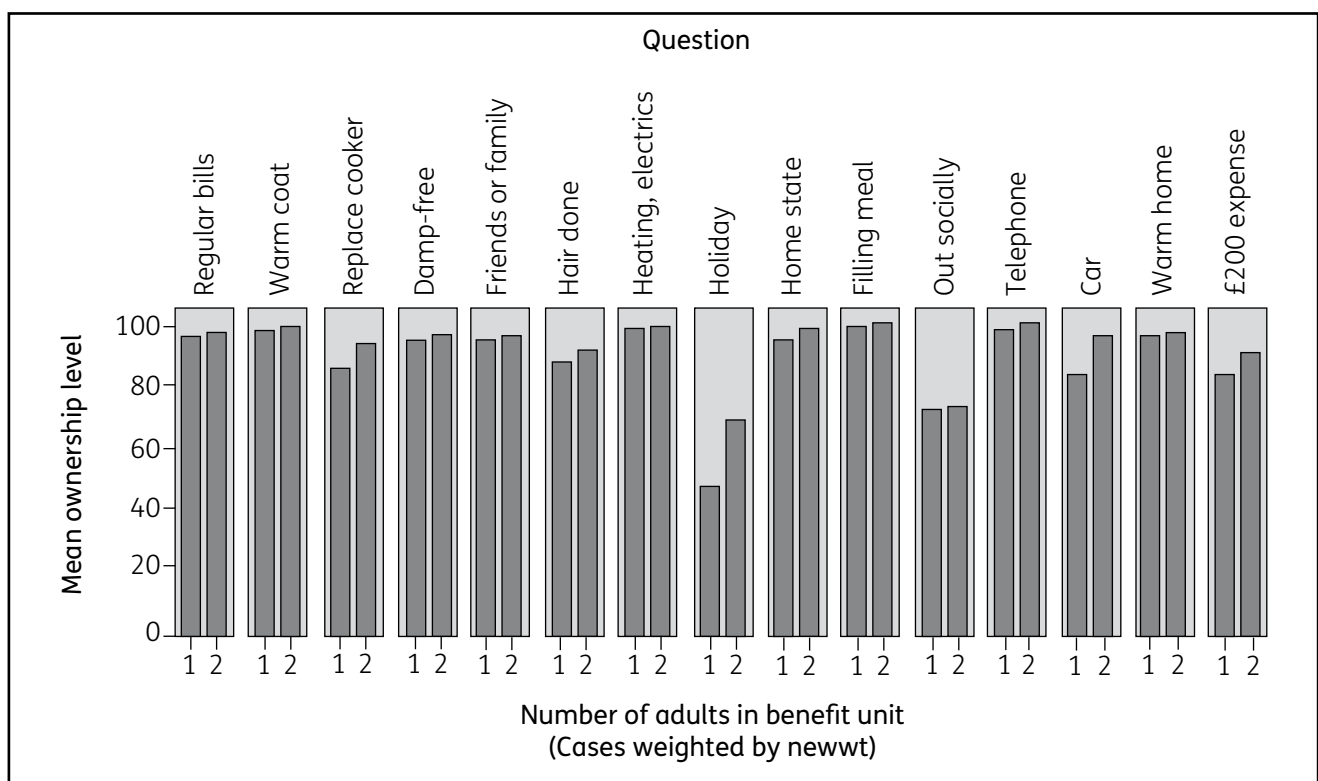
In a few instances, the level of ownership seems high among those on the lowest incomes, falls for those on slightly higher incomes, and only then rises again – a U-shape, in effect. This appears to be the case for having a holiday, and going out socially. Generally speaking it is not uncommon to see unusual results among those on the lowest incomes. It is possible that such incomes are not reliably measured, or that the low income is only temporary. Nevertheless, in most cases there is the expected link between having a higher income and being more likely to have each of the items asked about in the material deprivation section of the questionnaire.

**Figure 4.1 Links to income (Equivalised, benefit unit)**



Generally speaking couples are better off than those who are living on their own. In Figure 4.2 we show the association between family size (one adult or two) and ownership of each of the relevant items. For each question, two-adult families reported higher ownership, and hence lower deprivation. Often these differences were relatively small in magnitude (warm home, warm coat), for taking an annual holiday the difference was rather stronger and more noticeable.

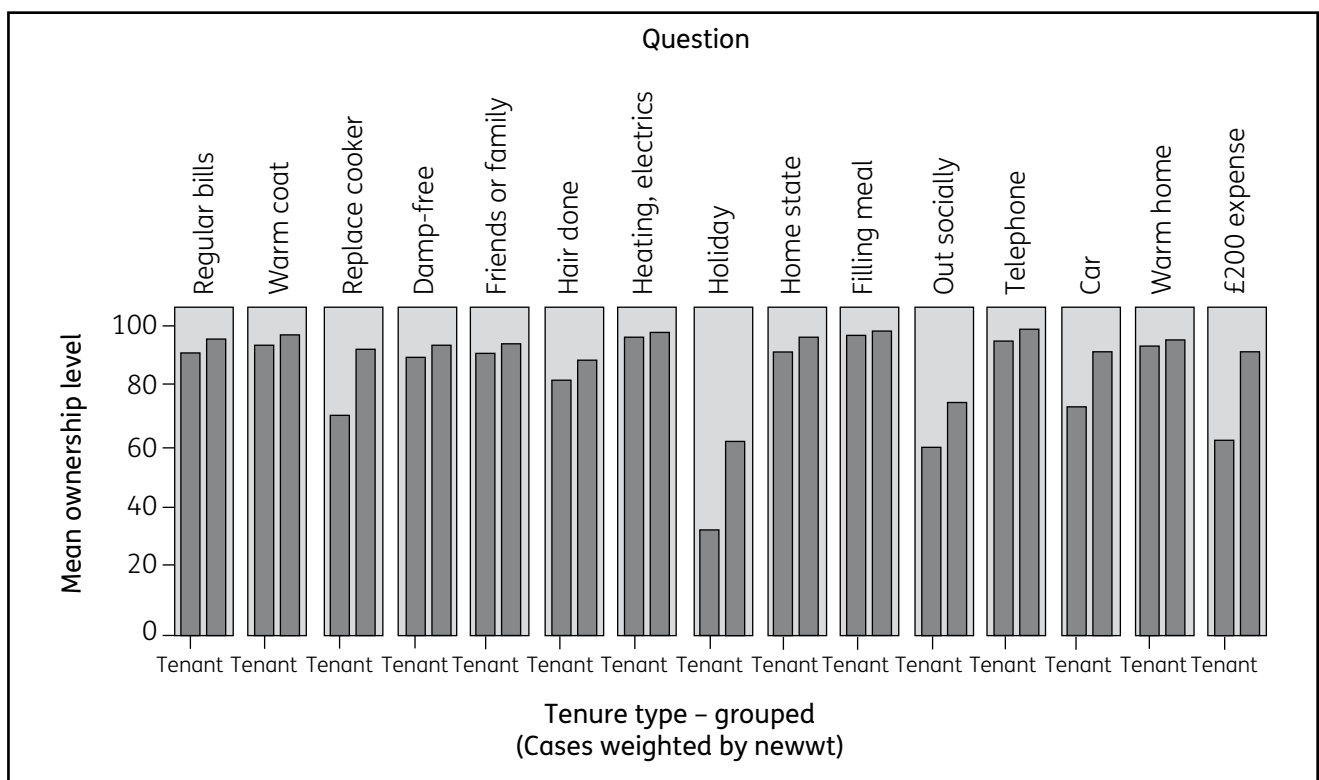
**Figure 4.2 Links to family size (1 or 2 adults)**



Homeowners tend to be better off than tenants – the last set of figures showed a rate of low income poverty at 13 per cent for homeowners, and 30 per cent for private tenants. We would, therefore, expect tenants to have lower ownership levels for each question, and hence potentially higher levels of material deprivation, compared with homeowners. The results displayed in Figure 4.3 strongly confirm this picture. Tenants were less likely than homeowners to have each item, and therefore, more likely to be experiencing material deprivation – albeit we have not yet looked at the reasons for the absence of those items, by tenure.

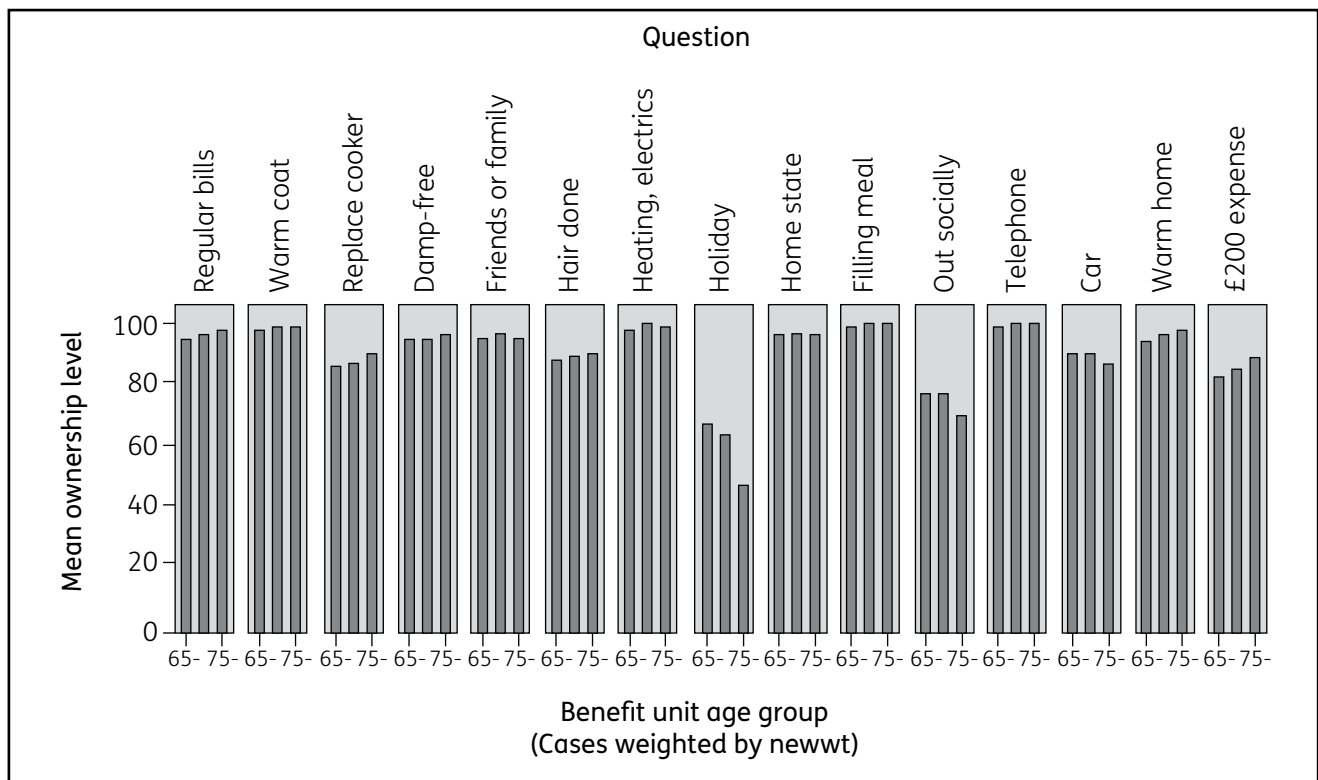
Similar results are obtained when looking at other measures of economic status, including Council Tax banding (a limited proxy for the value of the property) and level of savings.

