Testing the expert based weights used in the UK's Index of Multiple Deprivation (IMD) against three preference-based methods.

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Abstract

The Index of Multiple Deprivation (IMD), used widely in England, is an important tool for social need and inequality identification. It summarises deprivation across seven dimensions (income, employment, health, education, housing and services, environment, and crime) to measure an area's multidimensional deprivation. The IMD aggregates the dimensions that are differentially weighted using expert judgement. In this paper, we test how close these weights are to society's preferences about the relative importance of each dimension to overall deprivation. There is not agreement in the literature on how to do this. This paper, therefore, develops and compares three empirical methods for estimating preference-based weights. We find the weights are similar across the methods, and between our empirical methods and the current IMD, but our findings suggest a change to two of the weights.

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1. Introduction

Deprivation is multidimensional; low income and other material and social disadvantages affect an individual's well-being (Atkinson, 2003; Stiglitz, Sen and Fitoussi, 2009). In the UK, the Index of Multiple Deprivation is a multidimensional index used to measure deprivation in small geographically-defined areas. The IMD is used extensively by national and local government to identify pockets of high deprivation and to direct poverty alleviation policies, to classify local authority districts into those eligible for additional funding and used within formulae that determine funding for health care, policing and housing across England.

The IMD includes seven dimensions of deprivation: Income, Employment, Health and Disability, Education, Skills and Training, Barriers to Housing and Services, Living Environment, and Crime. The IMD aggregates these dimensions into one summary deprivation measure, in which the dimensions are differentially weighted. In multidimensional indices those dimensions with higher weights impact on total deprivation more, and increased achievement in one dimension can compensate for decreased achievement in another[1]. The weight given to a dimension is a judgement about the dimension's importance in the aggregate.

A variety of methods are used to estimate dimension importance for indices. These include expert-based, correlation-based, and preference-based weights (see Decancq and Lugo, 2013 and OPHI, 2012 for reviews). Expert-based weights are based on experts' opinions about each dimension's importance to the overall experience of deprivation. Many multidimensional deprivation indices use expert-based weights and most of these weight all dimensions equally[2]. Expert-based weights have been criticised because experts

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[1] In addition to weights, the choice of indicators, their transformed distributions and the aggregation function will also lead to implicit dimension weighting. See Decancq and Lugo (2012) for a discussion of these issues.
[2] Equal weights may be explicit and normative because each dimension is believed to be equally important. Often, however, equal weighting is implicit because researchers want to avoid the contentious task of setting weights (OPHI, 2012).

may not accurately represent the population being assessed by the index, which raises concerns about paternalism. The IMD is an example of an index with expert-based weights that differ across dimensions. (Noble et al. 2000; Noble et al. 2004; Smith et al, 2015). The IMD weights were applied based on theoretical and normative considerations about the dimensions' importance to the experience of deprivation. The reliability of the expert-based dimension weights in the IMD has been questioned (Deas et al, 2003).

Correlation-based weights are based on data about deprivation and the correlation between the different dimensions in the population. Correlation-based weights summarise data and do not reflect preferences. An extensive literature calculates weights based on the correlation between dimension deprivations in the population using Principal Component Analysis (PCA) or Factor Analysis (FA) (Ram, 1982; Noorbakhsh, 1998). Both, PCA and FA assume one single, latent variable (or construct) exists to be measured and that this is best measured using a set of variables (corresponding to the index's dimensions). The weight assigned to each dimension reflects the accuracy with which the variable measures the latent factor. A limitation of this method is that many multidimensional indices do not aim to improve a single (latent) construct's measurement, but to summarise several constructs into a single measure of aggregate deprivation. When a multidimensional index measures multiple, independent, latent constructs, PCA and FA can offer no guidance on dimension weights.

Consider the following thought experiment: In a hypothetical country, in time period *t,* citizens' wellbeing is measured by their housing quality, health, and mobile phone ownership. At time *t* everyone who is in poor health lives in poor housing and does not own a mobile phone and everyone in good health lives in good housing and owns a mobile

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Examples of multidimensional indices with equal weights include the Human Development Index (HDI) (UNDP, 1990), the Human Poverty Indices (UNDP, 1999), the Commitment to development index (Birdsall and Roodman, 2003), the Multidimensional Poverty Index (Alkire and Santos, 2010) and the New Zealand Index of Socioeconomic Deprivation (NZiDep) (Salmond et al, 2003).

phone. There is perfect correlation between these three variables. PCA or FA would generate equal weights. From a normative perspective, however, we believe that not owning a mobile phone is not as deleterious for wellbeing as living in poor housing or being in poor health. Now the country's government improves the housing of all citizens. In time period *t+1*, 90% of individuals previously living in poor housing now live in good housing, but nothing else has changed. The correlation between housing and health, and housing and mobile phone ownership is now lower. Therefore, correlation based weights will change and housing will receive a smaller weight even though the normative importance of housing to wellbeing has not changed.

Preference-based weights are based on individuals' preferences and can be either inferred from the relationship between individual wellbeing and deprivation in dimensions or directly elicited from individuals using surveys. Fleurbaey et al (2009), Haiksen-DeNew and Sinning (2010), and Schokkaert (2007) derive weights based on the relationship between individuals' (subjective) well-being and their experience of deprivation across a set of dimensions. Adler and Dolan (2008), Fusco et al (2013), Bellani (2013) and Benjamin et al (2014) derive weights from a sample of individuals stated preferences about the importance of achievements in each dimension for wellbeing.

This paper aims applies and compares three empirical methods to estimate preference-based weights for the IMD. The paper is based on research reported in the working paper Dibben et al (2007). The methods we apply to obtain preference-based weights differ in how directly preferences are elicited. In the first empirical method, we estimate weights based on the relationship between individuals' self-reported social exclusion and their achievements in the IMD dimensions. In doing so, we observe how achievements act through the individual's and society's preferences to affect their experience of social exclusion within the society to which they belong. In the second empirical method, we

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estimate weights using a stated preference survey and directly ask members of the general public to state the most deprived individuals from a set of multidimensionally deprived individuals. In the third empirical method, we estimate weights based on how much money the government spends alleviating deprivation across the IMD dimensions such that the weights are proportional to the relative government spending. We argue individuals' preferences influence government spending through the democratic process.

In this paper we detail the methods used to elicit preference-based weights, the assumptions underlying these methods and the challenges faced when applying each method. Each method takes a slightly different, but related, conceptual approach and this enables us to assess the stability of preference-based weights across the elicitation methods. If we find that weights differ across methods, our results can prompt discussion and a decision based on empirical evidence. If we find weights are the same across methods we provide strong support for a set of weights.

2. The Index of Multiple Deprivation in England

The IMD is a multidimensional deprivation index used to measure deprivation in England at the super output area level[3]. The IMD combines seven deprivation dimensions: Income, Employment, Health and Disability, Education, Skills and Training, Barriers to Housing and Services, Living Environment, and Crime. Deprivation in each dimension is measured by a set of indicator variables and their respective thresholds below which an area is considered deprived (Table 1, Column 1). For example, five indicators and thresholds are used to measure Income deprivation, and each indicator counts the proportion of an area's population who are deprived for that indicator. Dimension

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[3] The super output area level is a geographically area developed by the UK Office of National Statistics that contains on average 1,500 people.

indicators are combined or aggregated to obtain a score for that domain. The aggregation method varies across the dimensions. For instance, the indicators within the *Income Deprivation* dimension are believed to measure a single underlying construct – income deprivation – and as such are combined using FA.

