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Explaining Material Inequalities in Health: The Importance of Theoretically Based Measures

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Introduction

More than twenty years after the commissioning of the Black Report (Townsend & Davidson 1982) by the British Government, there is now a large literature on the subject of social and economic inequalities in health and mortality internationally. In contrast, in the Irish context, although there have been several papers on inequalities in mortality (Nolan, 1990); (OShea, 1997), published data on inequalities in morbidity are almost non-existent. The first task of this paper is thus to present evidence of inequalities in health in the Irish context using data from a nationally representative survey.

Yet, even in the British context, although the extent of inequalities in health and mortality have been described in some detail (Davey Smith, Blane, & Bartley 1994a), it would still be true to say that researchers are at an early stage in unravelling the causal processes at play. The Black Report itself accepted 'materialist' or 'structuralist' explanations as being the major cause as opposed to social selection, or cultural/behavioural mechanisms, but this was through a process of elimination rather than on the back of evidence (Davey Smith, Blane, & Bartley 1994b: 140). Subsequent research has not supplemented our understanding greatly for two main reasons: first, a great deal of research has been on whether inequalities in health are the product of the process of measurement (Bloor, Samphier, & Prior 1987) or are the result of social and economic selection (Blane, Davey-Smith, & Bartley 1993). Second, there has been a general lack of clarity about the nature of the 'material' factors involved. Until recently, few investigators used theoretically based social class schemas or attempted to differentiate the causal mechanisms that these entailed and none have attempted to separate these stratification processes from the effects of material factors such as income, deprivation and poverty. Research has led to a rejection of artefactual and social selection explanations (Davey Smith, Blane, & Bartley 1994a) and the acceptance of individual behaviour as having limited impact (Marmot 1986; Blane, Brunner, & Wilkinson 1996a; Carroll, Davey-Smith, & Bennett 1996; Blane, Brunner, & Wilkinson 1996b), thus this paper focuses on clarifying the theoretical and empirical nature of the material factors implicated in socio-economic inequalities in health as well as presenting much needed evidence of class inequalities in morbidity in the Irish context. The first part of the paper clarifies the concepts of 'material' and 'structural' circumstances and the mechanisms that are assumed to link these to health outcomes.

In particular, the paper argues that social stratification processes should be conceptually distinguished from income and deprivation based disadvantage. However, stratification schemes come in several flavours that have different theoretical bases and empirical properties, thus the paper also seeks to compare these.

Poverty, Deprivation and Health

Although socio-economic inequalities in health and mortality have been recognised for many years (Vernon 1939; Hunter 1955), the publication of the Black Report (Townsend and Davidson 1982) moved the debate on from one about the health

inequalities associated with particular occupations to one centred on generalised disadvantage summed up in the concept of social class. This was a major turning point that not only established a set of issues to be researched and debated, but also set the terms within which that debate would occur. The report made it clear that it saw the main explanation for these inequalities as lying outside the scope of the National Health Service and more likely due to 'economic factors such as income, work (or lack of it), environment, education, housing, transport and what are today called 'life-styles' (Townsend and Davidson 1982: 15).

Yet, as Vågerô & Illsley (1995: 221) have pointed out, it is unlikely that the same processes are at work at all these levels and dimensions. More generally, there is a failure to separate explanatory variables from their social and economic results that ultimately condition health outcomes. For example, although one may see the macro economic system and welfare state structure as ultimately explaining levels of poverty and disadvantage, it is still true that one's labour market status, household structure and education will be more directly influential on one's social and economic circumstances. It thus makes sense to separate out these factors from outcome measures such as material deprivation (e.g. food, heat and adequate shelter), low income or psychic outcomes such as poor locus of control or self-image.

