Between income and material deprivation in the UK: In search of conversion factors

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Abstract

The claim that there are 'conversion factors' between people's resources and their capabilities is fundamental to motivating the capability approach, yet is empirically relatively under-examined. The few analyses which exist focus typically on one group – disabled people – and focus overwhelmingly on current income as the relevant measure of resources. This paper extends existing analysis on both fronts, analysing conversion factors for a broader range of groups than are typically considered and estimating conversion factors using both a current and five-year average measure of income. It is found that conversion factors based on a five-year average of current income are 40-45 per cent lower than those based on current income. However, a conversion-adjusted income measure, whether based on current or five-year average income, still does not reflect 'command over capabilities' because conversion factors are estimated on the basis of group averages, while needs vary for different groups *and* different households. The paper concludes that understanding more clearly the nature of the conversion between resources and functionings or refined functionings represents an important task for those working with the capability approach.

Key words

Capability approach; conversion factors; low income; material deprivation; poverty

Introduction

Perhaps the central claim of the capability approach is that in undertaking interpersonal analysis – understood in this paper as poverty analysis – we should focus on what people can do and be, and not just on what they have, or how they feel. In justifying the capability approach, Sen has argued that the claim in favour of conceptualising poverty in terms of people's capabilities rather than their resources lies not only in terms of focusing on what is *intrinsically* important to our lives rather than that which is merely instrumentally important, but also because:

1. There is substantial variability in translating resources into capabilities (i.e. the existence of conversion factors); and
2. There are many more influences on one's well-being other than one's resources
   (Sen, 1999: 87-8).

If these two claims are true, then information about a person's resources will be insufficient to evaluate or assess their capabilities.

Given the fundamental role played by the conversion factors claim in motivating the shift to a capability-based analysis, it is remarkable that a greater number of studies which seek to identify conversion factors empirically do not exist. Indeed, acceptance that conversion factors do exist, at least in a form which renders income-centric analysis problematic, has not been universal, with Nolan and Whelan (1996) arguing that they play a relatively marginal role in the relationship between income and a material deprivation measure of poverty.

This paper seeks to contribute to the sparse literature on conversion factors (e.g. Zaidi and Burchardt, 2003; 2005; Kuklys, 2005; Lelli, 2005; Binder and Broekel, 2011; 2012) by seeking not only to validate the existence and estimate the magnitude of conversion factors between income and material deprivation in the UK, but also to assess their implications for poverty analysis and for the capability approach. The latter is crucial because, as we argue, the existing literature on conversion factors considerably simplifies both the nature and the sources of variation between resources and functionings, with important theoretical consequences. Thus, while Claims 1 and 2 above are both undoubtedly important, it is the former which is our focus here.

While this paper takes its inspiration from the capability approach, it seeks both to draw on and contribute to the literature on the capability approach *and* to that of poverty in the UK, both capability-inspired and otherwise. This approach is adopted in recognition of the view that the capability approach is not in itself a distinct field of studies ("capability studies"), but rather that it offers a lens with which to view our existing concerns – in this case, the problem of poverty (Author A). As we will see, this approach proves to be fruitful because some of the important studies in this field are by authors who do *not* primarily work from a capability perspective, but whose work is nonetheless crucial in understanding the nature of conversion factors. While the capability approach focuses extensively on the distinction between resources and functionings and capabilities, the European poverty analysis literature emphasises a related distinction between 'indirect' (i.e. income-centric) and 'direct' (i.e. standard of living or material deprivation) measures of poverty, and on the observed 'mismatch' between these measures (see below).

Conversion factors and poverty analysis

The claim that a poverty line should capture a certain *meaning*, relating to what people can do and be, is not, of course, unique to the capability approach. In setting his primary poverty line in his 1899 study of poverty in York, Seebohm Rowntree set out to identify 'what income is required by families … for the maintenance of merely physical health' (1901: 118), in the first of three studies of poverty in York which reported a substantial reduction in primary poverty over time (Rowntree, 1901; 1941; Rowntree and Lavers, 1951). The sociologist Peter Townsend would subsequently argue that the concept of poverty must reflect not 'merely physical efficiency' but the ability to 'participate in the activities and have the living conditions and amenities which are customary, or at least widely encouraged or approved, in the societies to which they belong' (1979: 31).

Both Rowntree and Townsend intended their poverty standards to reflect *adequacy*, albeit relating to the concepts of 'physical efficiency' and to 'participation', respectively. However, the existence of conversion factors requires us to approach the question of adequacy in a rather different way – in particular, reflecting the different needs which people have in translating resources into the particular capabilities (and which may be manifest irrespective of whether we adopt a physical efficiency *or* participation standard). While standard income-centric approaches to analysing poverty apply equivalence scales to capture the differing needs of households of different sizes and compositions, a central claim of the capability approach is that interpersonal heterogeneity is much more extensive than this and thus that the existence of conversion factors poses a significant

challenge to resource-centric approaches to conceptualising and measuring poverty. Thus, the existence of conversion factors is central to justifying a capability approach to understanding poverty.

According to the capability literature, the conversion of income into capabilities will be influenced by individual variations (such as the additional costs of disability; proneness to illness), social variations (e.g. due to heightened commodity requirements as a result of social norms and needs, systematic boy-preference in intra-family distribution) and environmental variations (such as heating and clothing requirements) (Kuklys, 2005; Sen, 1999: 70-71; Sen, 2009: 255-6). What these variations have in common is that they all reflect the different needs people face in translating resources into capabilities (Krishnakumar and Ballon, 2008).

Given the intrinsic importance of what people are able to do and be, as opposed to the instrumental importance of their income, Sen argues the existence of conversion factors implies that we should either (a) focus directly on capability deprivation or (b) create an interpersonally-variant poverty line that reflects 'command over capabilities' (Sen, 1983: 165, see also 1993: 42; 1992: 111; Foster and Sen, 1997: 215), and not just command over commodities.

The distinction between what people have and what they can do and be is, however, not unique to the capability approach. Within the field of Social Policy, there has been a long-standing distinction between *indirect* approaches to measuring poverty, focusing on people's incomes, and *direct* approaches, which employ a suite of indicators of material deprivation in order to provide a measure of the ability to participate in the life of society (i.e. the Townsendian concept, see Nolan and Whelan, 1996: 2; Ringen, 1988). Such indicators ask respondents whether they can afford an annual holiday, to replace worn out furniture, to have visitors for a drink or meal once a month, and so forth (see Table 1 below). Indeed, they are of interest to those working with the capability approach because they adopt a two-part structure asking first whether people have these items and participate in these activities and second, if they do not, whether this is because of a lack of resources, or is by choice (this latter question is commonly labelled the 'enforced lack' criterion). Thus, while not reflecting the range of constraints which would be recognised by the concept of capability deprivation, there is nonetheless an attempt to move beyond possessions or functionings to ask about one constraint in particular – a lack of resources (Author A). Thus, this dimension of material deprivation might be considered to represent a refined functioning (i.e. a functioning which takes account of the available alternatives, see Sen, 1987: 36-7).

There is by now a substantial body of literature assessing the relationship between low income and material deprivation measures of poverty which emphasises the *mismatch* between them (see Bradshaw and Finch, 2003; Nolan and Whelan, 1996; Author A, *inter alia*). Within the capability literature, the logic behind conversion factors is also concerned with a mismatch between resource and refined functioning measures but, from this perspective, we would want to go beyond merely looking at the aggregate mismatch to explore whether the relationship between low income and material deprivation varies for *different individuals or households and groups* in the population. Thus, adopting a capability lens would imply focusing on this 'mismatch' in a particular way. This paper, then, seeks to explore conversion factors between income and this material deprivation measure of poverty, which is selected as the relevant refined functioning because of its prominence within UK, and, increasingly, European, poverty analysis, and because of its attempt distinguish between choice and constraint.