Standardised dimension scores are aggregated following equation 1 to provide a multidimensional deprivation index score for a super output area:

$$I(X) = \left[w_1 I_1(\boldsymbol{x}_1) \quad + \cdots + w_q I_q(\boldsymbol{x}_q) \quad \right] \tag{1}$$

x_j denotes deprivation in dimension $j=1,\ldots,q$ and overall deprivation is summarised by $X=(x_1,\ldots,x_q)$. An area's deprivation is the weighted mean of the (transformed) deprivations $I_j(x_j)$. The dimensions, x_j, are measured in different units, thus a transformation function or standardisation is required giving, $I_j(x_j)$. The dimension weights are non-negative ($w_j{\geq}0$). The index is increasing in deprivation and can be used to assess if one geographically defined area is worse or better off (more or less deprived) than another.

In the five IMDs since 2000 (IMD 2000, IMD 2004, IMD 2007, IMD 2010 and IMD 2015), expert-based dimension weights have been used. The weights are unchanged since IMD 2004 and take account of theoretical and normative considerations based on existing literature and the quality of dimension indicator data[4] (Noble et al. 2000; Noble et al. 2004). The existing literature suggests that having a low income and being dislocated from the labour market are key determinants of other deprivations, and therefore these dimensions should carry greater weight Thus, the Employment and Income dimensions were given weights of 22.5%; Health and Disability, and Education Training and Skills

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[4] At each update, consideration has been given to changing the weights. Each time the consultation concluded that it was desirable to retain comparability across versions. Since IMD 2015 domain scores have been published which allow the construction of indices with alternative weights (Smith et al, 2015)

dimensions 13.5%; and Barriers to Housing and Services, Living Environment and Crime dimensions 9.3%.

3. Three empirical methods to calculate weights

3.1. Individual's experience of social exclusion

An individual's experience of social exclusion may reflect the allied but less experiential state of multiple deprivation. We measure an individual's experience of social exclusion and achievements in dimensions of the IMD using data from the Millennium Poverty and Social Exclusion Survey (PSE). The PSE interviewed a sample of 1,534 individuals drawn from respondents to the 1998/99 General Household Survey. The interviews asked respondents about their circumstances and their views on issues associated with poverty, deprivation and social exclusion (Gordon et al. 2000).

We measure social exclusion using responses to the following question:

> *"Have there been times in the past year when you've felt isolated and cut off from society or depressed, because of a lack of money?"*

This question fits with Townsend's conceptualization of deprivation as not only a state, but also a process that excludes people from social norms with consequences for the well-being of that person (Townsend, 1979). We therefore use feeling isolated and cut off from society as a proxy for the individual's experience of multidimensional deprivation.

We develop a set of regressors that represent achievements in each IMD dimension. For each dimension, we create a variable coded as 1 if the individual is 'dimension deprived' and otherwise coded as 0. To do this, we match dimension indicator variables from the

IMD 2004 with PSE variables as summarised in Table 1, columns 1 and 2. If exact equivalents for a dimension indicator were not available in the PSE then variables of most relevance to the dimension were used. Each PSE variable was used to create binary outcome for an individual: either above or below the IMD threshold (Table 1). These binary variables were combined into dimension indicator variables. Consistent with a union measure of deprivation, an individual was considered to be deprived in a dimension if they were below the IMD-equivalent threshold in any of the PSE variables for that dimension. The number of individuals considered deprived for each dimension are presented in Table 2.

We estimate the effect of being deprived in a dimension on the experience of social exclusion using a logistic regression model in which we estimate the probability that individual, i, experiences social exclusion ($Pr(ESE_i=1)$) as a function of experiencing deprivation in the IMD dimensions (Greene, 2011). We follow the specification of the IMD and specify a linear additive relationship between the dimensions as in equation (1):

$$Pr(ESE_i=1) = (\beta_{inc}INC_i + \beta_{emp}EMP_i + \beta_{hea}HEA_i + \beta_{bhs}BHS_i + \beta_{le}LE_i + \beta_{crime}CRIME_i) + \varepsilon_i \quad (2)$$

Subjective measures, such as the PSE social exclusion measure, can be affected by idiosyncratic individual differences and individual differences that lie within the 'private sphere' (for example, religious belief) that should not be considered in a deprivation measure (Schokkaert (2007). The error term ε_i in equation (2) captures idiosyncratic differences across individuals. Variables representing factors that lie within the private sphere may be included in equation (2) to control for their influence on social exclusion. We estimate equation (2) with and without these controls.

We use marginal effects to calculate the impact of moving from being not deprived in a dimension to being deprived in a dimension on the probability of experiencing social

exclusion. We calculate weights (scaled to sum to 1) for the IMD by dividing each marginal effect by the sum of all the marginal effects. These weights describe the relative importance of each dimension on underlying deprivation (social exclusion).

Based on the responses to the social exclusion question in the PSE, 240 individuals experienced social exclusion and 1330 did not. Table 3, column 2 reports the relationship between experiencing social exclusion and the dimension variables. All but one of these variables were statistically significantly related to probability of an individual experiencing social exclusion. Being deprived in the Barriers to Housing and Services dimension was not statistically significantly related to social exclusion. The ranking of the IMD dimensions from the regression-based weights is: Income, Health and Disability, Employment, Education, Skills and Training, Living Environment, Crime and Barriers to Housing and Services. Figure 1 reports PSE weights based on the rescaled marginal effects.

We test the robustness of the estimated weights in two ways. We test robustness to the choice of proxy by re-estimating the weights using individuals' feeling depressed as a proxy for the experience of deprivation. We test robustness to the inclusion of additional control variables. The weights derived from this alternative proxy and/or with the control variables are broadly similar and are available from the authors on request.

3.2. General population stated preference survey

We use a survey-based stated preference method, a discrete choice experiment (DCE) to find out which dimensions society considers to be worse than others, and how much worse[5]

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[5] DCEs are based on Lancaster's theory of value (Lancaster, 1966) and can be used to elicit the relative importance of different product characteristics in the demand for a good or a service. DCEs have been applied in transportation research, and in environmental and health economics to elicit preferences for non-market goods (Kanninen, 2007).

in order to assess how society judges individuals experiencing deprivation in one or multiple dimensions. We assume that deprivation states can be described by the dimensions, and that the relative importance of dimensions can be inferred from responses to a survey in which respondents judge if one multidimensional deprivation state is worse than another.

In the survey we define multidimensional deprivation states wherein each state refers to a hypothetical person's circumstances[6]. The dimensions included are based on the IMD dimensions and indicators (Table 1, column 3). A hypothetical person's circumstances in each dimension could be deprived or not deprived based on the IMD thresholds for the dimension's indicators. In our study there are 128 multidimensional deprivation states (2^7). We match these states with their mirror image to create 128 pairs of hypothetical states that describe two people who experience multidimensional deprivation. A mirror image of a state is created as follows, if one state is deprived in the income dimension then its mirror image is not, if one state is not deprived in the employment dimension then its mirror image is, and so on. An example of a pair of multidimensional deprivation states is presented in Figure 2.

We ask survey respondents to report which of the two individuals in a pair of deprivation states most needs additional government support. By asking which person needs additional government support, we incorporate the purpose of the IMD: the distribution of government funding. The respondents' choices reveal information about the trade-offs they make between deprivation on the different dimensions when deciding who needs additional government support. We developed questionnaires that explained to respondents each dimension's meaning, and the two states an individual could be in. In the questionnaire, the dimensions and indicators were explained in way that was

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[6] The hypothetical people are all adults: we take this perspective to avoid confounding respondents' weights for the dimensions with the deprived individuals' characteristics.

consistent with the hypothetical person perspective presented in the choice tasks. The deprivation thresholds were chosen both to match those in IMD 2004 and to be meaningful and understandable to the general public. The 128 pairs of states are too many to ask one respondent to assess. The pairs were randomly divided in to eight groups of 16 pairs and eight versions of the questionnaire developed. After respondents assessed 16 pairs, they completed questions about their socioeconomic characteristics.