The presence of this tendency in health research since the Black Report has made the task of forming some causal account of the mechanisms at play quite difficult. For example, in their work on the Whitehall sample of civil servants, Davey-Smith and colleagues (1990) use car ownership and access to a garden as indexes of disadvantage alongside civil service seniority measures. Similarly, those indexes of deprivation that have been used in area studies of mortality and health outcomes are based upon a range of variables that could have very different causal relations to health. Thus the SCOTDEP index developed by Carstairs & Morris (1989) in Britain combines the unemployment rate in an area with the proportions with no car, experiencing overcrowding and being in an unskilled social class. In Ireland deprivation indicies follow a similar logic, but add the proportion in rented accommodation to the list (Kelly, Hertzman, & Daniels 1997). Using such measures may illustrate the fine grain of the health inequality gradient, but do not provide a coherent measure of disadvantage that can be linked productively to the general social and economic processes that are causal on health.

Taking these considerations into account, we need to recast the concept of 'material' explanations more as mechanisms or processes and their outcomes that may impact on health. Even this more useful dichotomy is no more than a handy simplification of complex of interactive processes. However, to carry the debate on health inequalities forward, what we need is to separate explanatory factors from outcome circumstances and then find theoretically and empirically defensible ways of measuring these concepts. In the next section we go onto examine the notion of explanatory factors, and in particular, the concept of social stratification before returning to outcome measures and current empirical thinking on the operationalisation of poverty and deprivation.

Explaining Circumstances

If we were to simplify greatly the 'middle range' explanations given for inequalities in social and economic outcomes (and thence health outcomes), we could think about them as collections of *resources* and *constraints* on behaviour that lead to inequalities in *social power*. This is not a new simplification since it formed one part of both Giddens' Giddens (1979, 1984) and Bourdieu's (1990) work on 'structuration' and 'habitas' respectively, however, it provides an ideal typical way to think about causation and explanation. As both the above authors have made clear, individuals may or may not be aware of these resources and constraints, but they nonetheless exist as objective circumstances that effect their behaviour and can thus form regularities in social life and *aggregate* behaviour, if not necessarily *collective* behaviour (Goldthorpe & Marshall 1992: 383). Formally speaking, we could represent this collection of constraints and resources as a space with an infinite number of dimensions, or simplify this set to those of interest such as education, gender or ethnicity that we could label 'life circumstances' (Breen & Rottman 1995: 455). Analytically, it would be valuable to reduce the number of dimensions along which social power is believed to exist, but this should involve the specification of a grouping that subsumes these individual characteristics and links them to each other via the wider organisation of society. In the words of Mills (1959), this should allow us to relate 'personal troubles' to 'public issues'. This is precisely the value of the various theories of social stratification, which trace the confluence of various dimensions of social power to one indicator and formative mechanism.

Unfortunately, health inequalities tend to have been studied using atheoretical class schemas such as the old UK Registrar General's. This is unfortunate since there are several other more theoretically grounded measures available. Here we concentrate on two such stratification schemes, the 'EGP' and the 'Cambridge' Scale.

The class scheme of Erikson, Goldthorpe, & Portocarero (1979) (usually referred to as the 'EGP') was derived from an earlier continuous scale of 'social standing' devised by Goldthorpe & Hope (1974). The 36 categories of the earlier scale were grouped to form an eleven-class schema with the main divisions being between employees and the self-employed and between industry and agriculture. These divisions are constructed to reflect differences in employment relations and conditions, or what Lockwood (1958) has referred to as the 'work situation' within the enterprise. Thus, employers who buy the labour of others are differentiated from the self-employed who neither buy labour, nor sell their own. In the same way employees are divided into classes that reflect their position on a continuum between what are termed 'labour' and 'service' contracts:

> *Employment relations regulated by labour contracts entail a relatively short-term and specific exchange of money for effort. Employees supply more-or-less discrete amounts of labour…in return for wages, which are calculated on a 'piece' or time basis. In contrast, [service] relationships within a bureaucratic context involve a longer-term and generally more diffuse exchange…which takes the form not only of …a salary and prerequisites, but also comprises important prospective elements – for example salary increments on an established scale, assurances of security…, pensions and…well defined career opportunities (Erikson and Goldthorpe 1992: 41).*

Unlike the Registrar General's classification, the EGP is not a hierarchical schema, though if the self-employed are removed from the scale there should be an ordinal relationship between the remaining classes in terms of their position on the service-labour contract continuum.