**Figure 4.3 Links to tenure (tenants and owners)**



Last in this section we consider the link between the material deprivation questions and the age of the household reference person in three bands – see Figure 4.4. There are three important questions that show a decline in ownership with increasing age: access to a car, taking an annual holiday and going out socially. For most of the other questions the level of deprivation, if anything, tended to decline at older ages. So, those aged 75+ were the most confident about meeting an unexpected expense, being able to pay regular bills and having a warm home.

Figure 4.4 Links to age group (65-69; 70-74; 75+)



### 4.3 Conclusion

The evidence presented in this chapter suggests that all 15 questions are working as required. A new measure of material deprivation should build on the whole suite of questions, as there is no evidence that any of them is not working as intended. This is confirmed by reliability analysis and by factor analysis, which look at the consistency of the questions, and by breakdowns against measures of wellbeing, which explore the validity of the questions.

There are, however, some questions with high initial rates of ownership. This means it is difficult to track progress on the basis of those questions as they may be close to their ‘ceiling’. Where ownership is already at 98 per cent it is difficult to envisage much further progress, and only at a relatively slow rate. There would certainly be an argument for excluding such questions from the overall measure, as they permit very limited room for improvement. It is also likely, for those items with the very highest levels of ownership, that the question is picking up measurement problems rather than genuine deprivation. In such cases they are not good discriminators between the deprived and non-deprived. Such questions also receive quite a high weighting in measures based on giving higher weight to those items most commonly owned. If the decision was made to exclude such questions from the calculation of the overall measure, it would also make sense to remove them from the rather full FRS questionnaire.

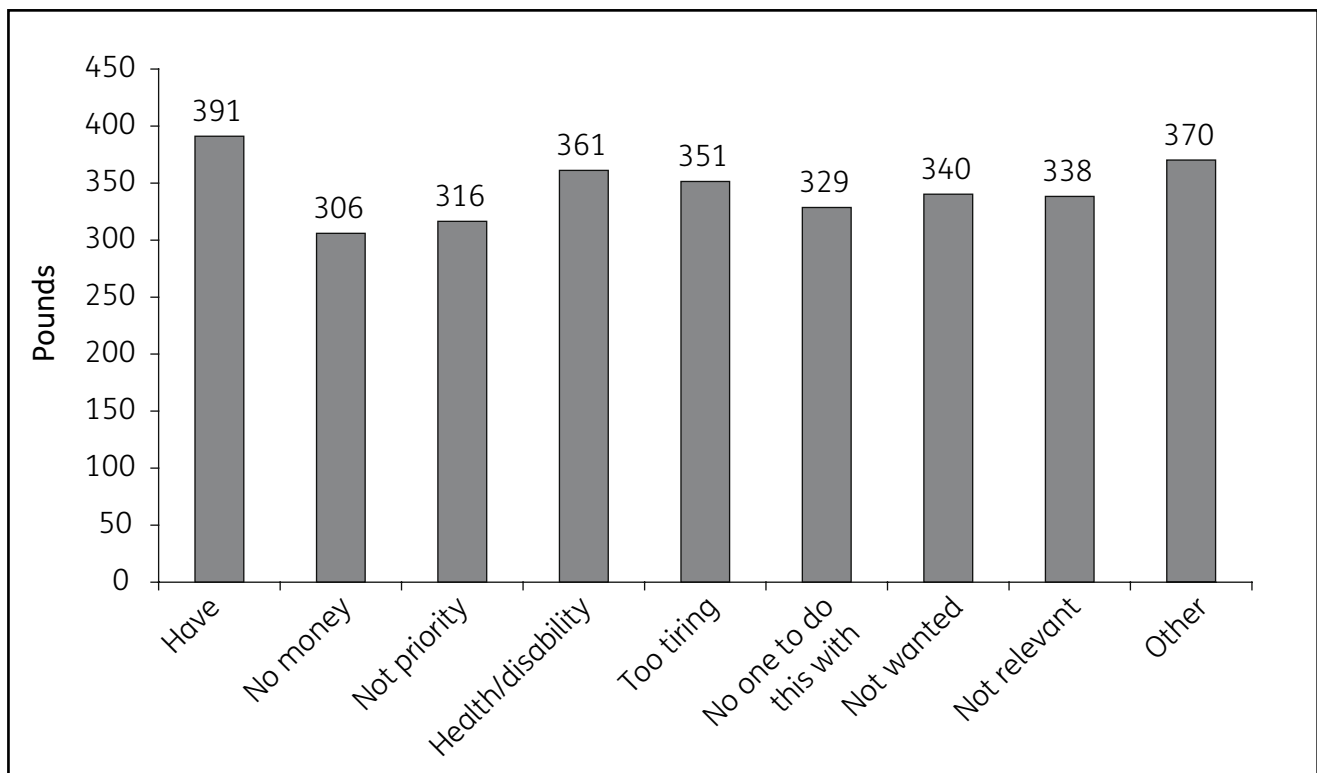


# 5 The follow-up codes to count as deprived

## 5.1 Introduction

One of the distinctive features of the new FRS questions is the set of follow-up questions for why people lacked each of the different items. Which of these distinct reasons should count as representing deprivation? One means of tackling this question is to consider the link between income and each of the different follow-up codes. In Figure 5.1, for instance, we look at the median income levels for those able to afford a holiday each year (£391), and then at the different incomes for those citing different reasons why they did not take a holiday each year. These include not having the money to do so (£306), not being a priority (median income £316 and so on)<sup>3</sup>.

**Figure 5.1 Median income levels: A week's holiday, by equivalised benefit unit income**

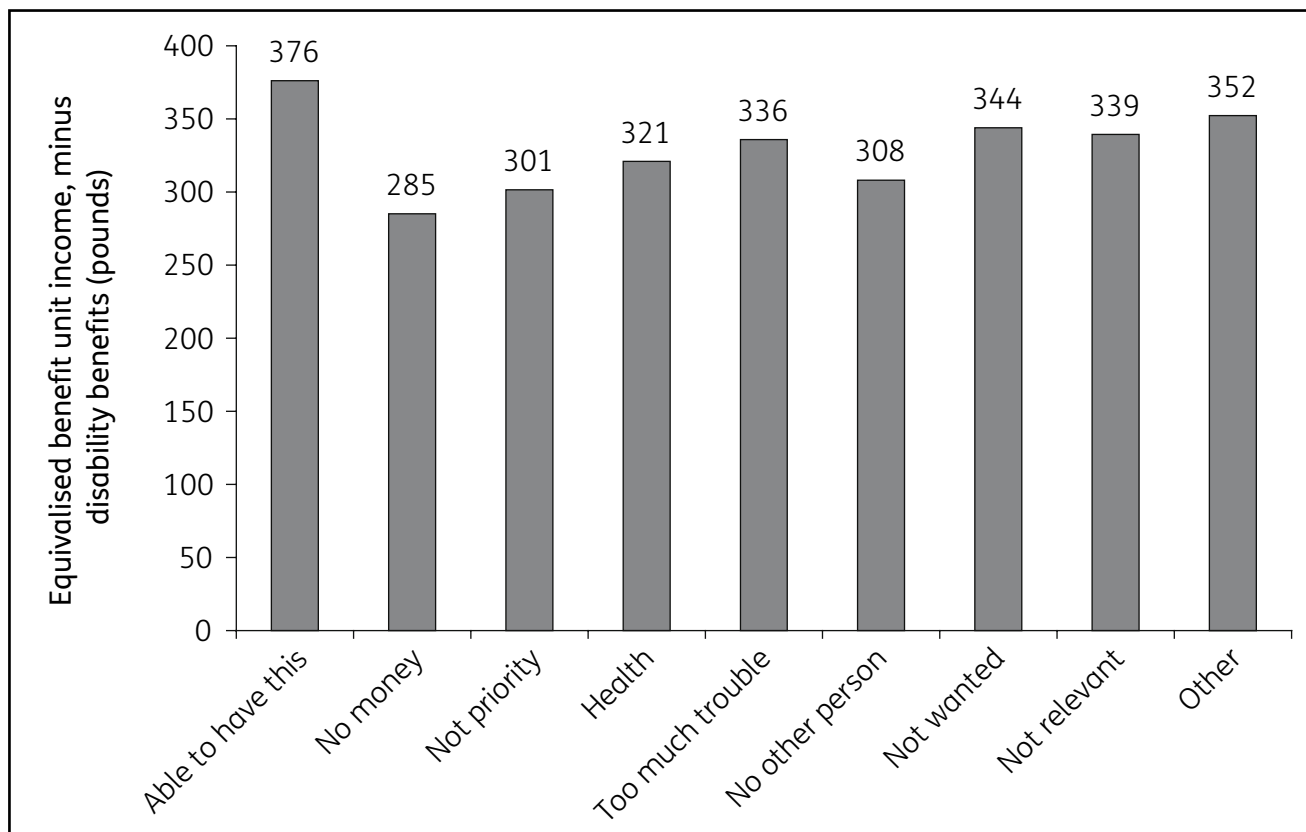


The average income levels of those not taking a holiday on grounds of health/disability, or it being too tiring, were somewhat above the level of those explaining the absence of a holiday on other grounds. However, it is important to note that income (in this chart) **includes** any income from disability-related benefits. Someone receiving such a benefit may appear to be better off (on a higher income) even though the benefit may only be compensating for additional costs of disability.