The questionnaire was sent to a random sample of 1000 households in England drawn from the Royal Mail's small user postcode address file in August 2006[7]. One week after the initial mailing a postcard was sent to the whole sample, to thank respondents and remind non-respondents to respond. A second questionnaire was sent to non-respondents three weeks later. The second mailing contained a revised covering letter urging those who had not yet responded to do so and another copy of the questionnaire.

From the questionnaire responses, we observe which of the two hypothetical persons a respondent states should be given more government support. Thus, we have a binary dependent variable. We assume that respondents select the person they believe is most deprived and analyse responses within the framework of random utility theory. We assume respondents perfectly discriminate between the two states and know the relative importance they give to each dimension when deciding who is most deprived, but that we, the analyst, cannot observe all the factors that influence respondents' choices (McFadden, 1973). We estimate the effect of being deprived in a dimension on respondent's choice using a logistic regression model in which we estimate the probability that respondent i states that individual j is most deprived (*Pr(D=1)),* as a function of the observable, deprivation dimensions as in equation 1, and an additive random (unobservable)

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[7] Included alongside the questionnaire was a covering letter explaining the use of the IMD and the relevance of this study and a prepaid return envelope was also included.

component, ε_j (Greene, 2011). We follow the specification of the IMD and specify a linear additive relationship between the dimensions as in equation (1):

$$Pr(D_j = 1) = (\beta_{inc}INC_i + \beta_{emp}EMP_i + \beta_{hea}HEA_i + \beta_{bhs}BHS_i + \beta_{le}LE_i + \beta_{crime}CRIME_i) + \varepsilon_i \qquad (3)$$

The random component ε_j represents inter-individual differences in state j's assessed deprivation due to heterogeneity in respondents' preferences, measurement errors and/or the functional form specification (Manski, 1977). Each respondent makes 16 choices, therefore we have 16 observations per respondent and estimate a random effects logit model[8]. We estimate marginal effects and calculate the weight for each dimension by transforming the marginal effects onto a 0 to 1 scale.

251 individuals returned the general population survey (response rate = 25.1%). The socioeconomic characteristics of the respondents are summarised in Table 4. Respondents are not representative of the population in England as at census 2001. Respondents under represent people under the age of 60 years and under represent people with no or 'O' level (or equivalent) educational qualifications. Responses are weighted by age and education, based on population proportions in the census 2001 to correct for the sample composition.

Table 5 reports the marginal effects of the survey responses, for the unweighted and weighted samples. Overall, most dimensions are statistically significant determinants of respondents stating that a hypothetical individual should receive more government support. Weighting the responses to correct for sample representativeness has a small impact on the results: each dimension's weight changes slightly but the dimensions' relative importance do not change. The ranking of the IMD dimensions from the survey-

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[8] In Dibben et al (2007) the DCE data are analysed using a probit model without random-effects.

based weights is: Income, Living Environment, Health and Disability, Education, Skills and Training, Barriers to Housing and Services, Crime and Employment. Table 5, column 5 and Figure 1 report the DCE weights for the IMD based on the rescaled marginal effects estimated for the weighted sample.

3.3. Government spending

Government spending, arguably, reflects society's assessment of the relative importance of factors influencing their own lives, and those of their fellow citizens through the electoral system. During elections political parties put before the electorate manifestos detailing different options about the manner and degree to which revenues are raised and how the state's resources will be spent. For instance, before the 1997 election the Labour party emphasised education's importance. This, therefore, provided a mandate for the Labour party, after winning the election, to put their policies into action, and increase government spending on the education sector (Department for Education and Skills 2004). Based on the assumption that the political system allows the population's preferences to influence government policy and through this the amount of money spent on various social policies, we derive weights by calculating the proportion of government spending allocated to each IMD dimension. We assume that government spending associated with each IMD dimension represents the value to society of keeping individuals out of a particular deprivation state.

Government spend is reviewed for financial year 2003-2004 for each major central government department and local government. Appendix A shows how departmental budgets are allocated to IMD dimensions. The total spending attributed to each dimension is added together and a percentage of total spend calculated for each dimension. This percentage indicates the emphasis given by local and national government to each IMD dimension, and translates to each dimension's weight given within the overall index. We

assume that the national debate acted out within the democratic process affects systems of government and that spending decision are not based on precise accounting processes but rather on a broader debate about the importance of providing social goods to reduce deprivation in specific areas of society. The differential cost of satisfying the same level of need in different dimensions is not accounted for in the wider debate, although may be important in the particular functioning of government.

Table 6 reports the total government spend attributed to each IMD dimension, as detailed in Appendix A. Health and Disability and Income Deprivation are given the greatest share of resources and Employment is given the lowest share. The percentage of government spend attributed to each IMD dimension represents the weight that should be given to each dimension. The ranking of the IMD dimensions based government-spend weights is: Health and Disability; Income; Education, Skills and Training; Barriers to Housing and Services; Crime; Living Environment; and Employment Deprivation. Table 6 and Figure 1 report the government spend-based weights for the IMD.

4. Discussion

All three empirical methods produce similar weights (Figure 2), and suggest a close correspondence between what is important to individuals who experience social exclusion, what people say is important when judging hypothetical others and how governments allocate spending to alleviate deprivation.

The weights represent a plausible weight range for the IMD within which, for most dimensions, the existing expert elicited weights sit. The weight range is fairly narrow for some dimensions: the *Income* weights range from 21.60 (PSE) to 25.39 (government spend) and the Education, skills and training weights range from 11.44 (DCE) to 13.02

(PSE). The narrow range indicates a 'consensus' about these dimensions' importance. There is a wider range of weights for other dimensions, however: the Living Environment weights range from 8.16 (government spend) to 24.02 (DCE) and Employment weights range from 3.76 (DCE) to 17.38 (PSE). In these cases, expert opinion is needed to understand why differences arise across the methods, how the methods affect the estimated weights, and to select an appropriate weight. The benefit of the method outlined in this paper is that this sensitivity is identified and the search for an appropriate response prompted.

All three empirical preference-based methods suggest that Employment should be given less weight and that Health and Disability should being given a higher weight than they currently receive in the IMD. The existing weights are 'outliers'. The low Employment weight derived from the DCE implies that respondents do not view unemployment as a significant problem for individuals 'over and above' deprivation in the other IMD dimensions. The low weight from the government spending implies that government does not spend a lot on alleviating unemployment. The PSE weights give a lower weight to Employment than the IMD, but still suggest that employment has a substantial influence on a person's feeling of social exclusion (even after controlling for income deprivation).

It was challenging to map the IMD to the methods used. Apportioning government spending separately to Income, Employment and Education, skills and training is complicated. Much government spending serves more than one purpose: for example, to increase a household's income and to incentivise work or to improve population education and to improve their 'employability'. Figures for Employment and Education domains differ from the original working paper. The Employment domain included spend for Education, Skills and Training in the original working paper (Dibben et al. 2007). On reflection, and to avoid double counting, the authors have removed this spend in the

analysis presented here. For the Education Domain, 'Cash' value was used in the original paper, whereas we have now used the 'real terms' value. Doing so gives greater clarity as to how the total was arrived at (see Appendix A). DCE respondents were asked to complete the questionnaire from a societal perspective and to state who should receive government support. This question mimics the IMD purpose, but does not ask who is most deprived. DCE respondents may have considered both the individuals' experiences of deprivation and how effective government support would be in alleviating deprivation. It is reasonable to assume that the government can reduce income deprivation, but should government be in the business of providing employment for all? For the PSE data it was a challenge to identify variables included in the data set that measured each of the dimension indicators in the IMD 2004. For the Income dimension, the PSE data included variables that were similar to four out of five of the IMD indicators (no variable measures asylum seeker support). Whereas, for the Education dimension, the PSE data included variables that were similar to only one out of seven IMD indicators. The PSE data has a variable on the adult respondents' educational attainment and does not included data on children's and young people's educational attainment.