The 'Cambridge Scale' scale on the other hand is explicitly a hierarchical measure of social distance between occupations where 'distance' is defined by the interaction patterns of those in different occupations. Instead of being made up of a discrete number of social class groups as in the EGP schema, the Cambridge Scale is a continuous measure that represents 'generalised advantage (and disadvantage)' (Prandy 1990: 635). However, unlike the individual level scales which underlay the U.S status attainment school of mobility research, the Cambridge scale actually represents the social structure of stratification by giving a score to each occupational grouping in *relation to all others*. The scale is based on the logic that those who share similar lifestyles and resources will interact more with one another on terms of social equality through friendship and marriage and, moreover, that these differences in lifestyle and resources will reflect a social structure of inequality. Thus to generate this social structure, the social distance between occupations (which is measured by the frequency of interaction) is directly measured. The benefit of using this 'relational' measure is that the method of construction takes into account the multiple dimensions of stratification and inequality and empirically creates a representation of this social space. This is important as other class theories, such as the EGP define the social space theoretically and then use the judgements of the originators to create the correct number of classes with the appropriate occupational groups within them. There has been some work validating the EGP measure using tests of criterion validity (Evans 1992, 1996). However, there is still an active debate as to whether the occupational characteristics identified by these tests do in fact identify classes, or whether they actually create a continuum with certain non-linearities akin to the Cambridge Scale (Prandy & Blackburn 1997).

Choosing between the Cambridge and EGP measures is difficult since we have two interrelated theoretical problems. First of all, which stratification mechanism is preferable? In a sense, the Cambridge Scale does not specify a mechanism through which the various dimensions of stratification it measures come about, but simply measures their impact on social relations. Nonetheless, it does offer a scheme that is related to health outcomes through the direct effects of differential resources, or the indirect effects of health beliefs and behaviours (Bartley 1999a, Chandola 1998). The EGP on the other hand offers an underlying mechanism through which inequalities in distribution occur (employment relations), including a more formalised economic theory (Breen & Rottman 1995; Goldthorpe 1997) and thus a number of routes to health outcomes. This more explicit theoretical mechanism does seem preferable to the somewhat 'black-box' approach of the Cambridge scale, but does depend more upon the judgements of the researcher in the construction of the classes than does the Cambridge Scale.

The second problem is whether the scheme adopted should be continuous like the Cambridge Scale or categorical like the EGP. Prandy & Blackburn (1997) have

argued that the factors said by Goldthorpe to differentiate the classes in the EGP actually lead to a continuous scale. Such an outcome would be far more amenable to health outcomes research which shows that even fine gradations in socio-economic circumstances leads to differential health outcomes, even near the top of any scale used (Davey-Smith et al 1990). The EGP classification came about partly as a reaction against 'status attainment' research in the US that used continuous scales similar to the Hope-Goldthorpe scale to measure occupational success. Goldthorpe, amongst others was more interested in examining the social structure within which success could, or could not occur and needed to represent this in a form amenable to empirical analysis. The result was the partnership of class theory and log-linear analysis through which social mobility research has progressed hugely in the last two decades (Goldthorpe et al 1980; Erikson and Goldthorpe 1992). The creation of the class schema was thus driven by the need to do social mobility research, rather than examine the consequences of these structural locations for other variables. However, outside of the realm of mobility research should we not adopt a measure which more validly represents the structure of inequality, rather than collapsing this down into useful, though essentially information shedding groupings? Given the space restrictions of this paper we cannot resolve the issue of whether the EGP should be seen as continuous here, but following Breen and Rottman (1995: 454), we can attempt to choose between the schemes empirically by seeing which is the better predictor of health outcomes.

Before we assess the value of the class schemas, we first need to return to the nature of general outcome measures which may, or may not be associated with these class based measures of structural inequality. As Townsend and Dividson (1982) themselves made plain in the later Penguin version of the Black Report, 'material deprivation' seems to be the key concept, thus we should turn to an examination of recent work on the association between deprivation, income and poverty.