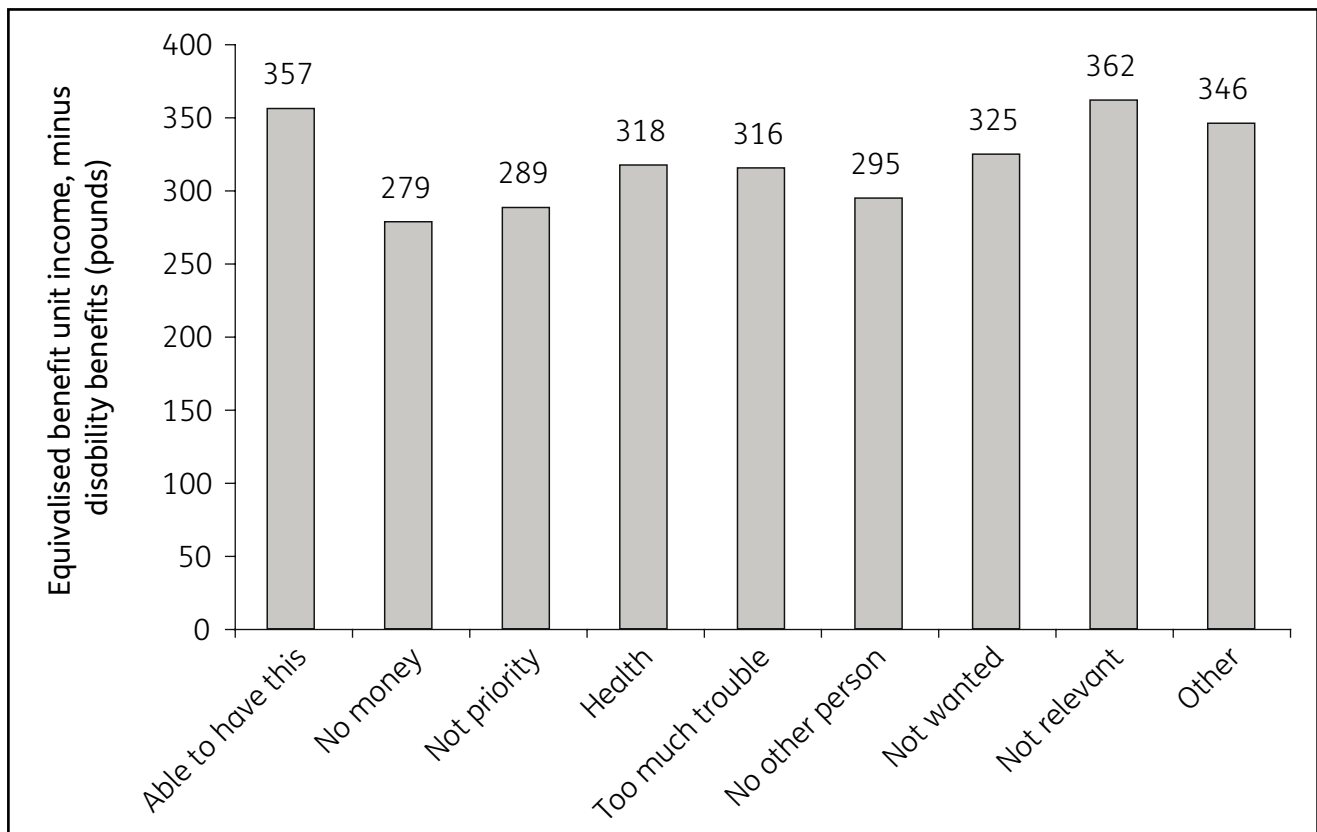
<sup>3</sup> The categories are not mutually exclusive, since respondents could give two or more reasons for not having an annual holiday. The bars represent all those giving a particular response, whether that was their only reply or one of several.

It would be more appropriate to deduct disability benefits from total income before presenting such results, and this is done in Figure 5.2. Income is now net of any disability benefits. This has the clear effect of reducing the reported incomes of those unable to have a holiday on the grounds of health. The median income levels of this group are still above those who gave direct monetary reasons (no money for this, not a priority) but they are somewhat less than those who didn't want a holiday or said it wasn't relevant for them.

**Figure 5.2 Income levels: A week's holiday – removing disability benefits from income**



We may conduct a similar analysis for another question that a significant proportion did not report doing – going out on a monthly basis. Median incomes for different replies to this question are shown in Figure 5.3. Again, those citing direct monetary reasons for the absence have the lowest incomes, followed by those mentioning health or the lack of another person to help. The highest incomes – comparable to those actually having the item – were associated with those saying the concept was not relevant to them. Those saying they did not want the item also tended to have higher incomes than those giving the other types of reasons why they did not go out socially each month.

**Figure 5.3 Income-levels: Socialise each month**

Another means of looking at links to income is to look at correlations. In Table 5.1 we show the association between income<sup>4</sup> and responding with any of the different reasons why people did not have a particular item. Only the statistically significant results are shown. The bottom of the table also calculates the number of significant correlations, and a crude ‘average size’ of correlation. For one question – one filling meal each day – there was no link between income and giving any of the reasons. This might be related to the very small number of people (one per cent) who did not meet this standard.

This approach enables us to provide an overall summary of the association between income and lacking each item, and the reason(s) why. The monetary reasons were the most strongly related to income (particularly those saying they didn’t have the money for any item). Next, the reasons linked to health. And, typically attracting the weakest links to income, those mentioning that something was not wanted, irrelevant, or missing for ‘other’ reasons.

<sup>4</sup> The income concept used is at benefit unit level, minus disability benefits, equivalised, and in logarithmic form.

**Table 5.1 Correlation of each response, with log (income)**

<i>Correlations with log income (only shown if statistically significant)</i>								
<b>Question</b>	<b>Do not have the money</b>	<b>Not a priority</b>	<b>Health</b>	<b>Too much trouble</b>	<b>No one to help me</b>	<b>Not wanted</b>	<b>Not relevant</b>	<b>Other</b>
Regular bills	-.099**	-.035**					-.041**	
Warm coat		-.037**						
Replace cooker	-.146**	-.052**					-.046**	-.027*
Damp-free	-.067**				-.026*			-.043**
Friends or family	-.063**	-.057**		-.038**				
Hair done	-.110**	-.057**	-.052**					-.029*
Heating, electrics	-.070**							
Holiday	-.158**	-.084**	-.078**	-.032*	-.038**			
Home state	-.086**	-.063**			-.029*		-.026*	
Filling meal								
Out socially	-.096**	-.084**	-.082**	-.033*	-.041**			
Telephone	-.072**	-.031*					-.026*	
Car	-.110**	-.079**	-.041**		-.038**	-.039**	-.026*	-.036**
Warm home	-.070**							
<i>Unweighted avg correlation</i>	<i>-0.08</i>	<i>-0.04</i>	<i>-0.03</i>	<i>-0.02</i>	<i>-0.02</i>	<i>-0.01</i>	<i>-0.01</i>	<i>-0.01</i>
Number of sig correlations	12	10	4	3	5	1	5	4

Note: \* indicates significant the 5% level, and \*\* at the 1% level.

## 6 Adding up the separate questions

So far we have looked at the individual questions, in order to assess their validity and reliability. We have also looked at the different reasons why people do not have each of the 15 goods or activities asked about, and the links to income. In terms of turning the individual questions into an overall measure of material deprivation, there are now three key choices to make.

- First – which of the follow-up codes to treat as deprivation. This could be a narrow definition (only those unable to afford the item), or a broader definition (lacking the item for any, or at least most, of the possible reasons).
- Second – whether to treat the lack of some items as being more important than others – as happens with the prevalence-based weighting approach used for the child deprivation measure.
- Third – whether to treat each response code equally, or instead to weight in some way.

### 6.1 Overall deprivation indices

We may calculate deprivation using different combinations of the follow-up codes. With eight follow-up responses which we might choose to include or exclude, in principle we could arrive at  $2^8$  different scales (a total of 256 alternatives). It is, therefore, important to be guided by the conceptual purposes of the scale, plus some insight from the data analysis already conducted (average incomes of those giving different responses). In Table 6.1 we show the conceptual issues at stake. We have two questions closely related to inability to afford, and perhaps three more closely related to choice. In the middle we have a further set of responses that seem to imply an enforced lack of different items, but not necessarily a lack that is directly related to financial resources.

We have seen, moreover, that those giving answers in this ‘grey area’ have somewhat lower incomes than those who tended not to want particular items, but perhaps slightly higher incomes than those citing direct monetary reasons. This analysis was presented in Chapter 5 of this report.

**Table 6.1 Locating responses on the affordability/desirability continuum**

	Cannot afford ←	↔	→ Do not want
Don't have the money	X		
Not a priority for me		X	
Health/disability		X	
Too much trouble		X	
No one to do this with		X	
Not something I want			X
Not relevant to me			X
Other (not on showcard)		X	

In Table 6.2 we show eight scales that seem to have certain advantages and key features. They range from very broad measures to more narrow measures. So, scale 0 just records any absence of a good or activity, for any reason. Scale a only regards a person as deprived if they say they do not have the money for this. For scale b this is extended to the response that it isn't a priority on their current income, and so forth.

**Table 6.2** Different approaches to defining deprivation

Response codes	Scales derived							
	0	a	b	c	d	e	f	g
1 I do not have the money for this.	X	X	X	X	X	X	X	X
2 This is not a priority for me on my current income.	X		X	X	X	X	X	X
3 My health/disability prevents me.	X				X	X	X	
4 It is too much trouble/too tiring.	X				X	X	X	X
5 There is no one to do this with or help me.	X			X	X	X	X	X
6 This is not something I want.	X							
7 It is not relevant to me.	X						X	X
8 Other (not on showcard).	X					X	X	X
9 Don't Know ( <i>not on showcard</i> ).	X							

Beyond the basic summation of different follow-up codes, treating each question equally, there are two further approaches that provide variations – where each question is not treated equally. First, prevalence weighting, and second differential weighting of the follow-up codes. We look at each in turn.