Benjamin et al (2014) ask individual to choose between two alternative lives that differ in 2, 4 or 6 dimensions to elicit weights for a large set of well-being dimensions, and Adler and Dolan (2008) ask individuals to rank alternative multidimensional lives. Both studies apply stated preference methods similar to the one applied here. One concern about stated preference methods is that choices are hypothetical and therefore are unreliable measures of true preferences. Economists apply stated preference methods to value non-market goods, and studies find significant differences between hypothetical and true valuations (Blumenschein et al, 2008; Harrison and Rutström, 2008). However, Benjamin et al (2014) argue that stated preferences reliability is less problematic when "elicited preferences are

used […] normatively". The convergence between our weights provides evidence that stated preference methods elicit reliable preferences for deprivation dimensions.

There is circularity in the use of government spending as a proxy for importance of the different dimensions of deprivation. Voters' preferences are reflected in the election's outcome, but government's spending reflects voter's preference and the marginal effectiveness of spending across different policies. Our method implicitly assumes that, at the margin, spending on education and spending on health will have the same effect on reducing education deprivation and health deprivation, respectively.

Our results have three limitations. First, in the DCE, all dimensions have two outcomes either an individual is deprived or not. For the Living Environment dimension this means the person's was living in "decent housing" or "not decent housing". Respondents' may have had an emotional reaction to the word "decent" and this framing effect could explain the high weight given to Living Environment in the DCE weights (Tversky and Kahneman, 1981). Second, the data across the three methods are for different years. The government spend is for 2003/4. The DCE was administered in 2006. The PSE data were collected in 1998/99. These data are close in date to 2004, and therefore are comparable to the expert-based weights chosen for the IMD 2004 and used in all subsequent indices (IMD 2007, 2010, 2015). Future research could consider if index weights should change over time and the stability of preference-based weights. Given the current interest in measures of wellbeing, social exclusion should be routinely measured by government using the PSE question or a similar question. Such data would provide the opportunity to explore the stability of preference-based weights. Third, the PSE and DCE weights are based on data concerned with an individual's experience of deprivation. The weights from apportioning government spending are based on spending across England and include spending that is not directed at individuals but at areas. The IMD is a measure of area

deprivation. It is an open question whether weights would differ if the general population were asked about an area's deprivation rather than individual deprivation (Atkinson, 2003).

5. Conclusion

The IMD is an important tool for social need and inequality identification. Indices assign weights are either explicitly or implicitly to each dimension. These weights are normative judgements about the each dimension's relative importance for overall deprivation. We apply and compare three empirical methods of deriving preference-based weights for the IMD. We compare weights derived from individuals' experience of social exclusion, a survey exploring the trade-offs society makes between different deprivation dimensions and the apportioning government spending on alleviating deprivation. We find a high degree of correspondence between the weights obtained from each method and between the empirical weights and the weights used since IMD 2004. The preference-based weights derived in this study do not consider the robustness of the data available to measure deprivation across the dimensions and this is taken into account in the weights set in the IMD 2004. Nevertheless, a simple swap of the IMD weights for the Employment and Health and Disability achieves a solution very close to that of the average weights across our three methods.

References

Atkinson, A.B. (2003). Multidimensionsal deprivation: contrasting social welfare and counting approaches. *Journal of Economic Inequality* 1: 51-65

Alkire, S. Santos, M.E. (2010). Acute multidimensional poverty: A new index for developing countries. *OPHI working papers* University of Oxford

Bellani, L. (2013). Multidimensional indices of deprivation: the introduction of reference group weights. *Journal of Economic Inequality* 11: 495-515

Benjamin, D., Heffetz, O., Kimball, M., Szembrot, N. (2014). Beyond happiness and satisfaction: Toward well-being indices based on stated preference. *American Economic Review*, 104: 2698-2735

Birdsall, N., Roodman, D. (2003). The commitment to development index: A scorecard of rich-country policies (Washington, DC: Center for Global Development).

Blumenschein, K., Blomquist, G., Johannesson, M., Horn, N., Freeman P. (2008). Eliciting willingness to pay without bias: evidence from a field experiment. *The Economic Journal*, 118: 114-137

Deas, I., Robson, B., Wong, C., Bradford, M. (2003). Measuring neighbourhood deprivation: a critique of the Index of Multiple Deprivation. *Environment and Planning C* 21: 883-904

Decancq, K., Lugo, M. A. (2013). Weights in multidimensional indices of wellbeing: An overview. *Econometric Reviews* 32: 7-34

Department for Education and Skills (2004). Departmental Report 2004 (Skills DfEa, ed):Norwich: HMSO.

Dibben, C., Atherton, I., Cox, M., Watson, V., Ryan M., Sutton M. (2007) Investigating the impact of changing the weights that underpin the Index of Multiple Deprivation 2004. Working paper Department of Communities and Local Government.

Fleurbaey, M. Schokkaert, E. Decancq, K. (2009). What good is happiness? *CORE discussion papers, Université catholique de Louvain*

Fusco, A., Guio, A-C., Marlier, E. (2013). Building a material deprivation index in a multinational context: Lessons from the EU experience. In Bérenger, V. Bresson, F. (eds). *Poverty and social exclusion around the Mediterranean Sea,* Economic Studies in Inequality, Social Exclusion and Well-Being Volume 9. Springer, London.

Gordon, D., Adelman, L., Ashworth, K., Bradshaw, J., Levitas, R., Middleton, S., Pantazis, C., et al. (2000). *Poverty and social exclusion in Britain*. Vol. 41. Joseph Rowntree Foundation, York

Greene, W.H. (2011). *Econometric Analysis*. Seventh Edition, Pearson Education.

Haisken-DeNew, J., Sinning, M. (2010). Social deprivation of immigrants in Germany. *Review of Income and Wealth* 56: 715-733

Harrison, G., Rutström, E. (2008).Experimental evidence on the existence of hypothetical bias in value elicitation methods. In Plott, C., Smith, V.L. (eds). *Handbook of Experimental Economics Results*, Elsevier, New York.
Kanninen, B. J. (Ed.) (2007). *Valuing Environmental Amenities Using Stated Choice Studies: A Common Sense Approach to Theory and Practice.* Dordrecht, The Netherlands: Springer

Lancaster, K. J. (1966). A New Approach to Consumer Theory. *Journal of Political Economy* 74: 132-157

McFadden, D. (1973). Conditional logit analysis of qualitative choice behavior. In P. Zarembka (ed.), *Frontiers in Economics*. Academic Press, New York

Manski, C. (1977). The structure of random utility models. *Theory and decision*. 8: 229-254

Noble M, Smith G A N, Penhale B, Wright G, Dibben C, Owen T, Lloyd M, (2000), *Measuring multiple deprivation at the local level: the indices of deprivation 2000*, Department of the Environment, Transport and the Regions, London

Noble M, Wright G, Dibben C, Smith G A N, McLennan D, Anttila C. Barnes H, Mokhtar C, Noble S, Avenell D, Gardner J, Civizzi I, Lloyd M. (2004), *Indices of deprivation 2004*, Report to the Office of the Deputy Prime Minister. London: Neighbourhood Renewal Unit

Noorbakhsh, F. (1998). The human development index: some technical issues and alternative indices. *Journal of International Development* 10: 589-605

OPHI Oxford Poverty and Human development Initiative (2012). *Value judgements in multidimensional poverty indices*. Report of the OPHI research workshop, June

Ram, R. (1982). Composite indices of physical quality of life, basic needs fulfilment and income: A principal component representation. *Journal of Development Economics* 11: 227-247.