Income, Deprivation and Poverty

Although, following others, we have criticised the Black Report for its lack of clarity on the notion of material circumstances, the work of one of the authors of the Report, Peter Townsend actually provides the starting point for our analysis of poverty and deprivation. Townsend's definition of poverty as exclusion from the ordinary, or customary living standards of society in general through a lack of resources (Townsend 1979: 31) has come to be widely accepted in poverty research, as has the definition's central assumption, that poverty research in industrialised countries will use a relative rather than absolute conception of poverty. This definition draws out the implicit logic in many studies that it is deprivation of particular items or type of lifestyle that is taken to be the causal process influencing health outcomes. The question is, how can such a definition be operationalised? Much poverty research has done so by using income as an indirect indicator of available resources, but this has been heavily criticised by Ringen (1988: 357) who argues that using income alone is both conceptually and empirically flawed. If, as most researchers assert, they are attempting to measure exclusion from the life of society because of lack of resources,

there is a fundamental flaw in using an *indirect* measure of resources to measure a *direct* concept of deprivation.

Following Callan, Nolan, & Whelan (1993) and Nolan & Whelan (1996a), we want to argue that income and lifestyle deprivation are conceptually distinct concepts and moreover that the relationship between variables representing these is to be empirically established. Past research (Callan, Nolan, & Whelan 1993; Nolan & Whelan 1996b) has shown that there are substantial proportions with relatively large incomes who are deprived in terms of consumption. Similarly, Callan *et al* (1993: 155) show that a majority of those in low income groups do not suffer from deprivation as measured by absence of particular items because of lack of resources.

Therefore, what aspects of deprivation should we attempt to bring together as indictors of deprivation? More to the point, is it realistic to speak of deprivation as a single dimension? Callan *et al* (1989) and Nolan & Whelan (1996) examined this question using factor analysis to test whether the absence of a variety of lifestyle items and services because of a lack of resources (following the work of Mack and Lansley 1985) formed identifiable dimensions. Their results showed that three distinct dimensions emerged which were labelled 'basic', 'secondary' and 'housing'. The basic dimension involved the enforced absence of items such as food, clothing and heat and the presence of debt for routine household expenses. The 'basic' nature of the items in this dimension was underlined by the fact that a majority of respondents saw them as necessary and relatively few lacked them. On the other hand, the secondary lifestyle dimension included consumer durables and leisure based items that could be seen as requiring significant and, as respondents saw it, unnecessary expenditure. Lastly, the housing dimension consisted of household facilities such as indoor toilets and access to a bath/shower, as well as housing quality indicators such as living in a damp free dwelling.

That the three forms of deprivation outlined above emerge coherently from household level data suggests that there are different processes accounting for variation in each. Moreover, it seems likely that some dimensions will be less associated with current income than others. For example, housing deprivation is likely to be heavily influenced by both national and local housing policy and need not, necessarily be closely related to current income. Similarly, low current income may not necessarily be a good guide to levels of basic deprivation since households would tend to draw on both their own savings and what other resources they had to avoid the absence of such essential items if at all possible. Thus, we could predict that those experiencing basic deprivation through a lack of resources will have been living on low incomes for a considerable period and now find this situation unavoidable. We would also expect that such low permanent income would also be associated with the lower end of the stratification spectrum, if the schemes already discussed have some purchase on social realities. However, if the social class theories are correct, they should not be completely synonymous with the deprivation and income measures. Since the EGP and Cambridge schemes represent stratification processes and thus explanatory factors rather than outcomes they should have some autonomous ability to predict variability

in health. The next section of the paper examines whether this is so by modelling the probability of experiencing chronic illness.

The Data

The data used for this paper come from the Living In Ireland Survey 1994 which was the Irish component of the first wave of the European Union Household Panel Study. Using a national sample, 4048 household and 9905 individual interviews were achieved from 6477 contacts, a response rate of 62.5%. After reweighting, the survey is a representative sample of Irish households. Here we restrict the sample to those aged between eighteen and sixty-four in these households.