In search of conversion factors

There have been at least four attempts to estimate conversion factors between income and particular functionings, three of which employ an equivalence scale approach. Both Zaidi and Burchardt (2003; 2005) and Kuklys (2005) sought to estimate conversion factors specifically for disabled people. Drawing on both objective (whether respondent has any savings, possession of consumer durables) and subjective (self-assessed financial situation) variables as measures of well-being, Zaidi and Burchardt (2003; 2005), estimated the additional cost of disability to be between 1.1 to 7.7 per cent of income for each point on a 22-point disability severity score, with the additional costs for disabled pensioners with a disability severity score of nine to be between 14 and 50 per cent of average income, depending on household size, composition and indicator employed for estimation (2005: 103-4).

In a similar vein, Kuklys (2005) adopted satisfaction with income as her measure of well-being and found that households with a disabled member required 1.56 times the income of those without a disabled member to achieve the same level of well-being – a figure which put the cost of disability as being close to the cost of the presence of additional person living in the household.

Lelli (2005) similarly employed an equivalence scale approach in order to estimate the conversion between income and being well-sheltered in Belgium and Italy, but her analysis focussed on a wider range of group characteristics, including geographical location, occupation, occupational sector, housing tenure, and education. She found that illiterate respondents in Italy required almost four times the income of college-educated respondents to equalise the probability of being well-sheltered, and respondents living in rented accommodation in Belgium required six times the income of owner-occupiers in order to have the same probability of being well-sheltered.

More recently, Binder and Broekel (2011) used an efficiency frontier method to estimate the average distance for different groups in transforming income into a group of functionings, comprised of being happy, being educated, being healthy, being nourished, being well-sheltered, and having satisfying relations (2011: 268), using data from the British Household Panel Survey. They did *not* express this relationship as an equivalence scale, but instead identified a number of groups who displayed lower efficiency levels, and thus had lower functionings rates for a given amount of income. They find that being unemployed, separated, divorced or widowed, or disabled lowered conversion efficiency, while being older, self-employed, married, in good health and living in London increased it. Longitudinal analysis of the same problem on a similar, though not identical, set of functionings found that age and self-employment increased conversion efficiency, while living in London, being disabled, being separated, divorced or widowed, and married all reduced conversion efficiency (Binder and Broekel, 2012). Binder and Broekel (2011; 2012) and Lelli's (2005) research is important as it extends empirical analysis of conversion factors beyond a focus on one particular group (i.e. disabled people).

Non-capability-inspired analysis provides valuable evidence on this topic, too. Drawing on data from the UK, Brewer *et al.* (2009) show that across a majority of the income range, children in workless families experienced higher levels of material deprivation than children in families where someone is employed, with those in the families of where someone was self-employed experiencing the lowest average deprivation (2009: 92). Similarly, Berthoud *et al.* (2004: 66) find that after controlling for income, variables such as work status, income source, education and housing tenure all remained important in explaining between-group differences in material deprivation, using cross-sectional data from the UK.

In their analysis of Irish data, and directly addressing the capability literature, Nolan and Whelan claimed to find limited evidence for the existence of conversion factors. They found that households with a disabled head of household displayed a pronounced risk of material deprivation, after controlling for income, but they note that '[g]oing beyond disability, however, it is not clear that interpersonal variation is so pronounced as to pose a major problem' for income-centric approaches (Nolan and Whelan, 1996: 184), suggesting that the additional costs associated with disability could be incorporated into an adjusted income variable, as Sen has suggested (ibid).

This was not because disabled people were the only group for whom a variable income-material deprivation relationship was found (on this, see Nolan and Whelan, 1996: 105), but rather because they argued that the source of much of the variation was *not* caused by people's differing needs (reflecting 'cross-sectional interpersonal variation in ability to convert income into capabilities', 1996: 184-5), but, they suggested, reflected longer-term experiences (reflecting 'long-term labour market problems and disadvantaged social and educational background', 1996: 184). Layte *et al.* (2001a: 106) similarly emphasised the longitudinal aspect of this relationship:

> 'Households get to their present position by numerous paths and via different experiences. For example, we would expect that those who have experienced intermittent and insecure unemployment in the past, but are now employed, would have higher levels of deprivation than those who had stable employment. Furthermore, we expect that critical life events such as divorce or separation or lone parenthood will distinguish in deprivation terms between those currently at similar levels of current income because of what they imply about the relative balance between resources and obligations'.

This raises the important question of which types of variation between low income and material deprivation we consider to be evidence of 'conversion factors' – a question which, surprisingly, remains relatively neglected within the capability literature, and to which we return in the concluding section.

Within the capability literature, there have been only a small number of empirical analyses of conversion factors, and these have focussed to a significant extent on one particular group – disabled people (e.g. Kuklys, 2005; Zaidi and Burchardt, 2003; 2005), and have relied on current income as being the relevant income measure (e.g. Binder and Broekel, 2011; Lelli, 2005). If conversion factors are limited to specific groups (e.g. disabled people), then the claim we should shift from resource-centric to capability-centric analysis does not seem as strong as it might at first appear. Furthermore, we know from existing research that persistent low income is a better predictor of material deprivation than current low income (e.g. Whelan *et al.*, 2003). Ideally, we would want to control for longer term holdings of 'permanent income' in order to estimate conversion factors as differing needs. This is not possible because of limitations in social surveys, but longer-term income measures may be constructed where panel data are available. Thus, further work is required on both fronts: focussing on a wider range of groups and not just disabled people, on the one hand, and investigating whether the use of a longer-term income measure can explain any cross-sectional 'conversion' that exists, on the other.

Analytic approach and data

In this paper, we attempt to estimate conversion factors between income and a measure of material deprivation, employing an equivalence scale approach. In practice, this entails exploring whether a number of groups experience different material deprivation rates given a fixed amount of income (Nolan and Whelan, 1996: 184) and estimating the income adjustments which would be required in order to equalise the probability of material deprivation for different groups.

The analysis in this paper draws on data for Great Britain from the British Household Panel Survey. The British Household Panel Survey was a household survey which interviewed adult members (aged 16 and over) living in sampled households on an annual basis. The BHPS sample is broadly representative of the population of Great Britain as it has evolved since 1991, but not of post-1991 immigrant groups (Jenkins and van Kerm, 2011). The survey commenced in 1991 and in 2009/10 was subsumed into the larger Understanding Society survey.

The analysis is a completed case analysis of 2,801 households, drawing on a cross-sectional data from 2006/7, although we have constructed five-year average income profiles for each respondent using data from the panel between 2002/3 and 2006/7. The bottom three per cent of households in both the current and five-year income distributions have been removed because of concerns regarding the quality of data in these percentiles. Specifically, previous studies have found that the living standards reported by those on the very lowest incomes seem considerably higher than one would expect from looking at their position on the income distribution alone (see below, and Brewer *et al.*, 2009; Berthoud *et al.*, 2004).

The selection of material deprivation as the relevant refined functioning is made for three reasons. First, our interest is not just in conversion factors in a general sense, but *specifically* in the conversion between low income and material deprivation, given the prominence of these measures in UK, and indeed European, analysis. Secondly, indicators of material deprivation are explicitly intended to capture aspects of material poverty, and have been selected because of their expected relationship to resources (e.g. Mack and Lansley, 1985). This matters because, as Zaidi and Burchardt (2003) note, in order to estimate conversion factors we require a measure of resources, on the one hand, and an income-responsive measure of living standards, on the other (for which we rely on material deprivation here). Third, we need to remove preferences from the equation if we are to separate differing needs from differences in taste. The inclusion of the 'enforced lack' criterion within the measurement of material deprivation, as we have described above, restricts attention to respondents for whom the absence of deprivation items is because of a lack of resources and, in theory at least, satisfies this requirement.