Salmond, C., Crampton, P., King, P., Waldegrave, C. (2006). NZiDep: a New Zealand index of socioeconomic deprivation for individuals. *Social Science & Medicine*, 62: 1474-1485

Schokkaert, E. (2007). Capabilities and satisfaction with life. *Journal of Human Development*, 8: 415-430

Smith, T., Noble, M., Noble, S., Wright, G., McLennan, D., Plunkett, E. (2015). The English indices of deprivation 2015. Technical Report, Department for Communities and Local Government.

Stiglitz, J.E., Sen, A., Fitoussi, J-P. (2009). *Report by the commission on the measurement of economic performance and social progress*. Commission on the Measurement of Economic Performance and Social Progress.

Townsend, P. (1979). *Poverty in the United Kingdom: a survey of household resources and standards of living*. University of California Press, Berkeley

Tversky, A., Kahneman, D. (1981). The framing of decisions and the psychology of choice Science, 211: 453-458

United Nations Development Programme (1990). *Human Development Report 1990*. Oxford University Press, New York.

United Nations Development Programme (1999). *Human Development Report*. Oxford University Press, New York.

Figure 1: Comparison of IMD weights and empirical weights by method
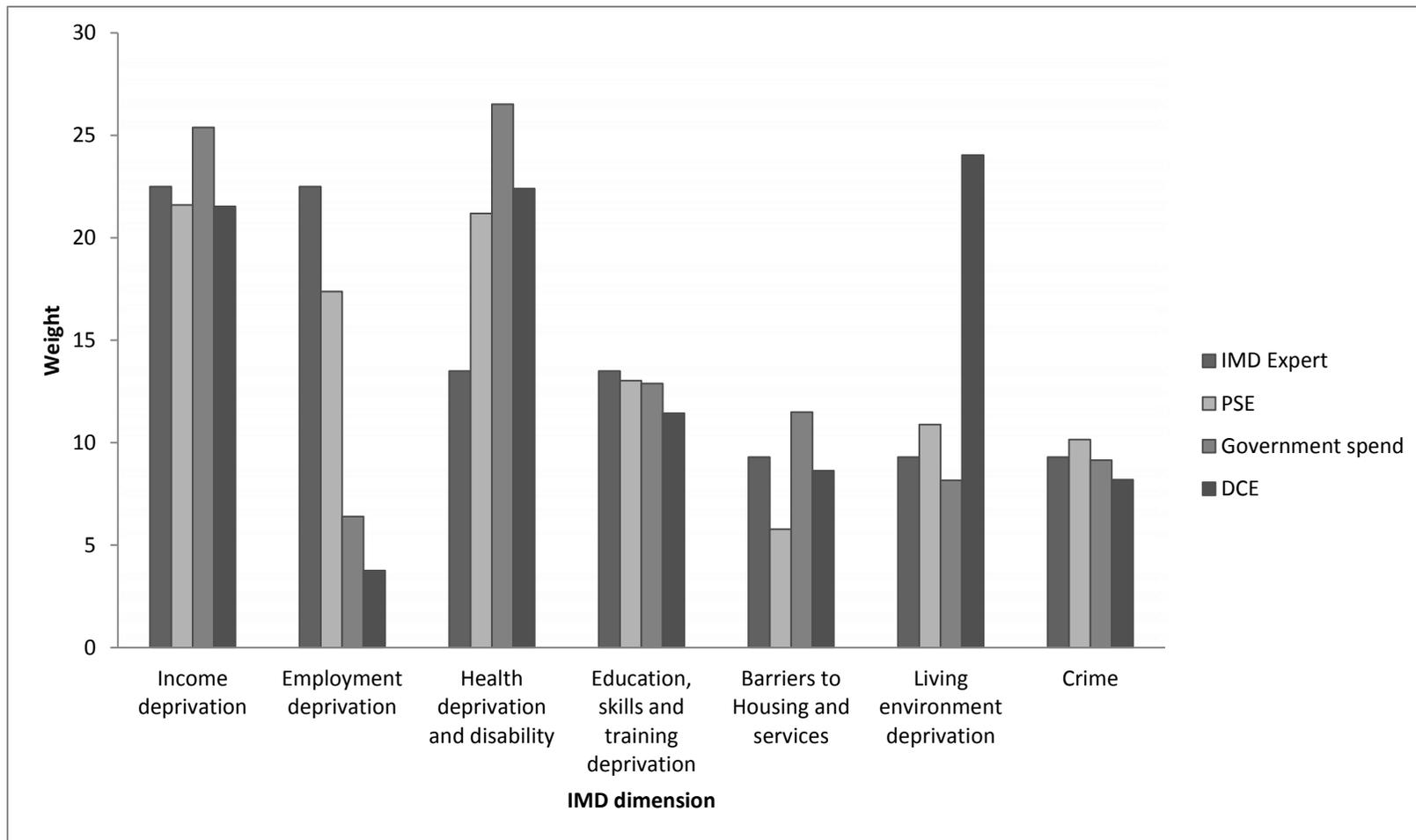
Figure 2: Example of a discrete choice experiment pair

	Person A	**Person B**
Crime	Not a victim of crime in last 4 years	Victim of crime in last 4 years
Employment	Unemployed	Employed, retired or looking after home/family
Income	At least £100 per adult.	Less than £100 per adult.
Health	No limits on daily activity and work	Limits on daily activity and work
Housing Quality	Decent	Non decent
Education	No educational qualifications	Educational qualifications
Convenience of services	Inconvenient	Convenient

Who needs most support?	**Person A**	**Person B**
	☐	☐

Table 1: Index of Multiple Deprivation 2004 indicators, Poverty and Social Exclusion (PSE) survey regression variables and Discrete Choice Experiment (DCE) dimensions.

IMD indicators	PSE equivalent variables (coding)	DCE dimensions and levels
Income dimension		
Adults and children in Working Families Tax Credit households whose equivalised income (excluding housing benefits) is below 60% of median before housing costs (2001, Source: Inland Revenue and Department of Work and Pensions (DWP)).	Equivalised net weekly household income. (0=Above 60% Median Equiv. Income; 1=Below 60% Median Equiv. Income)	The dimension was described as: "…the total amount of money that a household has each week for each adult living in this household. This is the money available to cover housing costs, bills, grocery shopping etc. In the following situations, people will be described as living in a household where income is:"
Adults and children in Income Support households (2001, Source: DWP).	Receipt of income supplement by head of household or spouse. (0=No; 1=Yes)	
Adults and children in Disabled Person's Tax Credit households whose equivalised income (excluding housing benefits) is below 60% of median before housing costs (2001, Source: Inland Revenue and DWP).	Receipt of National Insurance (NI) sick pay, incapacity benefit by Head of household or spouse. (0=No; 1= Yes)	More than £100 per person per week Or Less than £100 per person per week
Adults and children in Income Based Job Seeker's Allowance households (2001, Source: DWP).	Receipt of job seeker's allowance by head of household or spouse. (0=No; 1= Yes)	
National Asylum Support Service supported asylum seekers in England in receipt of subsistence only and accommodation support (2002, Source: Home Office and National Asylum Support Service).	None available.	