Health Outcome Measure

The Living in Ireland Survey asked respondents about their health in general and also whether they had any chronic illnesses. The question asked: 'are you hampered in your daily activities by any chronic, physical or mental health problem, illness or disability?' This type of question has been used very widely in surveys of health status and falls into what (Blaxter 1989) has called the 'medical model' of health status reports in the sense that although it is not a clinical judgement, it is a report of health which is a deviation from some notional ideal, or physiological norm. The bringing together of reduced abilities (are you hampered…) with the reporting of chronic illness is unfortunate since this could be said to introduce a degree of conditionality on reporting of illness. If the relationships between chronic illness and class were of a low magnitude this could be taken to be a problem, but if we see a significant and strong relationship between the variables this is unlikely to be a product of question bias. To focus the analysis we have used information on the type of chronic illness experienced to exclude those illnesses which are primarily psychological. The outcome measure is thus whether the respondent has a non-psychological chronic illness (given the value 1) or not (scored 0).

Stratification Measures

As discussed earlier, our main interest in this paper is the comparison of two stratification schemes, the EGP and Cambridge, both to each other and to other predictor and outcome variables. However, to make an argument about the need for theoretically based measures we compare these to the Irish CSO's social class measure. Although this measure was designed to encompass elements of a Weberian class scheme in that classes were divided according to possession of property or skills, it is essentially a differentiation between manual and non-manual occupations with a further division by skill among manual workers. This basic differentiation along with the lack of a division between self-employed and employees makes the schema a fairly insensitive measure.

In the Irish context it is possible to extend the 11 class EGP schema to 14 classes using information on the size of farm holdings. Here however, we use a collapsed 6 class version of the EGP which follows the guidelines set out in Erikson and Goldthorpe (1992), except that routine non-manual workers are separated from

service class workers. This adjustment was made because preliminary analyses showed the routine non-manual class to be significantly different from the service class and dividing the two provided a better fit to the data used. Thus, the final six class schema is made up of:

1. Service
2. Routine Non-Manual
3. Petty-bourgeoisie
4. Farm workers (farmers, smallholders, agricultural labourers)
5. Skilled Manual workers
6. Non-Skilled Manual Workers

The Cambridge Scheme is usually operationalised as a continuous scale, but this introduces some methodological problems when it is being compared to categorical measures such as the EGP the CSO social class measure. The categorical measures use a larger number of degrees of freedom (5) compared to the continuous Cambridge measure (1). Thus in assessing the significance of the EGP and CSO measures we will apply significance tests using both 1 and 5 degrees of freedom. However, to aid comparisons between the measures at a descriptive level, we also categorise the Cambridge scale into a six level variable using sextiles.

As will become obvious below, other variables such as income and deprivation are measured at the household level, thus the position of the individual on the EGP, CSO and Cambridge scores was altered to reflect this using a 'dominance' procedure. Under this system each individual was allocated the higher of their own or their partner's positions if married or cohabiting, although higher part-time employees were subordinate to full-time lower employees. Given that our causal link between the stratification schemes and health outcomes is primarily through the differential standards of living, resources and lifestyles offered by different positions within these social structures, the dominance approach makes a great deal of sense as the lifestyle of the household would tend to be correlated more highly with the 'higher' social class position. Such a procedure also allows analyses to be made of the health status of the large proportion of women who are not working outside the home.

Educational Qualifications

In an industrial society and particularly in a post-industrial society, education is an important determinant of one's life-chances and overall lifestyle. Though influenced strongly by the social origins of the individual, it has been shown to be a good predictor of class position across a number of countries. As such, we need to assess the autonomous effect of class position on health status controlling for the respondent's educational level, though we will also be interested in education as a predictor of health outcomes in it's own right. The variable is operationalised using the CASMIN coding scheme (König, Lüttinger, & Müller 1988):

1. No formal qualifications (CASMIN levels 1a, 1b and 1c)
2. Lower and intermediate second level education (2a and 2b)
3. Higher second level education (2c)
4. Third level education (3a and 3b).

Childhood Economic Circumstances

There is a growing amount of evidence internationally that family background and particularly poor economic status of the family of origin is related to later health status (Barker 1992; Lundberg 1991, 1993), although a great many issues still remain about the exact nature of this link and the effect of selection effects in the intervening period. Nonetheless, in the context of this paper we need to control for any such effects when assessing the power of each stratification schema and other variables such as current income and deprivation status. To do this we use a dichotomous variable based on the question: 'thinking back to when you were growing up, how would you say that your family was able to make ends meet'. Possible answers to this question were: 'very easily', 'easily', 'fairly easily' through to 'with great difficulty' on a six point scale. Those answering 'with some difficulty' or 'with great difficulty' are given the value 1, with all other answers getting the value 0.