The material deprivation measure is based on a nine questions which ask whether individuals are able to afford nine commodities and activities (Table 1 and discussion above). These items comprise a suite of indicators in the BHPS and are inspired by Townsend's (1979) classic study of poverty in the UK. This index is aggregated using a counting approach, and a binary measure is constructed, with respondents experiencing an enforced lack of one or more deprivation items deemed to be materially deprived (the same threshold as suggested by Nolan and Whelan, 1996). The counting approach adopted makes the implicit assumption of equal weights for each of the indicators. An alternative approach to simply counting the number of absent items is to construct a possession-weighted index, where each absent item is weighted by the proportion of the population who possess that item or participate in the activity. The logic behind such a measure is that an enforced lack of an item possessed almost universally (for example, two pairs of strong shoes) should be given a greater weight than items where absence is more typical (e.g. an annual holiday). Given the relatively small number of deprivation items in the BHPS, there is very little difference between these approaches in empirical terms. The analysis in this paper is based on a counting approach, which remains the dominant approach in the academic literature.

The income variable that has been chosen is equivalised net current (i.e. weekly) income (Whhnetde2). This employs the Modified OECD equivalence scale, which allocates a weight of 1 for the first adult, 0.5 for additional adults and 0.3 for each child. Since the income variable is a before housing costs (BHC) measure of income, this in itself may explain one important source of variation between low income and material deprivation – namely, the cost of housing (Ringen,

1988). We select a current income measure as the appropriate measure of resources given its continuing prominence in UK and European poverty analysis. However, to examine Nolan and Whelan's claim that the relationship between low income and material deprivation is influenced by longer-term resource holdings, we also use a five-year average of this current income variable in a second set of models. This allows us to estimate conversion factors as differing needs in a way which controls for these longer-term holdings and, indeed, allows us to test the extent to which the period of time over which income is measured affects the magnitude of conversion factors themselves. Where a binary low income measure is employed, the threshold is set at 60 per cent of median income, which is the threshold employed in the UK Child Poverty Act's income target as well as in the EU's official income poverty target as part of its Europe 2020 strategy.

In employing an equivalised income measure, we adopt a different approach from that of other authors who focussed on total net household income, and sought to determine their own conversion factors as equivalence scales (e.g. Kuklys, 2005; Zaidi and Burchardt, 2003; 2005). Indeed, in a recent paper in this *Journal*, Binder and Broekel (2011: 269) argued that applying equivalence scales to adjust for size and composition 'would run counter to the idea of identifying the role of conversion factors'. We take a different view because our primary interest is in examining the relationship between low-income-as-we-typically-measure-it and material deprivation. Since measures of low income are invariably equivalised, it seems sensible for us to do so here.

Furthermore, conversion factors reflecting differences in need can take a variety of forms, including those arising because of differences in household size and composition. Since no-one really doubts that these economies of scale must be accounted for within poverty analysis, but there *have* been questions about the reach of wider conversion factors reflecting differences in need (e.g. Nolan and Whelan, 1996), the use of an equivalised income measure acts to partition what is accepted (i.e. that we must account for household size and composition) from what is being questioned (i.e. whether there are variations between resources and capabilities beyond those captured by standard equivalence scales).

While the individual is the ideal unit of analysis when analysing poverty (e.g. Atkinson *et al.*, 2002: 93-4), both income and material deprivation data are collected at the household level, so the household is selected as being the unit of analysis. The analysis in this paper relies on unweighted data because we want to bootstrap confidence intervals for our conversion factors. The analysis has been re-run using weighted data but without confidence intervals for the conversion factors. The conversion factors estimated from this weighted analysis are very similar to those identified in the main analysis.

In this paper, analysis is not limited to one group – for example, disabled people – but rather considers a range of groups for whom systematic variations between resources and standard of living might occur, and thus for whom we might expect conversion factors to exist. The groups considered in this paper – age of household head, housing tenure, health status,[i] household employment status and household composition have been selected as they refer to characteristics which might be expected to be associated with differential 'material obligations imposed on households', or needs, and 'indicators of one's ability to command remuneration in the labour market', or resources (Layte *et al.*, 2001b: 443). We deliberately focus on a range of groups and not just the commonly cited example of disabled people because the extensiveness of conversion factors is necessary in order to motivate a fundamental critique of resource-centric measures of poverty.

Analysis

The proportion of households experiencing an enforced lack of each of the deprivation items is displayed in Table 1. This varies substantially depending on the item in question, with just 0.5 per cent of households report being unable to keep their home adequately warm, while nine per cent report being unable to afford an annual holiday. Material deprivation (a binary measure where households report an enforced lack of one or more of the material deprivation items) is experienced by 14.2 households, while 15.4 per cent fall below the low income line of 60 per cent of median income.

TABLE 1 ABOUT HERE

The familiar 'mismatch' between low income and material deprivation measures of poverty is displayed in Table 2. While 15.4 per cent of households were living on a low income in 2006/7, just over one in four of this group also experienced material deprivation. Low income and material deprivation measures of poverty thus identify quite different households as being poor (see also Author).

TABLE 2 ABOUT HERE

The probability of the experiencing material deprivation across the income distribution is plotted in Figure 1. In Figures 1 – 3 only, households in the lowest three income percentiles are included in the analysis to illustrate the relationship between income and material deprivation across the income distribution, including at these points.[ii] The figure contains two vertical lines – the right line, set at £170.99, represents the typical 60 per cent of median income line. The left line, at £113.99, corresponds to a more severe 40 per cent median income line. We can see that as equivalised income falls below £400 a week – thus, well above the 60 per cent median income line, the probability of deprivation rises fairly consistently until about £90 per week. Below about £90 per week, the probability of deprivation actually *falls*, contrary to what would normally be expected, but in line with previous analysis (e.g. Brewer *et al.,* 2009). Respondents reporting the very lowest incomes have, on average, a considerably lower probability of deprivation than one would expect given the level of their current income alone, which has led to questions about whether the income data in these lowest percentiles are robust (ibid).

FIGURE 1 ABOUT HERE

However, our interest is not only on the aggregate risk of material deprivation across the income distribution, but in how this varies for different groups. In Figures 2 and 3 respectively, we present the probability of deprivation based on health status and housing tenure across the income distribution. If low income were a *good* measure of material deprivation, there would be no difference in the probability of deprivation for different groups across the income distribution, since all differences would be explained by income itself.

This is not what we find, however. In Figure 2 we show that the probability of deprivation (1+ cut-off) is significantly greater for respondents in poor or very poor health than for those in good or very good health, at least from about 40 per cent of median income to above the median equivalised income (£285/week). Of course, since the deprivation line is smoothed, we should take care in reading the range of significant differences but, nonetheless, these figures serve to illustrate that the differential probability of deprivation experienced by particular groups is not fully explained by their incomes.

FIGURE 2 ABOUT HERE

A similar comparison of households in different housing tenures provides findings which is even more stark (Figure 3). Importantly, the elevated risk of material deprivation for respondents in social housing and those in ill-health occurs *both above* and *below* typical low income lines. Thus, based on these descriptive findings alone, we can see that the risk of material deprivation for different groups on at any given level of income can differ in quite an important way.

FIGURE 3 ABOUT HERE

This poses serious questions about the ability of *any* fixed income line to reflect adequacy for different groups, for what does it mean to adopt a low income poverty line set at, say, 60 per cent of median income when the rate of deprivation for social housing tenants *above* this line is significantly greater than for owner occupiers whose incomes fall some distance below the threshold? If material deprivation indicators measure what we want them to measure – and that is an *'if'* – then it appears that can is no income poverty line that does justice to the differential experience of deprivation for these groups. The risk of material deprivation is related to income, but is variable for different groups across much of the income distribution and, furthermore, the groups with elevated material deprivation rates *above* the standard income poverty line *are amongst those typically understood to be vulnerable* (in the analysis presented here, social housing tenants and respondents in poor and very poor health). Nonetheless, as important as these findings are, it is necessary to employ multivariate analysis in order to explore whether any one conversion factor (for example, ill-health) explains the various between-group differences which we can observe from this descriptive analysis.