## 6.2 Weighting

### 6.2.1 Using prevalence weighting

The aim of prevalence weighting is to give a higher weighting to those items that are more commonly possessed, and a lower factoring in of items that fewer people are able to enjoy. In the most common application of this approach, the weight becomes the proportion of people that have the item. Since 99 per cent of older people have one filling meal a day, those who do not have this (for whatever reason, in this example) are assigned a weight of 0.99, whilst those lacking a holiday (which 56.4 per cent have) receive an increment of only 0.564. The sum of all these different weights then varies on a relatively continuous scale from 0 to some upper limit (13.2, reflecting the worst case scenario of lacking each item). It is customary to then re-scale this number to a more easily interpreted measure, such as from 0 to 100. We again follow this practice.

The conceptual advantage of this approach is that it seems plausible that lacking something that more people have indicates a higher level of material disadvantage (Halleröd 1994). The arguable downside is that those items with almost complete coverage tend to be unresponsive to income differences, and therefore, less clearly connected to material circumstances (they are less ‘income-elastic’).

### 6.2.2 Using differential weighting of the response codes

A second approach to achieving finer grained control is to weight the follow-up codes differently, rather than treating their inclusion as either/or (as above). A possible schema is shown in this table, based on past analysis of the links between each of the codes and average incomes.

**Table 6.3 A possible weighting for different follow-up questions**

<b>Response codes</b>	<b>Weighting, where relevant</b>
1 I do not have the money for this.	1
2 This is not a priority for me on my current income.	1
3 My health/disability prevents me.	0.5
4 It is too much trouble/too tiring.	0.5
5 There is no one to do this with or help me.	0.5
6 This is not something I want.	-
7 It is not relevant to me.	0.5
8 Other (not on showcard).	0.5

### 6.3 Unexpected expense question

Fourteen of the new FRS questions follow a similar format in how they are asked. There is also a final question about whether people would be able to meet an unexpected expense of £200. If so, people are then asked how they would be able to cover such a cost. There are sizeable income differences between those able, and not able, to meet an unexpected expense of this level (see Table 6.4).

**Table 6.4 Able to pay an unexpected expense of £200?**

	<i>Average incomes</i>			
	<b>Income (equiv)</b>		<b>N</b>	<b>Percentage</b>
	<b>Mean</b>	<b>Median</b>		
Yes	£465	£378	5077	86
No	£330	£319	852	14
All	£446	£366	5929	100

There are also important differences in the incomes available according to how they would meet this expense (Table 6.5).

**Table 6.5 How would pay the expense**

<b>If can meet unexpected expense, how they would</b>	<i>Average incomes</i>			
	<b>Mean</b>	<b>Median</b>	<b>N</b>	<b>Percentage of responses</b>
Use own income but cut back	£487	£360	723	14
Use own income not cut back	£572	£467	1428	27
Use savings	£408	£355	2891	54
Use a form of credit	£494	£424	185	3
Get the money from friends	£329	£304	90	2
Other	£410	£329	33	1

Certainly, an answer of ‘no’ may be taken as an indication of deprivation. The financial circumstances of those who would pay, but get the money from friends, are very similar to this group. Moreover, this is the only code to have a positive correlation with at least some of the putative deprivation indicators (and, marginally statistically significant). In principle, the answer ‘use a form of credit’ might also raise suspicions of deprivation, but this group do not appear to be low income. This may be stating an age-based preference for how to manage money – twice as high a proportion of those aged 65-69 said this, compared to those aged 75+. It is also likely that this reflects the differential availability of credit – those on lower incomes are less likely to be permitted access to credit.

These pieces of evidence point towards treating those who state getting money from friends (and possibly from credit) as also equating to being deprived – just as if they had said they could not afford the unexpected expense. This may be added to the existing scales in the same prevalence-weighted manner.

### 6.4 Comparison of the different approaches

Some results for the different scales are shown below. In Table 6.6 we consider the associations between each of the overall indices of material deprivation, and the income and capital of respondents. These results indicate relatively little to choose between scales d-g. The more narrow scales (a-c) show somewhat less of an association with measures of command over resources.

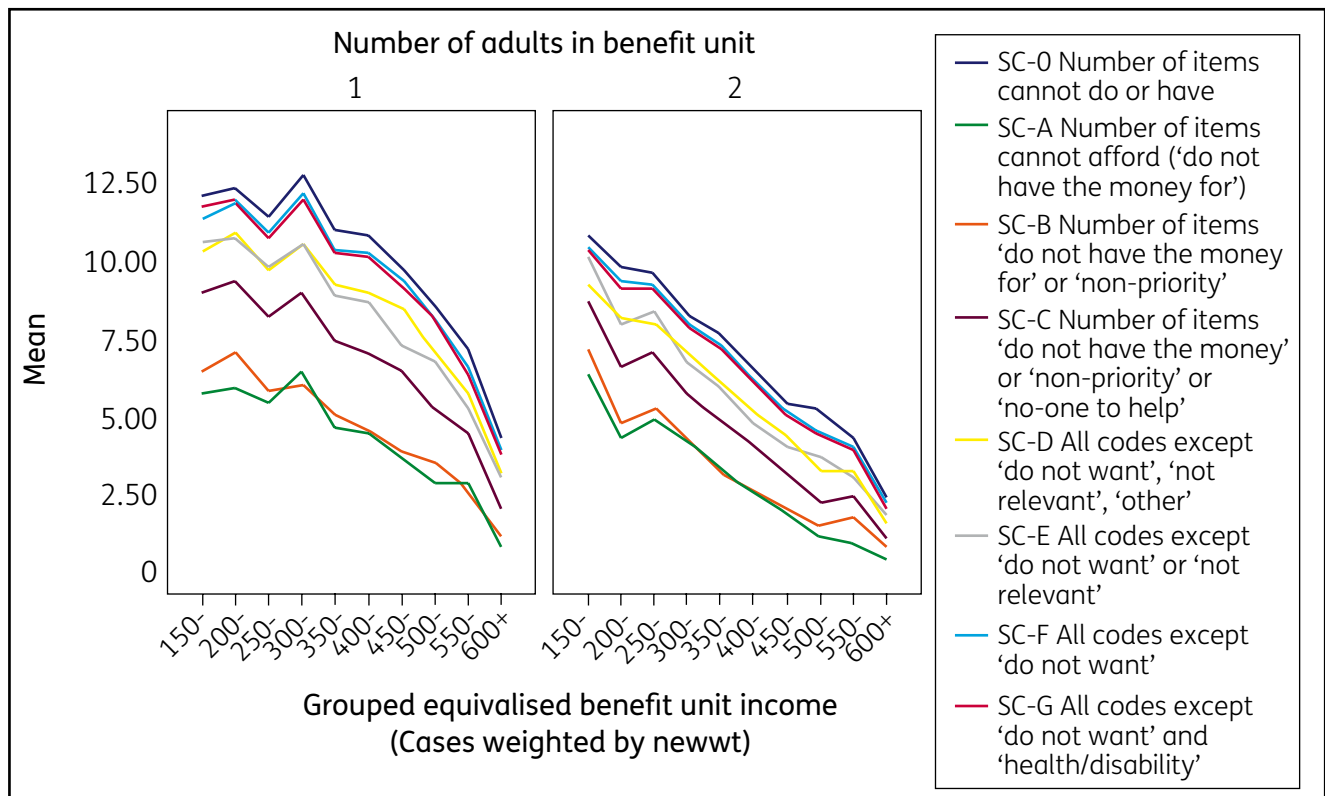
**Table 6.6 Comparison of the different scales**

	0	a	b	Scales derived				
				c	d	e	f	g
<b>Average values</b>								
Standard	1.4	0.5	0.7	0.9	1.1	1.3	1.3	1.1
Prevalence weighted	8.4	3.1	4.4	5.3	6.8	7.7	7.8	6.6
Prevalence weighted, differential follow-ups	8.4	3.1	4.4	4.6	5.6	6.0	6.1	5.5
<b>Correlation with eqv benefit unit income</b>								
Standard	-0.20	-0.14	-0.16	-0.18	-0.19	-0.19	-0.19	-0.18
Prevalence weighted	-0.19	-0.14	-0.16	-0.17	-0.18	-0.18	-0.18	-0.17
Prevalence weighted, differential follow-ups	-0.19	-0.14	-0.16	-0.16	-0.17	-0.18	-0.18	-0.17
<b>Correlation with logarithm of income</b>								
Standard	-0.23	-0.18	-0.22	-0.22	-0.22	-0.22	-0.23	-0.23
Prevalence weighted	-0.22	-0.17	-0.21	-0.22	-0.22	-0.22	-0.22	-0.22
Prevalence weighted, differential follow-ups	-0.22	-0.17	-0.21	-0.21	-0.22	-0.22	-0.22	-0.22
<b>Correlation with BU capital</b>								
Standard	-0.15	-0.11	-0.13	-0.14	-0.15	-0.15	-0.15	-0.14
Prevalence weighted	-0.14	-0.11	-0.12	-0.13	-0.14	-0.14	-0.14	-0.13
Prevalence weighted, differential follow-ups	-0.14	-0.11	-0.12	-0.12	-0.14	-0.14	-0.14	-0.13



We may also look at the association with income, in graphical format (see Figure 6.1). All of the various measures (from broader to narrow) show the expected relationship with income. Material deprivation appears somewhat higher for those living without a partner, even after equalisation of income.