Table 1: IMD indicators, continued.

IMD indicators	PSE equivalent variables (coding)	DCE dimensions and levels
Employment dimension		
Unemployment claimant count: women aged 18-59 and men aged 18-64 averaged over 4 quarters (2001, Source: Office of National Statistics (ONS)).	Respondent unemployed – International Labour Organisation definition (0=Other; 1=Unemployed)	The dimension was described as: "...the person described is in paid employment or not. In the following situations the people will either be:
Incapacity Benefit claimants: women aged 18-59 and men aged 18-64 (2001, Source: DWP).	Respondent aged between 18 and retirement age and unable to work. (0=Other; 1=Unable to work)	Employed – either employed, retired, or looking after home/family
Severe Disablement Allowance claimants: women aged 18-59 and men aged 18-64 (2001, Source: DWP).	None available.	Or Unemployed – not in paid employment
Participants in New Deal for the 18-24s who are not included in the claimant count (2001, Source: DWP).	Respondent aged 18-24 on government scheme. (0=Other; 1=On government scheme)	
Participants in New Deal for 25+ who are not included in the claimant count (2001, Source: DWP).	Respondents aged 25+ on government scheme (0=Other; 1=On government scheme)	
Participants in New Deal for Lone Parents aged 18 and over (2001, Source: DWP).	Respondent is lone parent aged 18+ and on government scheme (0=Other; 1=On government scheme)	

Table 1: IMD indicators, continued.

IMD indicators	PSE equivalent variables (coding)	DCE dimensions and levels
Health and Disability dimension		
Comparative Illness and Disability Ratio (CIDR) (2001, Source: DWP).	Respondent's activities limited by illness or disability (0= not limited; 1= limited).	The dimension was described as: "…health is measured by whether the person has a long-term illness or disability, which limits their daily activities or the work they can do. In the following situations the people described will either have:
Measure of adults under 60 suffering from mood or anxiety disorders, based on prescribing (2001, Source: Prescribing Pricing Authority), Hospital Episode Statistics (1998/1999 to 2001/2002, Source: Department of Health (DH)), suicides (1997 to 2001, Source: ONS) and health benefits data (1999, Source: DWP).	Mental health as measured by the 12-item General Health Questionnaire (GHQ-12). (0=GHQ Score 0-3; 1=GHQ Score 4+)	
Measures of emergency admissions to hospital, derived from Hospital Episode Statistics (1999/2000 to 2001/2002, Source: DH).	Respondent has attended casualty in last 3 months. (0=Not attended; 1=Attended)	Limits on their daily activities and work due to long term illness Or No limits on their daily activities and work due to long term illness
Years of Potential Life Lost (1997 to 2001, Source: ONS).	None available.	

Table 1: IMD indicators, continued.

IMD indicators	PSE equivalent variables (coding)	DCE dimensions and levels
Education, Skill and Training dimension		The dimension was described as:
Children/Young People sub-dimension		
Average points score of pupils at Key Stage 2 (end of primary) (2002, Source: Pupil Level Annual School Census (PLASC), National Pupil Database (NPD) - Department for Education and Skills (DFES)).	None available.	"...People who have no educational qualifications can find that they are limited in the opportunities that are available to them. In the following situations people have either:
Average points score of pupils at Key Stage 3 (2002, PLASC and NPD - DFES).	None available.	
Average points score of pupils at Key Stage 4 (GCSE/GNVQ – best of eight results) (2002, Source: PLASC and NPD -DFES).	None available.	No educational qualifications Or Have educational qualifications
Proportion of young people not staying on in school or non-advanced further education above age16 (Child Benefit 2001, Source: DWP).	None available.	
Secondary school absence rate (Average of 2001 and 2002, Source: DFES school level survey of authorised and unauthorised absences, allocated to the local area via the PLASC data, DFES).	None available.	
Proportion of those aged under 21 not entering Higher Education (1999-2002, Source: University and College Admissions System).	None available.	
Skills sub-dimension		
Proportions of working age adults (aged 25-54) in the area with no or low qualifications (2001, Source: 2001 Census).	Respondent had no qualifications. (0=Qualifications; 1=No Qualifications)	

Table 1: IMD indicators, continued.

IMD indicators	PSE equivalent variables (coding)	DCE dimensions and levels
Barriers to Housing & Services dimension		
Wider barriers sub-dimension		*Convenience* was defined as a short walk, drive or bus ride. The dimension was described as:
Household overcrowding (2001, Source: 2001 Census).	Household overcrowding. (0=Up to 1 person per room; 1=More than 1 person per room)	"Where a person lives will affect how handy local services, such as the shops, primary school, doctor's surgery are to
Difficulty of access to owner-occupation (2002, Source: ONS).	None available.	them. In the following situations people either live where local services are:
Local Area level percentage of households for whom a decision on assistance under the homeless provisions of housing legislation has been made - assigned to the constituent super output areas (2002, Source: Office of the Deputy Prime Minister (ODPM)).	None available.	Convenient (within a short walk, drive or bus ride)
Geographical barriers sub-dimension		Or Inconvenient (not within walking distance, a long drive or bus journey away)
Road distance to General Practitioner premises (May 2003, Source: NHS Information Authority).	Respondent did not have use of doctor. (0=Other; 1=Don't have use)	
Road distance to Post Office (End of March 2003, Source: Post Office Ltd).	Respondent did not have use of a post office. (0=Other; 1=Don't have use)	
Road distance to supermarket or convenience store (December 2002, Source: MapInfo Ltd).	Respondent did not have use of a medium size supermarket.(0=Other; 1=Don't have use)	
Road distance to primary school (2001-02, Source: DFES).	None available.	

Table 1: IMD indicators, continued.

IMD indicators	PSE equivalent variables (coding)	DCE dimensions and levels
Living Environment dimension		Decent housing is defined in the PSE survey as "warm, damp free, and [with] reasonably modern facilities". The dimension was described as:
The 'indoors' living environment sub-dimension		
Social and private housing in poor condition (2001, Source: Building Research Establishment and ODPM, modelled English House Condition Survey).	Accommodation was in poor state of repair. (0=Good/adequate state of repair; 1=Poor state of repair)	"The quality of housing can vary. Housing is considered to be in **decent** condition if it is warm, damp free, and has reasonably modern facilities. If housing does not have some or all of these conditions then it would be considered **non-decent**. In the following situations the people live in housing that is either:
Houses without central heating (2001, Source: 2001 Census).	Accommodation without central heating. (0=Central heating; 1=None)	
The 'outdoors' living environment sub-dimension		
Road traffic accidents involving injury to pedestrians and cyclists (2000-2002, Source: Department for Transport, STATS19 (Road Accident Data) smoothed to Super Output Area level).	Respondent reported road risk as problem in area. (0= not problem; 1= is problem)	
Air quality (2001, Source: UK National Air Quality Archive data modelled at Super Output Area level by the Geography Department at Staffordshire University).	Respondent reported air pollution as problem in area. (0= not problem; 1= is problem)	Decent Or Non Decent

Table A1: IMD indicators continued.