Estimating conversion factors

In this section, we adopt a multivariate approach, exploring whether group-specific differences in the probability of deprivation exist after controlling for income and other variables. Table 3 presents odds ratios taken from two logistic regression models – one in which we control for age category, housing tenure, health status, household employment status and household composition and a measure of current income, and a second model which is identical but controls for a five-year average of the current income measure. [iii] The data are unweighted in order to provide bootstrapped standard errors so that confidence intervals for the conversion factors can be estimated, though in the sensitivity analysis we also estimate conversion factors (without confidence intervals) using weighted data.

We use the following formula to move from the regression coefficients presented in Table 3 to the conversion factors displayed in Table 4:

$$\text{Conversion factor} = \exp(-1 * (\beta_{group}/\beta_{\ln(income)}))$$

In Table 3, and as expected, we find that income is negatively associated with material deprivation. Moreover, we can see that the relationship between five-year income and material deprivation is stronger than the relationship between current income and material deprivation. We assume that the direction of causality runs from income to material deprivation and not vice versa for two reasons. First, even in the current income model, the income data refer to a period temporally prior to that for the material deprivation data (specifically, the current income data are constructed on the basis of household income in the month preceding the interview; deprivation data, in contrast, reflect the date of interview itself). Second, the inclusion of the 'enforced lack' criterion

(see above) means that measured deprivation captures circumstances where the absence of items *is because of a lack of resources specifically.*

Importantly, even when we control for income, whether over the short or longer term, many of the coefficients for the groups considered here remain statistically significant. The experience of material deprivation is significantly associated with ill-heath, with living in local authority or housing association accommodation and with lone parent households in both the current and five-year income models. Older respondents and owner occupiers without a mortgage display a significantly lower risk of material deprivation than the respective reference categories. Other households (i.e. households with three or more adults) – with or without children – are significantly associated with material deprivation in the current income model only. The household employment status variables are not significant in either model, after controlling for income and other variables. Two goodness-of-fit statistics have also been computed. Though pseudo-R-squared statistics are difficult to interpret, the McFadden's Adjusted R-squared and Nagelkerke's R-squared tests both show that the use of five-year average income in the model results in a marginal improvement in model fit over the current income model.
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Overall, we can see that, once we control for differences in income, not only do group-specific differences in the probability of material deprivation remain, but many of the effects are quite large. A five-year measure of income displays a stronger relationship to material deprivation than a current measure, but this does not explain all of the group-based differences in experiencing material deprivation. Thus, the groups identified here display quite different probabilities of experiencing material deprivation, even after controlling for current income or, indeed, a five-year average measure of current income. If between-group differences in deprivation status reflect longer-term income trajectories (cf. Nolan and Whelan, 1996; Layte *et al.*, 2001a; b), then this would seem to operate over a longer period than has been considered here.

TABLE 3 ABOUT HERE

Estimating equivalence scales to compensate for between-group variation

How much additional income would be required in order to equalise the probability of each group being materially deprived? In Table 4, the predicted probabilities taken from the preceding model have been used to estimate conversion factors – that is, the amount of additional income required in order to account for these group specific effects on material deprivation, controlling for the other variables. So, we can say that holding tenure, health status, employment status and household composition constant, household heads between 16 and 24 require 1.53 times (i.e. an increase of 53%) more income than heads aged between 40 and 59 in order to report the same probability of deprivation, although this difference is not statistically significant. In each case the reference category is given a 'conversion factor' of 1.[iv]

TABLE 4 ABOUT HERE

The crucial feature about these conversion factor estimates is that many of them are substantial in magnitude. Looking at the conversion factors based on current income, we see that, all else being equal, social housing tenants require twice the equivalised income of owners with a mortgage in order to face the same risk of deprivation (CI: 1.35 - 2.69). The relevant conversion for private sector tenants is 1.5 (CI: 1.04 - 1.97). The conversion factors for health status are particularly substantial, with household heads in poor and very poor health requiring 2.8 times and 2.6 times the level of income to achieve the same probability of deprivation as heads in very good health (CI: 1.42 - 4.09 and 1.03 - 4.19 respectively). Lone parents require a similar adjustment – 2.3 times

the equivalised income of couples without children in order to equalise their probability of deprivation (CI: 1.08 - 3.55).

Turning to the estimates from the model using five-year income, we note first that these estimated conversion factors are in every instance lower than those based on current income (i.e. the values are closer to 1), which can be explained by the stronger relationship between five-year average income and material deprivation. Thus, the reference period of income that is selected will have a non-negligible impact on the conversion factors themselves. On average, for the eighteen subgroups considered here, conversion premiums[v] for the five-year measure were 40 per cent lower than those for the current measure.[vi] This is significant because if conversion factors are intended to reflect differing needs (the standard interpretation in the capability literature), then ideally they should not be sensitive to the time period over which income is measured or, if they are, should be estimated using a longer-term measure of 'permanent income'. In the analysis presented here, the time period over which we measure income has an important influence on the magnitude of the conversion factors themselves, suggesting the importance of taking longer-term income holdings into account when conducting such analyses.

These conversion factors are subsequently used to estimate a conversion-adjusted measure of income for each household, based on a cumulative household conversion factor from the five variables considered here. In Figure 4, we plot the predicted log odds of material deprivation taken from the regression model from Table 3 against actual current income data (left hand side of figure) and the conversion-adjusted measure of income (right hand side of figure). The dispersion around the trend line when using the current income measure reflects the contribution of other household characteristics to the predicted probabilities from the model, independent of income. What we see in the right hand figure, with an absence of any dispersion around the trend line, is that the adjusted income figure now itself 'contains' these estimated conversion factors.

FIGURE 4 ABOUT HERE

Moving subsequently from the predicted log odds to the actual experience of material deprivation, in Figure 5 we plot the smoothed probability of material deprivation by current income (left hand side) and conversion-adjusted income (right hand side). This comparison demonstrates that the conversion-adjusted measure displays a stronger association with the actual probability of deprivation, as we would anticipate. Nonetheless, as the dots at points 0 and 1 (which represent households) indicate, there are some deprived households even with relatively high incomes, as well as some non-deprivation for households on the lowest incomes, even after we adjust for conversion factors for the five characteristics considered here (this is observed for both the adjusted current and five-year average income).

FIGURE 5 ABOUT HERE

Finally, we may ask to what extent the 'mismatch' between low income and material deprivation is explained by replacing a current measure of income with a conversion-adjusted measure in this way. Here, we focus on the lowest income quintile in each case so as to provide identically-sized low income groups and thus like-for-like comparisons. The results presented in Table 5 show that moving from a current income to a conversion-adjusted income measure improves the overlap between low income and material deprivation from 27% to 44% (since the number of households experiencing material deprivation is lower than the number in the bottom quintile, the maximum possible overlap would be 70%). Using the five-year average of the current income measure implies an increase from 31% to 44% when we employ a conversion-adjusted measure of income.

Two important conclusions follow. First, adjusting income for conversion factors improves the overlap between low income and material deprivation quite substantially. But second, and conversely, this is not so great as to imply that the conversion-adjusted income variable represents 'command over material deprivation', which would be equivalent, at least for this dimension, to Sen's suggestion that a conversion-adjusted measure of income might reflect 'command over capabilities'.