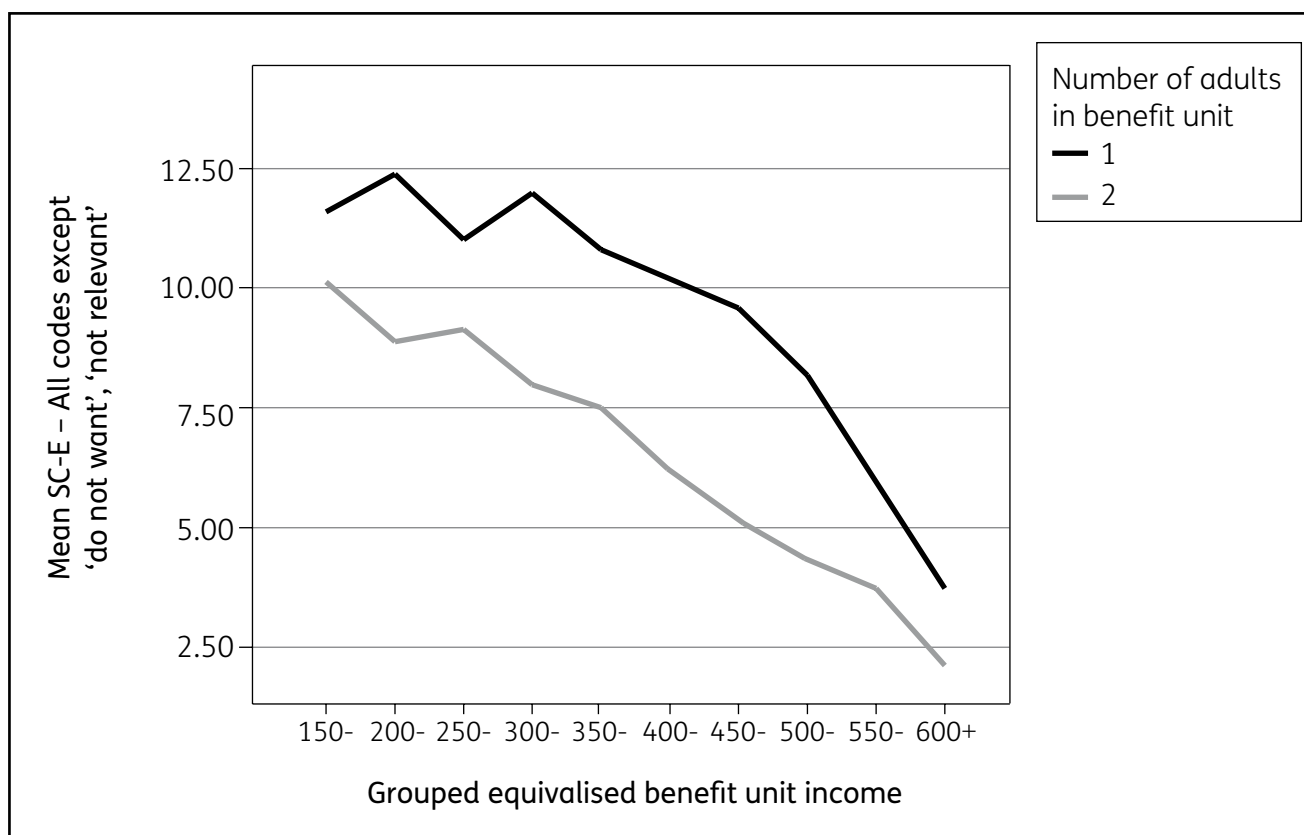
**Figure 6.1 The association between income and the different measures of material deprivation (all prevalence weighted)**



## 6.5 Using the overall index

In this section we look at how the association between income and deprivation is mediated by different socio-demographic characteristics. To simplify the presentation we focus on a particular measure of material deprivation, scale e, which is a broad measure. It counts people as deprived if they lack items **unless** that is because they don't want them or because it is not relevant to them. Figure 6.2 serves to confirm the general impression created by Figure 6.1, above. For those on the same level of equivalised income, material deprivation is higher for single adults compared to couples. It also seems to fall faster among couples, particularly those on middle income. Deprivation remains higher among single people, even those on income above £600pw.

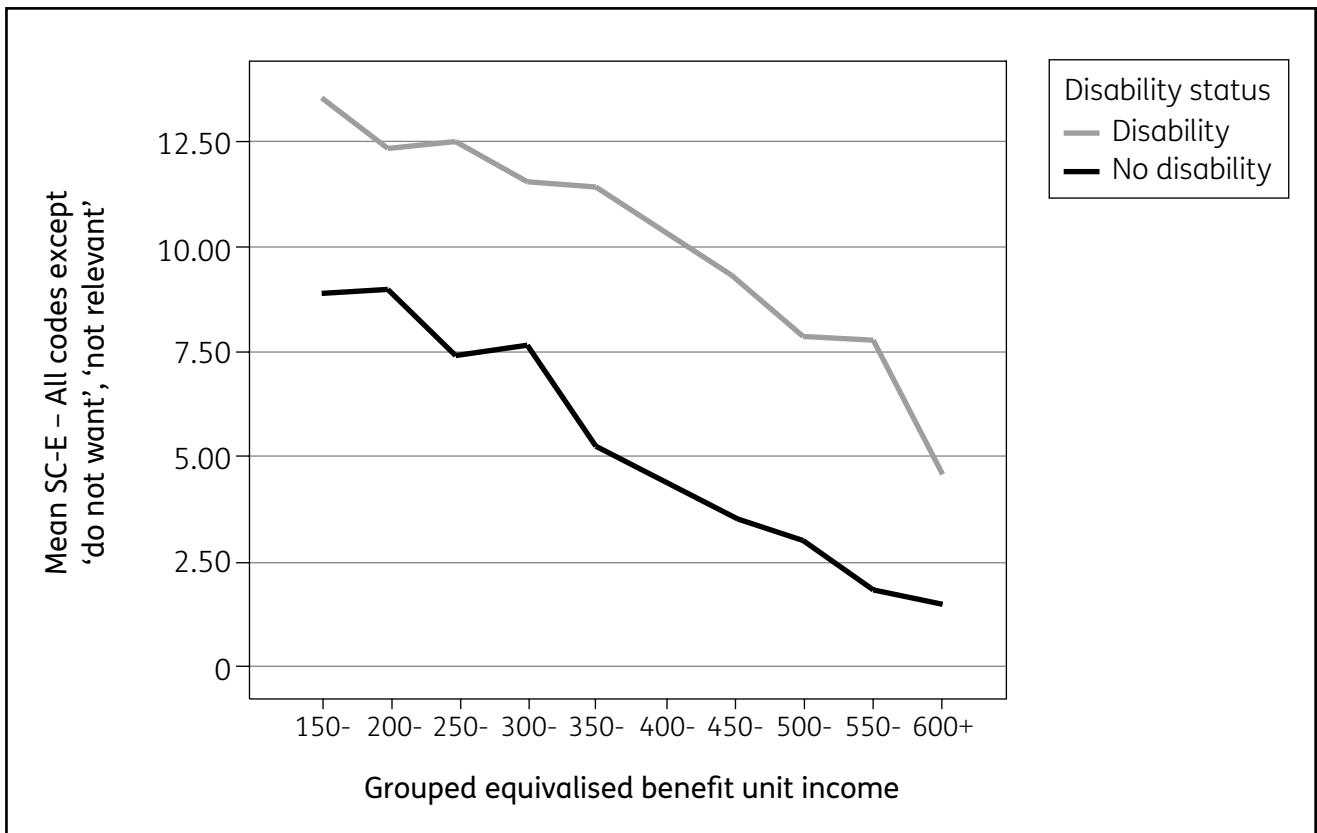
**Figure 6.2 Lacking particular levels of a prevalence-weighted score [scale e concept]**



In Figure 6.3 we examine the effect of disability<sup>5</sup> on levels of material deprivation. Disabled older people experience higher levels of material deprivation than non-disabled people on the same level of income. This is despite disability benefits being included in this measure of income. This additional effect on deprivation of being disabled appears to occur throughout the income distribution, though is somewhat reduced for those with incomes exceeding £600 per week. Removing disability benefits would tend to show disabled people as even worse-off, compared with their non-disabled counterparts.

<sup>5</sup> This is measured using the 'DISDIF' variables in the FRS, with any 'yes' answer to any of the nine questions indicating disability. These questions cover the definition of disabled people – those with a longstanding illness, disability or infirmity, and who have a substantial difficulty with day-to-day activities. All of those in this group meet the definition of disability in the Disability Discrimination Act (DDA). There also other people who may have rights under the DDA.

**Figure 6.3 Lacking particular levels of a prevalence-weighted score [scale e concept] by disability**



# 7 Identifying an appropriate threshold for material deprivation

## 7.1 Introduction

There are a number of possible approaches available to identify a relevant threshold to indicate deprivation. There is no definitive, single right answer to setting such a threshold. Instead, there are a number of statistical approaches that may be used to help discipline and guide informed judgement about where such a line should be set. We may divide such approaches into two main groups, as follows:

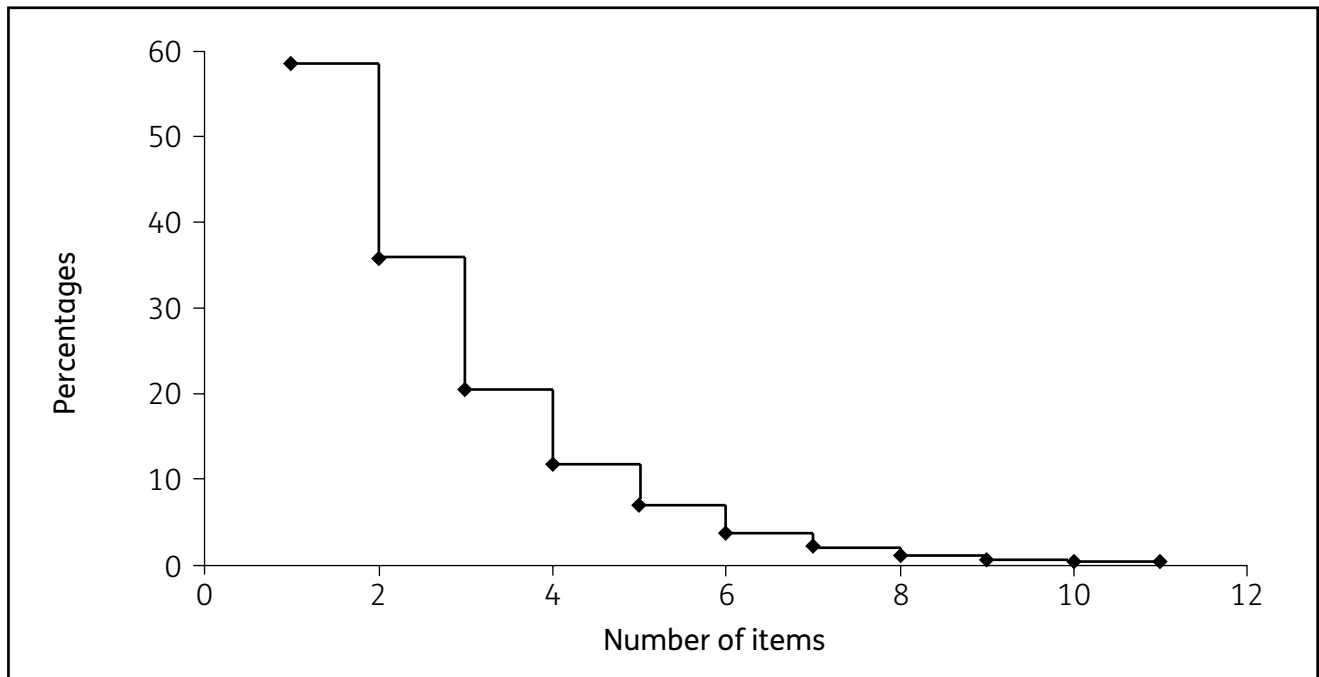
- Judgement, guided by statistical analysis – selecting a threshold that roughly corresponds to the proportion expected to be materially deprived. This might (or might not) be linked to the level of income poverty identified.
- A variety of statistical approaches that, typically, seek to exploit the presumed strong link between material deprivation and incomes and to identify a threshold purely on statistical grounds. Such approaches include:
  - Regression/General Linear Model (GLM) approach.
  - A technique like Receiver Operating Characteristic (ROC) curves may be used to find relevant cut-offs as a means of identifying lower-income groups