IMD indicators	PSE equivalent variables (coding)	DCE variable and levels
Crime dimension		
Burglary (4 recorded crime offence types, Police Force data for April 2002-March 2003, constrained to Crime and Disorder Reduction Partnership (CDRP) level).	Actual or attempted break in to home in the last year. (0=No; 1= Yes)	The dimension was described as: "Crime rates vary across neighbourhoods, thus the chance of a person being a victim of crime differs depending on whether or not s/he lives in a high crime area or not. The serious crimes that happen most often are theft and burglary. In the following situations you are told whether the person has experienced burglary or theft in the last four years.
Criminal damage (10 recorded crime offence types, Police Force data as above).	Deliberate damage or vandalism to home in the last year. (0=No; 1= Yes)	
Theft (5 recorded crime offence types, Police Force data as above).	Theft of item being carried in the last year. (0=No; 1= Yes)	
Violence (14 recorded crime offence types, Police Force data as above).	Violently assaulted outside of household or by adult member of household. (0=No; 1= Yes)	
		Has been a victim of burglary or theft in the last four years Or Has not been a victim of burglary or theft in the last four years.

Table 2: Number of deprived and non-deprived individuals by dimension based on PSE survey

PSE Equivalent Variables	Dimension Deprived Individuals (N)	Dimension Non-Deprived Individuals (N)
Income	560	974
Employment	193	1341
Health Deprivation and Disability	663	871
Education, Skills and Training	379	1155
Barriers to Housing & Services	60	1474
Living Environment	657	877
Crime	244	1290

Table 3: Weights based on experience of social exclusion (Logistic regression)

PSE Equivalent Variables	Marginal effects	Weight
Income	1.085**	21.6
Employment	0.873**	17.38
Health Deprivation and Disability	1.064**	21.18
Education, Skills and Training	0.654**	13.02
Barriers to Housing & Services	0.290	5.78
Living Environment	0.547**	10.89
Crime	0.510*	10.15
Number of observations	1534	
Pseudo R^2	0.1951	

Notes: * Significant at the 95% level; ** Significant at the 99% level;

Dependant variable=1 if individual feels socially excluded and 0 if individual does not feel socially excluded

Table 4: Socioeconomic characteristics of respondents to stated preference survey

Socioeconomic Characteristics	Level	Sample (%)
Age (years)	Range	18-91
	Mean	54
Gender	Male	49.3
	Female	50.7
Highest educational qualification	None	20.6
	O level	14.8
	A level	12.1
	Apprentice	17.5
	Degree	27.4
	Other	7.6
Employment status	Employed	47.5
	Seeking Employment	1.81
	Retired	34.84
	Looking after Home/family	2.71
	Ill health	2.71
	Student	0.90
	Self employed	9.05
Gross annual household income	Up to £5200 per year	4.3
	5,200 – 10, 300	13.3
	10400 – 15559	11.4
	15600 – 20799	4.8
	20800 – 25999	13.8
	26000 – 31199	12.9
	31200 - 51999	22.4
	52000 +	17.1

Table 5: Weights based on discrete choice experiment (random effects logit)

IMD Dimension	DCE dimension	Marginal effect Unweighted	Marginal effect Weighted	Weight
Income	Income	-0.895**	-0.860**	21.54
Employment	Employment	-0.096*	-0.150	3.76
Health and disability	Health and disability	-0.730**	-0.895**	22.41
Education skills and training	Education	-0.417**	-0.457**	11.44
Barriers to housing and services	Convenience of Core services	-0.331**	-0.345**	8.63
Living environment	Housing Quality	-0.840**	-0.960**	24.02
Crime	Experience of Crime	-0.363**	-0.327**	8.20
N. observations		3440	3393	
N. individuals		251	228	
Pseudo R^2		0.2485	0.2203	

<u>*Notes:*</u> * Significant at the 95% level; ** Significant at the 99% level;

Of the 251 questionnaire respondents, 27 did not complete the DCE, 25 partially completed the DCE (2 completed 1 choice, 2 completed 3 choices, 1 completed 4 choices, 2 completed 6 choices, 3 completed 7 choices, 1 completed 11 choices, 4 completed 12 choices, 3 completed 14 choices, 7 completed 15 choices), and 199 respondents completed all 16 choices.

Table 6: Weights based on attributed government spend (Source: Appendix A)

IMD Dimension	Local and national government spending 2003-2004	
	(£millions)	Weight (percentage of spending)
Income	91,199	25.39
Employment	22,971	6.40
Health and disability	95,220	26.51
Education skills and training	46,301	12.89
Barriers to housing and services	41,278	11.49
Living environment	29,314	8.16
Crime	32,853	9.15
Total	**359,136**	**100**

Appendix A: Allocation of Government spending across dimensions of IMD

Table A1: Spending to alleviate Income Deprivation
Table A1 reports government department spending aimed at alleviating income deprivation. The figures comprise spending from two departments: the Department of Work and Pensions (DWP) and HM Revenue and Customs (HMRC). Means-tested benefits ensure people have a minimum level of income are allocated to the Income dimension. Not all social benefits are concerned with alleviating income deprivation, however; some benefits are intended primarily to assist people into work or to enable then to remain within work. These benefits are not allocated to the Income dimension and instead are allocated to the Employment dimension.

Expenditure	(£million)	
DWP[1]	**Resource**	**Capital**
Children	249	8,287
Working-age (minus employment related benefits)	18,135	
Pensioners	55,549	
Corporate and shared services	1,679	91
National Insurance Fund	1,423	1
Public corporations	115	−65
Total DWP spending	**85,529**	
HMRC(2005)[2]		
Tax credits	5,670	
Total HMRC spending	**5,670**	
Total spending	**91,199**	

[1] Department of Work and Pensions (2005) Table 2.

[2] HM Revenue and Customs (2005) Table 1.

Table A2: Spending to alleviate Employment Deprivation

Table A2 reports government department spending aimed at relieving Employment Deprivation.   The figures comprise spending from three departments: the DWP, the Department of Trade and Industry (DTI), and the Department for Education and Skills. We include benefits designed to assist people to remain a part of the labour force, or to take a break from participation in waged labour.

Expenditure	Spending (£million)	
DWP		
Employment programmes[1]	1,403	
Working age employment benefits (including jobseeker's allowance, job grant, earnings top up, statutory sick pay, statutory maternity pay, maternity allowance, and incapacity benefit)[1]	15,887	
Total DWP spending	**17,290**	
	Consumption of resources	**Capital**
DTI[2]		
Increasing UK competitiveness	2,859	510
Increasing Scientific Excellence	2,196	116
Total DTI spending	**5,681**	
Total spending	**22,971**	

[1] See Department of Work and Pensions (2005) Table 2.

[2] See Department of Trade and Industry (2005) Table 1.

Table A3: Spending to alleviate Health Deprivation and Disability
Table A3 reports government department spending aimed at relieving Health Deprivation and Disability. The figures comprise spending from three areas: the Department of Health (DH), the DWP, and local councils on social care. We have included spending on the National Health Service and spending by councils on social service provision; an essential part of the lives of many who have a disability. Income transfers that are not means tested and enable people to act as carers, thus enabling individuals to remain living independently in the community, are also added.

Expenditure	(£million)			
DH	Hospital, community, family health services (discretionary), related services, trusts	Family Health services (non-discretionary)	Central health & miscellaneous services (inc. departmental admin)	Total
Current expenditure (net)	57,594	2,097	1,336	61,027
Capital expenditure (net)	2,579	0	60	2,640
Total DH spending				**63,667**
DWP (2005)[2]		**Resource spending**	**Capital**	
Disability		19,190	249	
Total DWP spending		**19,349**		
Local councils - social service provision[3]				
Social services strategy		85		
Older people (aged 65 and over) including older mentally ill		4,043		
Adults aged under 65 with physical disability or sensory impairment		5,802		
Adults aged under 65 with learning disabilities		1,066		
Adults aged under 65 with mental health needs		882		
Other adult social services		326		
Total local council spending		**12,204**		
Total spending		**95,220**		

[1] See Department of Health (2006) Table E1

[2] See Department of Work and Pensions (2005) Table 1

[3] See Department for Communities and Local Government (2005) Table C1c

Table A4: Spending to alleviate Education, Skills and Training Deprivation

Table A4 reports government department spending aimed at alleviating Education Skills and Training deprivation. The figures are spending from the Department of Education and Skills (DFES).