Some mismatch will inevitably remain because in estimating conversion factors in this way, we estimate *average* adjustments for certain groups (e.g. average conversion factors for people in ill-health or living in social housing), but there will always be household-level dispersion around these group averages. Thus, conversion-adjusted measures of income *cannot* be expected to reflect the experience of material deprivation (or, indeed, other forms of capability deprivation), because of this variation at both group and household levels.

TABLE 5 ABOUT HERE

<u>Sensitivity analysis</u>

In order to test the robustness of the main findings, we have re-specified the regression models used to estimate conversion factors, based on a variety of amendments (not presented here for reasons of brevity, but available from the author on request). Specifically, (i) we estimated conversion factors using weighted data (and thus without confidence intervals), (ii) removing the bottom 2% and 4% of the income distribution instead of the bottom 3%, (iii) employed a 2+ deprivation threshold and (iv) a 1+ threshold based on the simple absence (and not enforced lack) or one or more deprivation items, (v) by re-running the analysis on households where the head was under the age of 60, since previous research has shown that older people have a very different relationship between income and material deprivation (Author A), and (vi) using a material deprivation measure which omits the most prevalent two deprivations (i.e. holiday and furniture). The overall picture is very similar and the results in most instances do not differ dramatically. Perhaps the primary differences are for the models with the more difficult 2+ threshold and the models with one and two items dropped, where deprivation is concentrated to a greater extent on those groups identified by the main model as being experiencing elevated rates of deprivation, with the result that the beta coefficients (and thus conversion factors) in these model are somewhat greater than those in the main analysis (though differences are mostly not statistically significant).

In addition to these tests, we re-ran the current income model but estimate an ordered logistic regression model so as to avoid the necessity to impose a deprivation threshold, but recoded the scale 0-4+ to ensure sufficient cases for each response category. The results of this test were remarkably similar to the main analysis.

The inclusion of (log of) income as a linear variable imposes certain restrictions on the model, so we re-ran the model with a series of dummy variables representing household income decile instead. While this precludes 'conversion factors' from being estimated in the same way, the main finding of this test is that, in terms of the estimated predicted contribution to the log-odds of material deprivation, the contribution of households with a head in poor or very poor health is about the same as the coefficient from moving from the bottom income decile to the seventh income decile, while the coefficients for lone parent households, social housing tenants, and household heads in fair health were similar to those for moving from the bottom decile to the sixth household income decile. These are, of course, substantial compensations, which reflect the significant nature of many of the conversion factors estimated in the main model.

Finally, in addition to the conversion factors being estimated on the basis of current and five-year average income, we estimated these also on the basis of three- and seven-year average income, based on a completed case analysis of households with income data over the seven-year observation window. Again, these largely confirmed the findings presented here, though it suggested that the primary reduction in conversion factors was observed between current and three-year income models, with only marginal further reductions thereafter.

Inevitably, when comparing such tests, the precise estimates themselves change, and, on occasion, change in non-trivial ways. Nonetheless, what unites these conversion factors is their *size* – in all models the conversion factors estimated imply substantial income transfers in order to equalise the probability of material deprivation for particular groups.

Concluding Discussion

The existence of conversion factors between resources and capabilities are fundamental to the claim that we should move away from income-centric analysis to understanding poverty in terms of capability deprivation. Such conversion factors imply that 'the relationship between resources and poverty is both variable and deeply contingent on the characteristics of the respective people and the environment in which they live' (Sen, 2009: 254) and, therefore, that standard income-centric approaches do not tell us what a person can do or be. Sen has argued that our response to conversion factors can either be to (i) include these conversion factors into a measure of 'adjusted income' or (ii) to focus directly on capabilities themselves (e.g. Sen, 1992: 111-2).

In this paper, we have sought to examine the existence, magnitude and nature of conversion factors between income and material deprivation for five groups in the UK, thus contributing to the sparse empirical literature which seeks to estimate conversion factors. The analysis shows that not only is there a mismatch between low income and material deprivation, but this does indeed vary between groups. This seems to lend some legitimacy to the idea of conversion factors. In this concluding discussion, we discuss three important issues which arise from the preceding analysis.

The first is the importance of adopting a longer-term approach to the measurement of income when estimating conversion factors. When conversion factors were estimated using a five-year average income measure, these were on average between 40-45 per cent lower than those estimated based on current income, depending on whether weighted or unweighted data were analysed. The findings presented here go some way to supporting the contention of Nolan and Whelan (1996) and Layte *et al.* (2001a; b) that current deprivation scores reflect past income trajectories as well as current income holdings. Of course, there is no scientifically 'correct' length of time over which income would be needed to be collected in order to represent permanent income, but these results point to the importance of considering income holdings over the longer-term when estimating conversion factors, since such factors are usually employed to capture differences in need, and not accumulated deprivation over time.

Second, even when conversion factors are used to construct a conversion-adjusted measure of income, this will not reflect 'command over capabilities' because of the nature of the variation between resources and capabilities. In estimating conversion factors as equivalence scales we are relying on regression estimates which are based on group averages, but the different needs which people face relate both to different groups *and* to different households. Thus, while Sen often outlines conversion factors in terms of the variable conversion for different 'people' (e.g. 2009: 254), it matters to a significant extent whether one is referring to conversion factors for different groups (e.g. for disabled people compared with non-disabled people) or for different individuals *within* different groups (e.g. some disabled people more than others, and so forth).

The existence of variation at both individual/household and group levels means that one cannot be neutral regarding the decision of whether to focus on capabilities directly or continue to estimate capabilities indirectly using an adjusted income measure, for income cannot be transformed in such a way as to equate to command over capabilities, as Sen has suggested. In the analysis presented here, the overlap between low income and material deprivation in the lowest income quintile rose from 27% to 44% (from a maximum 70%) when a current income measure was employed, suggesting a substantial, but far from total, increase in the ability of conversion-adjusted income to reflect the experience of material deprivation.

And this brings us to a third and final point, which relates to the sources of variation between resources and refined functionings. While Sen outlines conversion factors as relating to variations in need, this is but one of the many reasons why resource-based measures such as income, and living standard measures such as material deprivation may provide diverging results. The estimated conversion factors may reflect previous labour market or educational differences, and not differences in need; they may reflect the direct impact of, say, ill-health on deprivation, independent of income. They may even reflect, to draw on Rowntree's early studies, 'wasteful spending' (1901), or inefficiency in household budgeting. Since the motivation for moving away from resource-centric analysis was simply because a person's resources does not tell us what that person is able to do and be, it is not necessary for the 'differing needs' explanation to account for *all* of this variation in order to point to the importance of drawing on information about people's functionings and refined functionings.

However, the 'differing needs' explanation provides not just an explanation of *why* variation between resources and capabilities exists, but also makes an *normative* case for adopting a focus on people's capabilities over and above their resources, since this explanations suggests that some people face greater *constraints* to achieving certain outcomes. It is this suggestion of constraints which motivates the normative claim for people's capabilities as the focus of analysis. But not all of the possible explanations for the variations between resources and functionings or refined functionings are suggestive of constraints, and thus not all help to motivate a shift away from a resource-centric approach. If this variation was explained to a substantial extent by wasteful spending, for example, then it would be strange to ignore this by focussing only on functionings or refined functioning measures since a person's income might provide the more accurate measure of whether they were *able* to achieve the particular functionings.

Within the capability literature, the space between resources and capabilities is intended to reflect (i) the conversion factors which different people face in translating resources into capabilities and (ii) the non-monetary influences on people's capabilities. The space between capabilities and functionings is intended to reflect choice and the distinction between what they *are able* to achieve and what they do, in fact, achieve. In theory, this serves to neatly partition constraints from choices. But since most, if not all, measures of people's capabilities are non-ideal, this partition between constraints and choices cannot be drawn as neatly in practice as one would like. And this means that our judgement about the *reason* for variations between resources and functionings or refined functionings will influence our decision about the relative merits and demerits of focussing on resource or functioning measures, respectively. Understanding more clearly the nature of 'conversion factors' between resources and refined functionings is therefore of considerable importance for poverty analysis, and, indeed, for justifying the capability approach.