It is worth noting that our task should be somewhat eased by the need to look at trends. Past studies have tried to identify optimal cut-off points from cross-sectional data. The requirement here is at least partly to track changes over time. We should try to find the ‘best’ line on the basis of current data, but it is also important to see effects over time.

A key practical advantage of the prevalence weighted approach is that it allows for finer-grained control over where to place a cut-off for being materially deprived. When using a standard summation of the missing items, the available cut-offs would give step-changes in the number who count as deprived. This is illustrated in Figure 7.1. There is a choice to be made between a fixed series of steps – those lacking (say) two, three or four or more items from the full list, with deprivation then said to affect one-third, or one-fifth or one-tenth of the older age group, respectively.

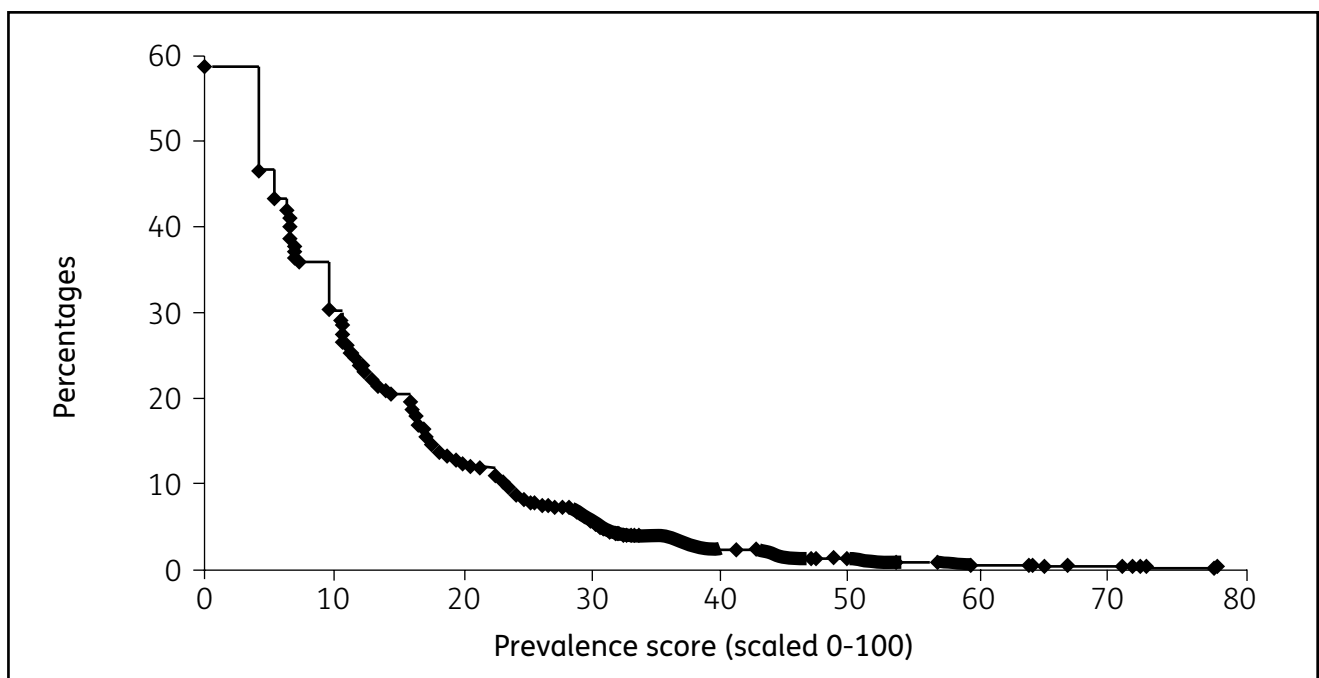
This flexibility comes at the cost of increased complexity and decreased transparency of what is being measured. It is far easier to explain that someone is lacking two items from a list, than to explain how a score of 20 on a prevalence-weighted scale has been arrived at. This has not prevented the child deprivation index being calculated in this way, but for a new measure it is important to again look at such issues.

**Figure 7.1 Lacking particular numbers of items [scale e concept]**



If, however, we adopt a prevalence weighting approach then the comparable graphic is displayed as Figure 7.2. This provides a greater degree of ‘control’ over where to place a cut-off. The underlying data is not strictly continuous – it is still the sum of a set of fixed numbers – but the number of potential cut-off points is very much greater (especially in the range from 30 per cent to 10 per cent in material deprivation). Of course, there are also conceptual reasons for preferring a measure of this kind (see Section 6.2) rather than treating all items as equally important in measuring deprivation.

**Figure 7.2 Lacking particular levels of a prevalence-weighted score [scale e concept]**



## 7.2 Judgement

Where indices are prevalence-weighted, scales routinely adjusted to range from 0 (no deprivation) to 100 (theoretical maximum). The child poverty deprivation index (with more items, and different rates of them being missing) uses a threshold of 25, but the figures will not be directly comparable given that they are based on different questions. The child poverty threshold was set using judgement augmented by statistical analysis, and was set so that roughly the same proportion of children were materially deprived as were in low income households.

In Table 7.1 we show the consequences of four different thresholds, ranging from a very liberal level (with three in ten regarded as materially deprived) to a more conservative level (with only eight per cent then classified as materially deprived). We show a range of different characteristics associated with the threshold set at different points, including the receipt of other benefits, income and whether behind with bills.

With a low threshold, more people are classified as deprived. With a level set at 10, with 30 per cent then deprived, just over one third (37 per cent) received Pension Credit. This compares with 46 per cent receiving means-tested support with a threshold set at 25. The proportion behind with bills also increased from three to nine per cent for this comparison: it is worth noting that only 1.4 per cent of pensioners, overall, were behind with any of their bills, so these display a fairly marked gradient<sup>6</sup>.

**Table 7.1 Effect of different thresholds for material deprivation**

	Level = 10	Level = 15	Level = 20	Level = 25
Percentage deprived (benefit units)	30.2	20.5	12.2	7.9
Average score (if deprived)	21	26	32	37
Receive Pension Credit/Income Support	37	40	44	46
Some income from disability benefits	34	36	36	37
Behind with bills	3	4	6	9
Percentage deprived (adult level)	28.0	18.9	11.2	7.5
Median income: deprived	£323	£316	£313	£311
Median income: not deprived	£402	£392	£385	£382

In Table 7.2 we illustrate the kinds of situations that are classified as being deprived on each of these thresholds. In each case we are showing those who only just make the criterion for being materially deprived. There will be cases with somewhat greater levels of deprivation in each band.

<sup>6</sup> The FRS still contains this arrears data for older people, and hence it could be included in an index of deprivation. However, rates of arrears are, as mentioned, very low.

**Table 7.2 Meaning of different thresholds of material deprivation**

Threshold	Deprived percentage	Groups that are (just) deprived on each threshold
10	28.0	No access to car, no holiday
15	18.9	No holiday (health), cannot meet £200 expense, no social outings each month (non-priority)
20	11.2	Cannot meet £200 expense, no regular hair cut (no money for this), home not kept adequately warm (no money for this)
25	7.5	Don't see friends (non-priority), no holiday (non-priority), no access to a phone (no money for this), no car access (non-priority).

This presentation tends to suggest that a threshold around the 20 mark would be seen as plausible, and would remain consistent with fewer pensioners being materially deprived than other groups. Such a result would be consistent with other studies of material deprivation, though with a smaller gap than with studies not attempting questions specific to the older age group. It would equate (roughly speaking) to an enforced lack of about three items – which was the threshold used in the original Breadline Britain study (Mack and Lansley 1985), although the later 1999 study (Gordon *et al.* 2000) used a threshold of lacking **two** or more items as indicating deprivation. If we use that threshold of 20, where 11 per cent of adults in pensioner units are materially deprived, then the composition of the deprived and non-deprived is illustrated in Table 7.3. There are higher than average levels of material deprivation in the North West and in London, plus Northern Ireland. Those who are deprived were also more likely to be tenants, and living in a flat, disabled, and living alone. They were also less likely to have any savings, or to have only modest savings.

**Table 7.3 Composition of deprived and non-deprived**

<i>Cell percentages</i>	
<b>More materially deprived than average</b>	<b>Less materially deprived than average</b>
North-West, London, Northern Ireland	Eastern, South-East
Living in a flat	Lives in a house
Tenants	Homeowners
Minority ethnic groups	White
Disabled	No disability
Inactive	Employed
Has one adult	Two adults
Divorced, widowed	Married
Savings <£1500	Savings >£20,000
Consented to DWP data linking	Didn't consent

### 7.3 Statistical approaches to setting the threshold

There are a number of statistical approaches that may be used to set a threshold for deprivation. We considered both GLM-based and ROC-curve methods.