Expenditure		(£million)*
DFES[1]		
Schools		
Capital		2,628
Current		29,763
of which		
Under 5s	3,436	
Primary	10,031	
Secondary	12,594	
Other	3,701	
Further education, adult learning, other education initiatives		5,671
Higher Education		5,589
Student support		1,058
of which		
Further education	159	
Higher education	900	
Administration, inspection costs, other services		1,592
Total spending		**46,301**

[1] See Department for Education and Skills (2004) Table 2.3

*2003-2004 estimated outturn

Table A5: Spending on alleviating Barriers to Housing and Services

Table A5 reports government department spending aimed at relieving Barriers to Housing and Services. The figures comprise spending from three areas: the Office of the Deputy Prime Minister (ODPM), local councils on housing services, and the Department for Transport (DFT).

Expenditure	(£million)	
	Consumption of resources	Capital
ODPM[1]		
Housing supply and demand	2,103	388
Decent places to live	351	1,260
Tackling disadvantage	2,205	221
Better services	70	109
Total ODPM spending	**6,707**	
DFT[2]		
Inter-regional transport systems - making better use of existing road network; reforming rail services and industry structures	8,372	427
Improve to accessibility, punctuality and reliability of local and regional transport systems. Increased use of public transport and other appropriate local solutions	2,049	2,522
Improving safety and respecting the environment	372	68
Financial management, cost control and appraisal of transport investment	125	16
Spending by Local Authorities relevant to DFT	4,392	2,444
Total DFT spending	**20,787**	
Local council		
Total non-HRA housing services[3]	9,103	
Highways, roads and transport services (specifically: highways maintenance planning, policy and strategy; public and other transport planning policy and strategy; structural maintenance-local authority roads; winter maintenance; street lighting; congestion charging; safe routes; road safety education; parking services; concessionary fares; bus services; local rail services; other public transport)[4]	4,681	
Total local council spending	13,784	
Total spending	**41,278**	

[1] See Office of the Deputy Prime Minister (2005) Table B1

[2] See Department of Transport (2005) Table A1

[3] See Department for Communities and Local Government (2005) Table C1d

[4] See Department for Communities and Local Government (2005) Table C1b

Table A6: Spending to alleviate Living and Environment Deprivation

Table A6 reports government department spending aimed at alleviating Living Environmental deprivation. The figures comprise spending from four areas: the Department for Environment, Food and Rural Affairs (DEFRA), the ODPM, local councils on environmental services, and the DWP. Resources that are spent on housing are included here as are benefits provided by the DWP that assist people to afford to live in adequate accommodation.

Expenditure	(£million)	
	Consumption of resources	Capital
DEFRA[1]		
Environmental protection	618	403
Natural resources and rural affairs	426	45
Departmental operations	309	20
Rural payments agency	590	36
Total DEFRA spending	**2,447**	
ODPM[2]		
Housing supply and demand	2,104	388
Decent places to live	351	1,260
Tackling disadvantage	2,205	221
Better services	70	109
Development of English regions	1,015	524
Admin	182	11
Government office administration	134	2
Total ODPM spending	**8,576**	
Local councils[3]		
Environmental services (Foreshore; sports and recreation facilities; open spaces; cemetery, cremation and mortuary services; public conveniences; other environmental health; waste collection; waste disposal; building control; development control; conservation and listed buildings planning policy; other planning policy; environmental initiatives)	**5,375**	
DWP		
Housing Benefits[4]	**12,916**	
Total spending	**29,314**	

[1] See Department for the Environment Food and Rural Affairs (2006) table 1

[2] See Office of the Deputy Prime Minister (2005) table B1

[3] See Department for Communities and Local Government (2005) table C1e

[4] See Hansard (2005)

Table A7: Spending to alleviate Crime

Table A7 reports government department spending aimed at reducing Crime. The figures comprise spending from two groups: the Home Office and local councils. The spending of the Home Office that is allocated to achieve strategic objectives that fit with within the definition of the crime dimension are used. Some spending by local councils is also primarily allocated to address crime.

Expenditure	(£million)	
	Consumption of resources	Capital
Home Office[1]*		
People are, and feel, more secure in their homes and daily lives (police, crime reduction, criminal records bureau, firearms compensation, police information technology, police complaints authority, independent police complaints commission, central police training and development agency, organised crime and counter terrorism, national criminal intelligence service, and national crime squad)	5,703	545
More offenders are caught, punished and stop offending, and victims are better supported (correctional services, youth justice board, probation, prison service, criminal cases review commission, criminal injuries compensation authority, and criminal justice)	3,754	257
Fewer people's lives are ruined by drugs and alcohol	96	0
Migration is managed to the benefit of the UK while preventing abuse of the immigration laws and of the asylum system (immigration service commissioner, immigration and nationality directorate, and UK passport service)	1,875	123
Citizens, communities and the voluntary sector are more fully engaged in tackling social problems and there is more equality of opportunity and respect for people of all races and religions (community development foundation, commission for racial equality, community policy directorate, and future builders)	87	0
Central services (research & statistics directorate, and departmental unallocated provision)	209	2
Spending by Local Authorities applicable to crime	10,388	
Total Home Office spending	**23,039**	
Local councils [2]*		
Police services	9,498	
Coroners court services	46	

Magistrates and other court services	445
Total local council spending	**9,989**
Total spending	**32,853**

[1] See Home Office (2005) Table 6.1

[2] See Department for Communities and Local Government (2005) Table C1f

*2003-2004 outturn

References for Appendix A

Department for the Environment Food and Rural Affairs (2006). Departmental Report 2006 (DEFRA, ed). Norwich:Norwich: HMSO.

Department for Communities and Local Government (2005). Local Government Financial Statistics England No.16 2005 (Government DfCaL, ed).

Department for Education and Skills (2004). Departmental Report 2004 (Skills DfEa, ed):Norwich: HMSO.

Department for Transport (2005). Annual Report 2005 (Transport Df, ed):Norwich: HMSO.

Department of Health (2006). Health and social services statistics, England (Health Do, ed):Government Statistical Service.

Department of Trade and Industry (2005). Department Report (Industry DoTa, ed):Norwich: HMSO.

Department of Work and Pensions (2005). The DWP Departmental Report (Pensions DoWa, ed):Department of Work and Pensions.

Department of Work and Pensions (2005). The DWP Departmental Report: The Department for work and pensions http://www.dwp.gov.uk/publications/dwp/2005/dr05/foreword.asp (last accessed 20 September 2006).

Hansard (2005). House of Commons Written Answers for 27 June 2005: http://www.publications.parliament.uk/pa/cm200506/cmhansrd/cm050627/text/50627w20.htm.

HM Revenue & Customs (2005). Child and Working Tax Credits Statistics: finalised awards 2004-04 (Customs HR, ed): National Statistics.

Home Office (2005). Departmental Report (Office H, ed):Norwich: HMSO.

Office of the Deputy Prime Minister (2005). Annual Report. Norwich: Office of the Deputy Prime Minister, http://www.communities.gov.uk/pub/48/2005ODPMAnnualReportPDF1175Kb_id1123048.pdf (last accessed 12 October 2006).