Notes

[i] Health status is selected instead of disability status because ill-health is a better predictor of material deprivation. The coefficient for disability status was not significant once health status was included in the final regression model.

[ii] These three figures are therefore based on 2,943 households.

[iii] In selecting a longer-term income measure, there is a balance to be struck by the theoretical desire for selecting more years and a practical desire to minimise missing cases (and thus selecting fewer years). After inspecting the substantive results and number of missing cases, a five-year measure was selected as providing the optimal balance between these competing aims.

[iv] A household where the head it aged between 40 and 59, is in very good health, is in owner-occupier with a mortgage, lives as a couple with no children, where at least one household member is employed.

[v] When we subtract the '1' of the reference category

[vi] For the conversion factors taken from the weighted regressions, the figure was 46 per cent.

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Zaidi, A. and T. Burchardt (2005), 'Comparing incomes when needs differ: Equivalization for the extra costs of disability in the UK', *Review of Income and Wealth*, 51: 1, pp. 89 - 114.

Table 1. Proportion of households experiencing an enforced lack of each deprivation item

material deprivation items	%
keep home adequately warm	0.5
pay for a week's annual holiday away from home	9.2
replace worn out furniture	5.8
buy new, rather than second hand, clothes	1.9
eat meat, chicken or fish at least every second day	1.3
have friends or family for a drink or meal at least once a month	2.4
have two pairs of all weather shoes for each adult in the household	1.1
have enough money to keep home in a decent state of decoration	3.3
have household contents insurance	3.8

Source: BHPS 2006/7

Table 2. Four-way material poverty classification

	%
not poor	74.7
income poor but not materially deprived	11.1
materially deprived but not income poor	9.9
both income poor and materially deprived	4.3

Source: BHPS 2006/7

Table 3: Logistic regression model predicting experience of material deprivation

	current income	five year ave
log of income	-1.524***	-2.124***
	(0.17)	(0.21)
16 to 24	0.643	0.622
	(0.41)	(0.41)
25 to 39	0.329*	0.328*
	(0.17)	(0.17)
60 to 79	-1.004***	-1.222***
	(0.22)	(0.23)
80 to 99	-1.942***	-2.171***
	(0.33)	(0.34)
owner without mortgage	-0.499*	-0.539*
	(0.21)	(0.21)
social tenant	1.071***	0.884***
	(0.18)	(0.18)
private rented tenant	0.621**	0.562*
	(0.22)	(0.23)
good health	0.507**	0.487*
	(0.2)	(0.2)
fair health	0.941***	0.886***
	(0.21)	(0.21)
bad health	1.545***	1.462***
	(0.26)	(0.26)
very bad health	1.463***	1.402***
	(0.38)	(0.38)
workless household	0.322	0.282
	(0.21)	(0.21)
some self-employment	-0.266	-0.154
	(0.23)	(0.23)
single person HH	0.376	0.303
	(0.19)	(0.19)
lone parent	1.278***	1.059***
	(0.3)	(0.31)
couple, children	0.237	0.0967
	(0.22)	(0.22)
other, no children	0.578*	0.468
	(0.25)	(0.25)
other, children	0.747**	0.457
	(0.28)	(0.28)
_cons	5.659***	9.249***
	(1.02)	(1.28)
N of cases	2801	2801
McFadden's Adjusted R2	0.227	0.238
Nagelkerke's R2	0.324	0.337

* $p<0.05$, ** $p<0.01$, *** $p<0.001$; standard errors from model appear in parentheses
Reference categories: age 40 – 59; owner occupier with a mortgage; very good health; some employment in HH; couple, no children.
Source: BHPS 2006/7

Table 4. Estimated conversion factors based on regression estimates from model reported in Table 3.

|	current income		five-year average income	
Age category (ref: 40 to 59)	**Conversion factors**	**95% CI**	**Conversion factors**	**95% CI**
16 to 24	1.53	0.59 - 2.46	1.34	0.79 - 1.89
25 to 39	1.24	0.97 - 1.51	1.17	0.99 - 1.35
60 to 79	0.52	0.35 - 0.68	0.56	0.44 - 0.69
80 to 99	0.28	0.14 - 0.42	0.36	0.24 - 0.48
Tenure (ref: owner w mortgage)				
owner without mortgage	0.72	0.52 - 0.92	0.78	0.62 - 0.93
social tenant	2.02	1.35 - 2.69	1.52	1.21 - 1.82
private tenant	1.50	1.04 - 1.97	1.30	1.02 - 1.59
Health Status (ref: very good)				
good	1.39	0.96 - 1.83	1.26	0.99 - 1.52
fair	1.85	1.21 - 2.50	1.52	1.17 - 1.87
poor	2.76	1.42 - 4.09	1.99	1.37 - 2.61
very poor	2.61	1.03 - 4.19	1.93	1.20 - 2.67
Employment status(ref: some employment()				
workless household	1.24	0.85 - 1.63	1.14	0.89 - 1.39
some self-employment	0.84	0.56 - 1.12	0.93	0.71 - 1.15
Household composition (ref: couple, no children)				
single person HH	1.28	0.90 - 1.66	1.15	0.92 - 1.38
lone parent	2.31	1.08 - 3.55	1.65	1.06 - 2.23
couple, children	1.17	0.78 - 1.55	1.05	0.80 - 1.30
other, no children	1.46	0.92 - 2.00	1.25	0.92 - 1.58
other, children	1.63	0.88 - 2.38	1.24	0.85 - 1.63

Source: BHPS 2006/7

Table 5. Change in 'mismatch' between income and material deprivation when moving to conversion-adjusted income measures

	current income measure	conversion-adjusted income
% of lowest income quintile who experience deprivation	27.1	44.0
N of cases	561	561
	five year ave of current income	**five year conversion-adjusted income**
% of lowest income quintile who experience deprivation	30.7	43.5
N of cases	561	561