### 7.3.1 Regression/GLM framework

In some past research, the selection of an ‘objective’ cut-off point between deprived and non-deprived has been attained using a regression or GLM approach. In this approach, different levels of deprivation are tested to establish which one produces the greatest variation of incomes between deprivation groups, and the least income variation within groups. A variety of levels are tested (lacking 1+ items, 2+ items, etc.) and the one selected that breaks up the variance in income in the best manner.

This was the approach used by Gordon *et al.* (2000, Appendix 2). The dependent variable used was income. A succession of different thresholds are tested that put people into a deprived and a non-deprived group, and the independent variable was then the binary grouping that resulted – plus a number of control variables (number of adults, number of children). The Analysis of Variance (ANOVA) model with the highest F-statistic was used to identify the best fitting model<sup>7</sup>.

This approach accords primacy to the role of income. As we have discussed, a key reason for using indicators of material deprivation is to break free of a reliance on income. For older groups, savings may be rather more significant than for the population as a whole, and it is the wider population which has normally been investigated to identify relevant cut-off thresholds for deprivation. The method is also, clearly, more difficult to operationalise with a prevalence-weighted score that takes on many more distinct values than a simple summed index. When this approach was tried for the FRS data, the statistical tests suggested taking a very low threshold for deprivation – the wider the scope of the deprivation group, the ‘better’ the fit of the models. This may relate, at least in part, to the lack of a consistent link between income and deprivation at the lower end of the income distribution.

### 7.3.2 ROC curves

An arguably more flexible, less parametric approach is ROC analysis. On this occasion, we take being in the lowest quintile as the outcome measure, and Scale e (prevalence-weighted) as the means of identifying this, and consider which threshold makes for an optimal classification. ROC analysis indicates the trade-off between the **sensitivity** of any measure (how many above a given deprivation level are lower income) and its **specificity** (essentially, the ‘false positive’ rate at each threshold). This is a non-parametric approach that may provide insight into identifying a relevant cut-off point for deprivation.

Again, success was limited in practical terms. This provides another reminder that deprivation indicators are used precisely because they do not do the job of replicating income measures. What statistical evidence we did derive pushes us towards a more inclusive definition (low cut-off) rather than a narrower definition of material deprivation (high cut-off).

In each case, the purely statistical evidence would propose a low cut-off point for deprivation, but relying heavily on the association between deprivation and low income, a fit that is important but not overwhelming. The results based on judgements about the meaning of deprivation point towards a rather higher threshold as indicating material deprivation.

An important feature of these statistical approaches is that they tend to rely on the association between income and material deprivation to reach their conclusions. Approaches based more directly on judgement look only at material deprivation itself. The link to income may then be included through having a joint measure of (income) poverty and (material) deprivation, that counts towards the poverty measure only those who are both low income and materially deprived.

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<sup>7</sup> They also used logistic regression, with the deprivation group = f (Income, family composition), and discriminant analysis. Each belongs to the GLM family of statistical models.



### 7.4 Updating the threshold over time

Once a threshold level of deprivation is established, this should remain in place for the lifetime of the underlying questions. If those questions are changed, then it will be necessary to reconsider the appropriate cut-off point. The approach taken with the measurement of child deprivation was that a five-year time horizon was an appropriate point at which to re-examine the questions. This would be a sensible planning assumption for looking at deprivation more widely, including for the older age group. To avoid significant 'breaks' in the time series, new questions would need to have approximately the same incidence in the population as the questions they replace. Even so, when questions change it would be appropriate to at least consider if the threshold for measuring deprivation should also change.

If questions are changed then, if resources permitted, the best practice would be to have a year (or, at least, a reasonable number of months) during which both the 'new' and 'old' questions were asked in the FRS. This would enable analysts to calculate a new threshold that yielded the same proportion in deprivation on either measure, at the point of cross-over of the different sets of questions. Such a new threshold could then be carried forward in future waves using only the new questions. Taking this approach, with a period of overlap, would be particularly important if the incidence of lacking items on the new questions was somewhat different to that of the questions that they replaced.

## 8 Conclusions and recommendations

The analysis conducted above leads to a number of relatively clear recommendations for constructing an index of material deprivation among older people. This set of recommendations is based on a combination of past experience with material deprivation indices, and statistical analysis of the new set of questions on FRS. The set of questions was itself established only after significant testing (see McKay 2008 for further details).

First, it is sensible to use all the existing questions from the new FRS question block. There is no reason to exclude any, at least on statistical grounds. It is arguable that a few do not contribute all that much, as there are already very high levels of ownership, but each retains the expected association with incomes and other measures of command over resources. On an individual basis, the questions are, therefore, working well.

In looking at the different follow-up codes used for the questions, it seems that a relatively broad set of definitions needs to be included. In particular, that the codes relating to health and disability should be regarded as indicating material deprivation. The case for doing this becomes clearer once disability benefits are removed as a source of income. It is possible to give differential weight to the different follow-up questions, to reflect some differences in the resources of these groups, but this seems to introduce a fair bit of additional complexity without producing a more credible final scale. The resulting index is no more reliable or valid than one based on treating each follow-up code equally.

The case for using prevalence-weighting for each question, or instead to sum up the number of whole items lacking, is more balanced. The prevalence-weighted approach gives more importance to those goods enjoyed by the greatest number of people, rather than the absence of each good being treated as equivalent to the absence of any other item. In addition to this conceptual justification, prevalence-weighted scores allow for a greater degree of control over where to set the appropriate threshold to determine material deprivation. Simply counting each missing item, with equal importance, means there will only be a limited number of cut-points with step changes between them. It is also arguable that such a measure might include greater volatility over time, with people moving to a greater extent following a change in a single item than would occur with the prevalence-weighted approach. Prevalence-weighting still creates an index with a finite number of cut-points, but there are rather more cut-points from which to select an appropriate threshold.

It would, however, be wrong to be too strongly focused on the cross-sectional issue of where to set the line, when a key function of that line is to track progress over time. We are looking at how the number of materially deprived older people changes over time, not just at the number who are deprived in 2008/09. It is also likely that, whatever the cut-off point chosen, analysts will also want to look at points above and below any set line, indicating more severe and more moderate material deprivation, in following changes over time. That certainly applies to income poverty and the use of different proportions of the median to indicate different depths of income poverty.

Prevalence-weighted scores are routinely translated into scales ranging from zero (no deprivation) to 100 (the maximum possible, when all items would be lacked through an inability to obtain them). On the basis of judgement, and some degree of statistical analysis, a cut-off point in the range 15-20 would be defensible and credible. A threshold of 25 is used within the child poverty measure, but these numbers are not directly comparable (because the set of questions and the relative prevalence of those items are different).

Having identified a range of 15-20 as capturing the best information about material deprivation and being defensible on academic grounds, that leaves open a wide range of deprivation from just over one in ten, to close to one in five. How might we select a threshold that narrows this down to a single figure (or at least a narrower range)? Having a large number in material deprivation would allow for measuring greater progress over time, compared to a more restricted number. The limited overlap between income poverty and material deprivation might also argue for a lower threshold (and hence a higher number experiencing a degree of material deprivation). It would also be possible to select a threshold that equalled, or was close to, the same percentage of pensioners who are observed as being in income poverty in the latest figures – which is around 16 per cent.

The questions asking about material deprivation among older people will need to be reviewed over time, as people's expectations change, the prices of different goods changes, and technical innovation changes the array of products that people may wish to have. For the child poverty measure a five-year time horizon was set, and recently the questions reviewed. This led to some change, albeit relatively modest in the light of the number of questions asked. Such a time horizon would appear sensible for the older age group.

# Appendix A

## The new FRS material deprivation questions for older people (FRS May 2008 onwards)

Q1a) INTERVIEWER READ OUT.... 'I am going to read out a list of questions about items related to people's standards of living. For each one, please answer yes or no.'

ITEM A: Do you eat at least one filling meal a day?

ITEM B: Do you go out socially, either alone or with other people, at least once a month?

ITEM C: Do you see your friends or family at least once a month?

ITEM D: Do you take a holiday away from home for a week or more at least once a year?

ITEM E: Would you be able to replace your cooker if it broke down?

ITEM F: Is your home kept in a good state of repair?

ITEM G: Are your heating, electrics, plumbing and drains kept in good working order?

ITEM H: Do you have a damp-free home?

ITEM I: Is your home kept adequately warm?

ITEM J: Without cutting back on essentials, are you able to pay regular bills like electricity, gas or Council Tax?

ITEM K: Do you have a telephone to use, whenever you need it?

ITEM L: Do you have access to a car or taxi, whenever you need it?

ITEM M: Do you have your hair done or cut regularly?

ITEM N: Do you have a warm waterproof coat?

ITEM O: Would you be able to pay an unexpected expense of £200?

YES/NO responses

Follow up question for unexpected expense item:

If answer yes at Q1a item O, ask follow up question:

Q1b. 'How would you pay for this [unexpected expense of £200]?'

SHOW CARD

INTERVIEWER CODE ALL THAT APPLY

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I would use my own income but would need to cut back on essentials

I would use my own income but would not need to cut back on essentials

I would use my savings

I would use a form of credit (for example, credit card or take out a loan)

I would get the money from friends or family as a gift or loan

Other (not on showcard)

DK (not on showcard)

**Q2. INTERVIEW READ OUT...** 'I am now going to ask you about each of the things you said you do not do or have. Selecting your answers from this card, please tell me why this is.'

Why do you not/would you not be able to ['item where no stated at question1a?']

Note: for item F and item I the question wording is slightly different to the rest.

These items need to be asked as follows: Why is your home not kept in a good state of repair? Why is your home not kept adequately warm?

SHOW CARD

INTERVIEWER CODE ALL THAT APPLY

1. I do not have the money for this
2. This is not a priority for me on my current income
3. My health/disability prevents me
4. It is too much trouble/too tiring
5. There is no one to do this with or help me
6. This is not something I want
7. It is not relevant to me
8. Other (not on showcard)
9. Don't Know (not on showcard)

# Appendix B

## Results of factor analysis

KMO = 0.786. Bartlett’s test, chi-sq(105) = 9550, p<0.001; N =5929 benefit units.