Source: BHPS 2006/7

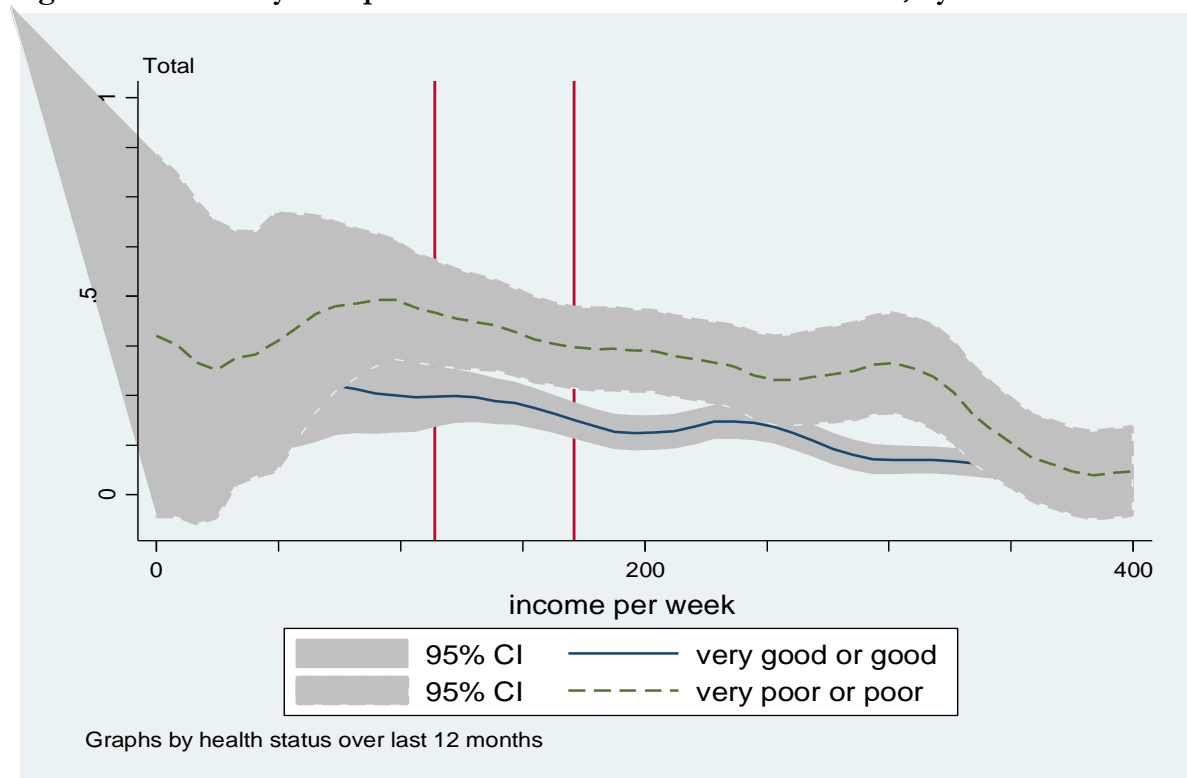**Figure 1: Probability of experiencing material deprivation, by equivalised £ per week**
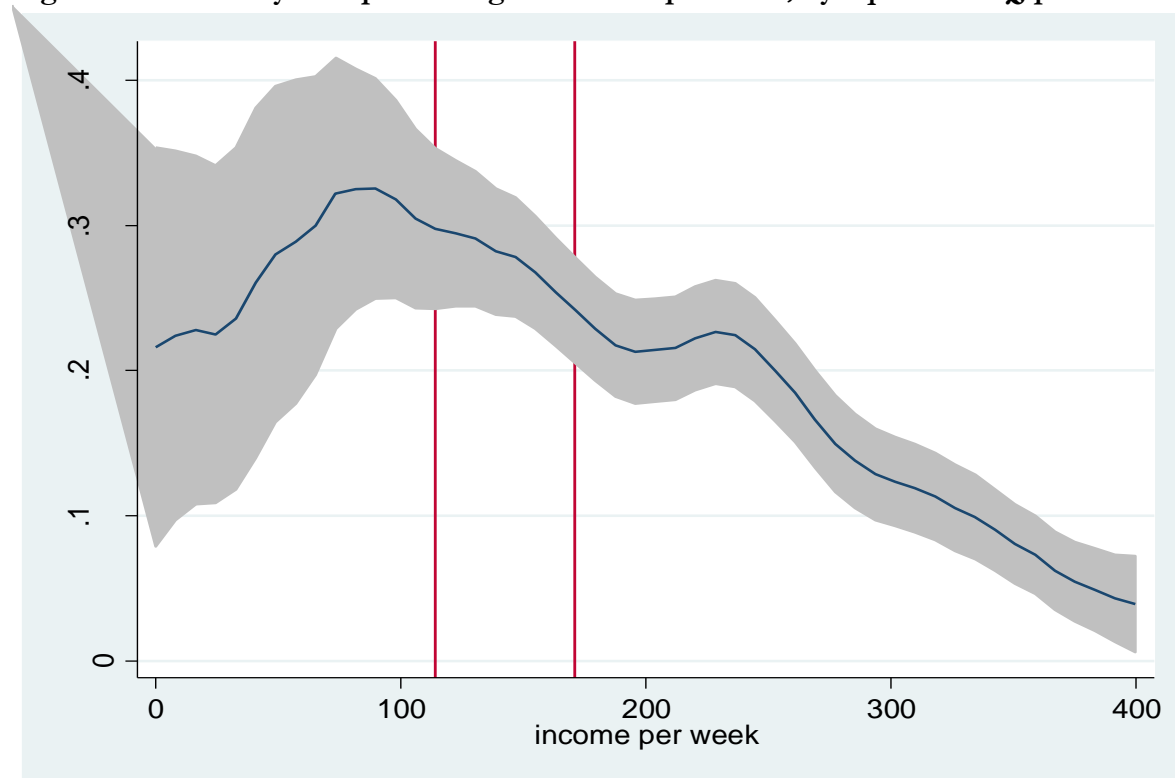
Source: BHPS 2006/7. Trend line and confidence interval computed using Stata's -lpolyci- command
Note: Material deprivation is classified as respondents with an enforced lack of one of more items.
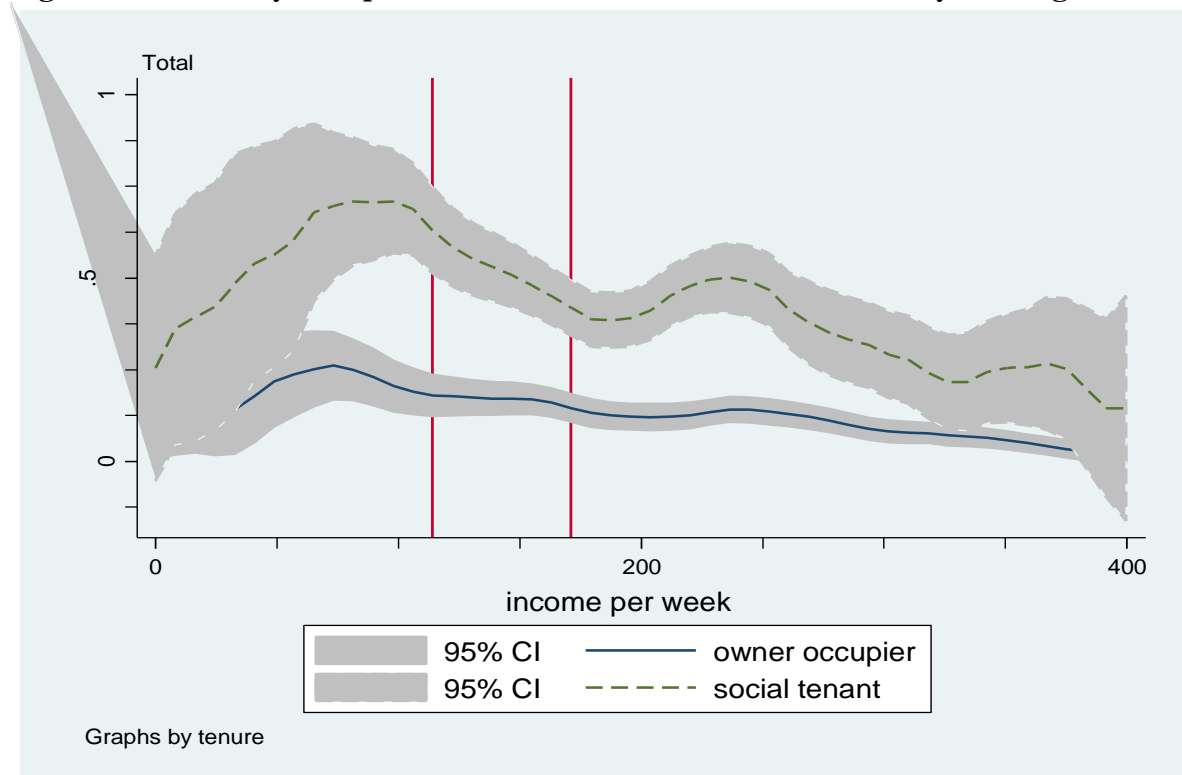Vertical lines represent 60 per cent median income poverty line (right-hand line) and 40 per cent median
income poverty line (left-hand line), respectively.

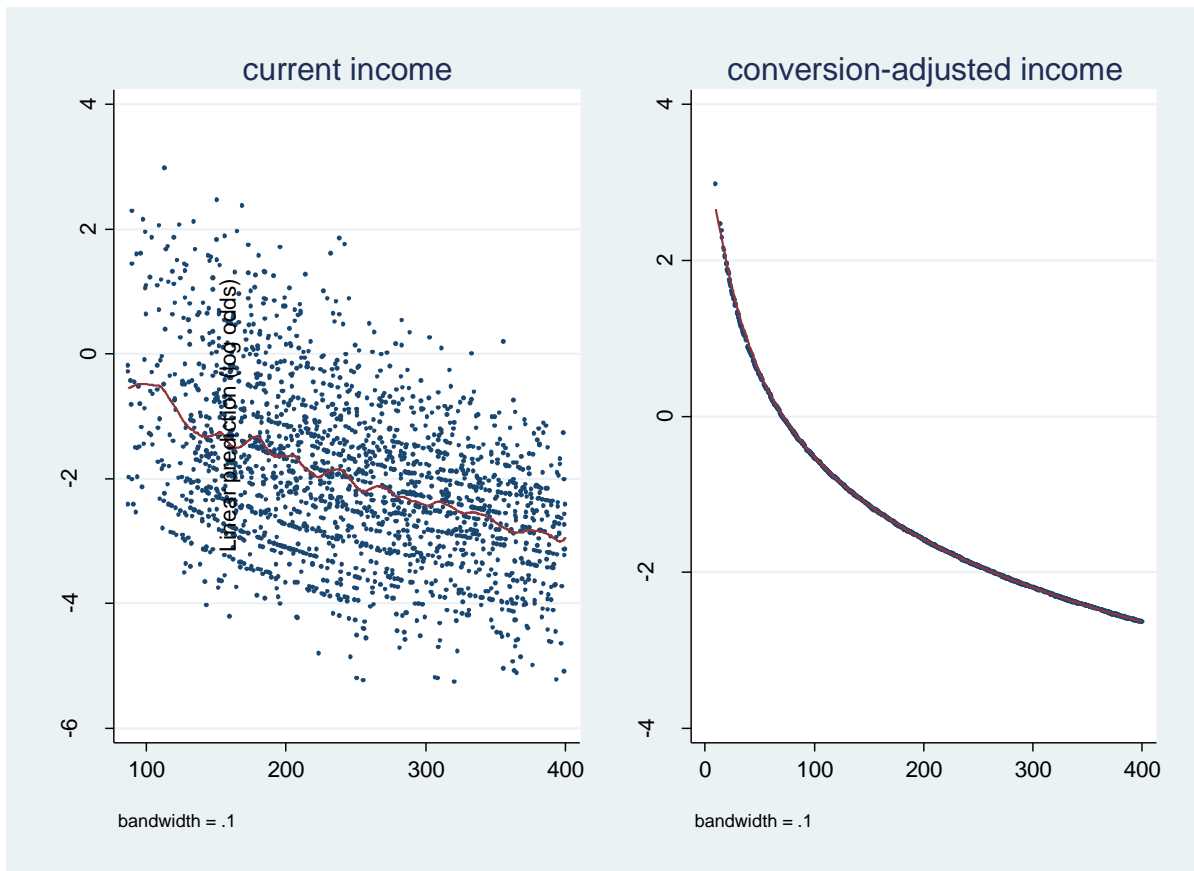**Figure 2. Probability of deprivation across the income distribution, by health status**

Source: BHPS 2006/7. Trend lines and confidence intervals computed using Stata's -lpolyci- command
Vertical lines represent 60 per cent median income poverty line (right-hand line) and 40 per cent median
income poverty line (left-hand line), repectively.

Figure 3. Probability of deprivation across the income distribution, by housing tenure

Source: BHPS 2006/7. Trend lines and confidence intervals computed using Stata's -lpolyci- command
Vertical lines represent 60 per cent median income poverty line (right-hand line) and 40 per cent median income poverty line (left-hand line), repectively.
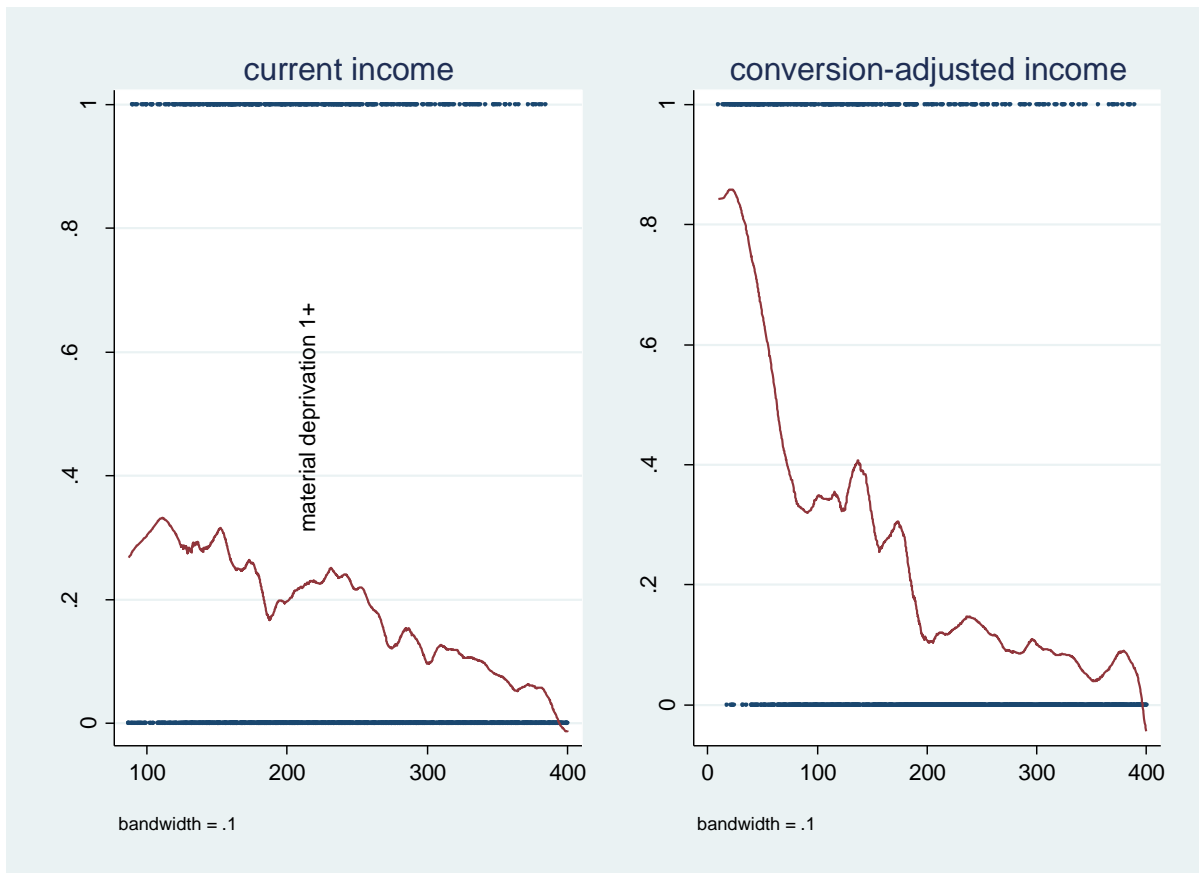
Figure 4. Linear prediction of log odds of material deprivation by current income (LHS) and conversion-adjusted income (RHS), current income model

Source: BHPS 2006/7

Figure 5. Smoothed probability of material deprivation (actual data) across distribution of current income (LHS) and conversion-adjusted income (RHS), current income model

Source: BHPS 2006/7