**Table B.1 One-factor solution**

<b>Factor Matrix</b>	<b>Factor 1</b>
OAEXPNS Would you be able to pay an unexpected expense of £200?	.635
OACOOK Would you be able to replace your cooker if it broke down?	.627
OAHOME Is your home kept in a good state of repair?	.445
OABILL Without cutting back on essentials, are you able to pay regular bills like electricity, gas or Council Tax?	.403
OAHOL Do you take a holiday away from home for a week or more at least once a year?	.377
OAHEAT Are your heating, electrics, plumbing and drains kept in good working order?	.376
OAHAIR Do you have your hair done or cut regularly?	.370
OATAXI Do you have access to a car or taxi, whenever you need it?	.357
OAWARM Is your home kept adequately warm?	.356
OAOUT Do you go out socially, either alone or with other people, at least once a month?	.327
OADAMP Do you have a damp-free home?	.292
OAPHON Do you have a telephone to use, whenever you need it?	.266
OACOAT Do you have a warm waterproof coat?	.265
OAFRND Do you see your friends or family at least once a month?	.207
OAMEAL Do you eat at least one filling meal a day?	.187

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 4 iterations required.

**Table B.2 Two-factor solution (with varimax rotation)**

Rotated Factor Matrix	Factor 1	Factor 2
OAEXPNS Would you be able to pay an unexpected expense of £200?	.664	.185
OACOOK Would you be able to replace your cooker if it broke down?	.621	.218
OAHOL Do you take a holiday away from home for a week or more at least once a year?	.411	
OATAXI Do you have access to a car or taxi, whenever you need it?	.361	.104
OABOUT Do you go out socially, either alone or with other people, at least once a month?	.360	
OAHAIR Do you have your hair done or cut regularly?	.317	.184
OABILL Without cutting back on essentials, are you able to pay regular bills like electricity, gas or Council Tax?	.294	.273
OACOAT Do you have a warm waterproof coat?	.260	
OAPHON Do you have a telephone to use, whenever you need it?	.242	.114
OAFRND Do you see your friends or family at least once a month?	.203	
OAMEAL Do you eat at least one filling meal a day?	.132	.132
OAHHEAT Are your heating, electrics, plumbing and drains kept in good working order?		.599
OAHOME Is your home kept in a good state of repair?	.196	.521
OADAMP Do you have a damp-free home?		.392
OAWARM Is your home kept adequately warm?	.162	.391

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

# Appendix C

## Missing data within the pensioner material deprivation questionnaire

In this section we consider the extent of missing data. Item-missing data is where there are specific questions with missing responses, but respondents do answer at least some questions. Where individuals are not taken through the questionnaire at all, we describe this as being structurally-missing data (if they answer alternative questions) or a case of complete non-response. We analyse the extent of each, and different ways that the absence of data may be tackled. So there are three key groups: those refusing a few questions or unable to provide an answer (item-missing); those refusing the whole block (complete non-response); and, those answering other questions on deprivation (for example, because there are children within the household), or structurally missing cases.

It is worth noting that it is much more plausible to impute real information for missing data in the case of item-missing questions. Respondents' answers to other questions within this block may help to produce those imputations. Attempting to model what the answers might have been, when no questions have been answered and the case is, therefore, completely missing deprivation data, requires more heroic assumptions about the determinants of deprivation. We have already commented upon the lack of a close fit between income and deprivation; imputation for the overall state of being deprived would, therefore, be problematic simply using income. That would also be likely to bias a measure based jointly on income and deprivation. However, it might be more plausible to impute deprivation among the older age group if they have answered alternative deprivation questions (such as the child and adult deprivation questions).

### Item-missing data

A total of 6,742 respondents were asked each of the 15 main questions on material deprivation, **and answered at least some of them**. In this section we examine the patterns of non-response among those answering at least some of the deprivation questions – the next section (structural missing data) looks at total non-response to the section where none of the questions are answered.

Across these questions, the proportions of missing responses – that is, those saying **Don't Know** or refusing to provide an answer – had a very low average of 0.13 per cent. The most commonly declined questions were whether people could afford to replace their cooker (0.6 per cent, formed of 35 don't knows and 4 refusing) and if they could meet an unexpected expense (0.4 per cent, comprising 27 don't knows and 3 refusing). There may be perceived to be a certain similarity in the intent of the questions, generating such similar proportions of missing data.

Of the 6,742 people who were asked this block of questions, some 6,665 completed each question without any missing codes (98.86 per cent, therefore, provided complete information). Of these 77 people missing at least one response, 61 declined to answer just one question.



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Taken as a group, this 1.1 per cent of eligible respondents were slightly more likely to be one-adult families (74 per cent, compared with 54 per cent for those with complete data), and to have lower incomes (median benefit unit income of £238 versus £294). The standard approach in these circumstances would be to simply exclude this group on the basis of their small size. It is unclear how else they might be included in any analysis – any imputation would need to assign them as either having or not having these items. Nevertheless, it is worth noting for analysts that this group is effectively lost and might have (very slightly) increased the number found to be deprived. Where a respondent missed a single question, it would be possible to try to impute that response on the basis of those who did answer the question.

### Structurally missing data, and complete non-response

The pensioner material deprivation questions are asked dependent on the structure of households and benefit units. Where a household contained dependent children these cases are filtered to the child deprivation questions – and also answer the main adult deprivation questions, irrespective of age. Where a benefit unit contained older people, the new material deprivation questions were used (even if there was a younger person present, for example, a 55 year-old with a partner aged 65+). What this means in terms of data availability is shown below as Table C1.

**Table C.1 Individual-level analysis of the family-level material deprivation questions**

	<i>Column percentages</i>					
	<b>Age group of individual</b>					
	<b>50 to 54</b>	<b>55 to 59</b>	<b>60 to 64</b>	<b>65 to 69</b>	<b>70 to 74</b>	<b>75 +</b>
No questions	0.5	0.3	0.2	3.4	3.7	4.5
Pensioner deprivation	1.3	3.9	15.3	88.1	91.3	91.0
Adult-only deprivation	72.9	87.7	81.8	7.5	4.6	4.4
Child + adult deprivation	25.3	8.2	2.7	1.0	0.4	0.1
<b>Total (unweighted base)</b>	<b>3,534</b>	<b>3,532</b>	<b>3,804</b>	<b>3,005</b>	<b>2,625</b>	<b>4,357</b>

Source: FRS 2008-09

Results in future years may be different, as interviewers become better acquainted with the set of questions and perhaps more able to reassure respondents about their nature and overall intent. The use of the adult-only deprivation questions is not helpful, and respondents would be better routed either to the child + adult deprivation questions, where appropriate, or instead to the pensioner material deprivation questions.

### Dealing with missing data

In principle there are a number of options for dealing with missing data. It is also possible, and often sensible, to treat quite differently item-missing from structurally-missing data. A small proportion of item-missing information may often be safely imputed, without much affect on overall results. Decision-making in this area should also be guided by the FRS approach in other domains. It is also plausible that non-response to this section will decline in future years compared to the first year, as interviewers become more familiar with the questions and better able to reassure respondents about this section. Indeed, an analysis of non-response by interviewer might prove insightful in determining if non-response is only linked to respondent characteristics, or instead reflects features of the interviewer.

There has been considerable statistical attention to the topic of missing data (for example, Little and Rubin 2002, or for a somewhat less technical treatment Allison 2002). Listwise deletion is often a better approach than simple measures of imputation in further statistical work and specifically that:

*‘whenever the probability of missing data on a particular independent variable depends on the value of that variable...listwise deletion may do better than maximum likelihood or multiple imputation’.*

(Allison 2002: 7)

There are a number of options for dealing with the high proportion of cases with missing data on the deprivation section. First – to restrict attention only to those with complete data. That is, to ignore those with missing data. This is sometimes known as ‘listwise deletion’. If the aim of the measure is to track material deprivation over time, then this may be justifiable, although it would also be important to track the extent of missing data over time.

It is also possible that a further weight might be applied to the results, to reflect differential levels of response among key sub-groups (for example, grouped by age or income). In short, to increase the number of those where non-response is relatively high compared to those groups with lower rates of non-response.

Second, attempt to impute responses. It would be possible, in principle at least, to try to impute either the 15 individual items or the overall index of material deprivation (or, the binary status of being materially deprived, or not). Imputation of a small proportion of item-missing responses is fairly standard, and helps to maintain sample sizes for analysis.

Third, introduce a code for ‘missingness’. Thus, we might have codes for being materially deprived, not being deprived, and ‘not known’ [where the whole section has been declined].

In terms of transparency, however, there is a case for introducing a code for where the overall level of deprivation is simply not known. Results for those experiencing material deprivation might be expressed either as proportions of the whole population, or as a proportion of those providing reliable responses (or both, of course). This option does have disadvantages, and it would make interpretation difficult if the size of the missing group changed significantly over time. In particular, the number of pensioners classified as deprived might increase over time if the proportion of refusals **decreased**. Alternatively, the proportion who are deprived may change if there are changes in the proportion with missing data – a possible scenario if there are associations between socio-economic status (deprivation) and having missing data. There is no straightforward answer to these problems, but their empirical importance is uncertain at this stage. The approach of re-weighting to take into account non-response (on top of the existing weighting matrix) might be superior if appropriate characteristics may be found that are associated with levels of deprivation, and if non-response continues to be non-trivial.

## Recommendations

- It should be possible to impute deprivation questions, if respondents have missed a small number of questions.
- It would make sense to adopt imputation procedures used for other parts of the FRS questionnaire, as users are already familiar with these approaches and their implications.
- It may be possible to go further in imputing **overall** deprivation, if respondents have answered other questions specifically concerning material deprivation. However, if there is no information on deprivation then imputation would have less safe foundations from which to work.

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- It is important to analyse the socio-economic characteristics of those without deprivation information, as this will indicate whether there are any biases in using the data that is present. Some re-weighting by sub-groups, where that sub-group is associated with missing data and with material deprivation, would improve on estimates if such biases exist.
- Probably it will take until the second year of questions to ascertain the likely ongoing level of non-response.

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This working paper takes the new material deprivation questions for older people, asked in the Family Resources Survey (FRS) since 2008, and assesses ways that they might be used to construct an overall measure of deprivation. It uses data from the FRS from the period May 2008 to March 2009, and applies a range of statistical methods of analysis to compare different strategies to constructing such a measure. It looks at the implications of different choices in the design of the overall index of pensioner material deprivation.

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