Life-Style Deprivation and Income

The life-style deprivation measures were developed as described earlier in the paper, although a fuller account of the development of the measures can be found in Nolan and Whelan (1996). After identifying the three dimensions using factor analysis, the items absent from the household because of a lack of resources are summed to produce an additive scale running from 0 to 8 for the basic index, 0 to 7 for the housing index and 0 to 9 for the secondary. Although items could have been weighted by their factor weights this was found not to influence the results and thus the more parsimonious additive scale was used instead. Given the different processes that could be said to underlie each of the types of deprivation identified, all three measures are entered into the analysis, thus we have variables representing basic, secondary and household deprivation. However, lacking even one of the items in the basic deprivation index could be seen as serious deprivation (reflecting as it does lack of food, warmth and adequate resources), thus this is divided into a dichotomous variable where the value 0 represents no deprivation, and 1 lacking one or more items.

As discussed earlier, income and deprivation are conceptually separate concepts that are not necessarily very well correlated. As such, income is entered into the analysis as a separate variable to represent the level of resources available to the household in terms of their weekly equivalised disposable income. The equivalisation weight used is that implicit in the Irish welfare system: the initial adult in the household is given a weight of 1 with each additional adult being given a weight of 0.66 and each child 0.33. Finally, the income variable is logged.

Employment Status

The centrality of paid work in industrial societies means that in the absence of 'decommodifying' institutions like the welfare state, or familial support (Esping Andersen 1990), unemployment, inactivity and sickness can all undermine and sometimes pauperise individual and household standards of living which could have consequences for health outcomes. To examine this effect, we use a variable which represents the employment status of the individual which is divided into categories of employed, unemployed, ill/disabled, retired and inactive (e.g. full time caring). Unemployment here is self-defined which is a slightly more liberal (and thus

inclusive) definition than the International Labour Organisation (ILO) definition because it does not include any stipulation about job search.

Analyses

Using the data and variables just described we now want to examine the contributions that explanatory variables such as education, employment status and the social class schemes have on the probability of having a chronic condition when controlling for individual characteristics such as age and sex. However, we also want to examine the relative importance of these variables, first against each other and then in the presence of the outcome variables in the form of income, basic, secondary and housing deprivation. To do this we build three logistic regression equations in stepwise fashion examining the effect of each variable added on those already in the model. The final step in the model building is the addition of each of the stratification schemes in turn. By doing this we can assess the autonomous contribution of each to the probability of experiencing chronic illness that is not already explained by the existing variables in the equation. Our main question is, do the stratification schemes give us any additional explanatory power, or are occupational stratification processes irrelevant once more immediate factors such as employment status, education and income are taken into account?

Before proceeding to this model however, we should first use some descriptive techniques to examine the distribution of our predictor variables and establish some basic information about the relationship between the stratification measures themselves and between these measures and the probability of experiencing chronic illness. Table 1 gives the weighted proportions by variable.

Looking down table 1 it is noteworthy that over 44% of both men and women are under the age of 35 which means that there will be relatively lower numbers with chronic illness since age is *the* best predictor of chronic illness. On the other hand over 17% of men are unemployed in the sample which has been shown to have a significant effect on health status (Bartley 1988, 1991). Moving on to the measures of deprivation, table 1 shows that around a quarter of men and women live in households experiencing some basic deprivation, though less than 4% are experiencing high levels of 5 or more items. Finally, it is interesting to note that women in the sample are more likely to experience chronic illness than men, though this difference is not significant at a 5% level.

Although we have discussed the theoretical differences between the stratification measures we have not as yet compared them directly to see if they overlap in practice and the degree to which they are correlated. Figure 1 shows graphically the relationship between the two main schemes of interest in this paper, the EGP and the Cambridge, by giving the proportion of each Cambridge sextile making up each EGP class. To aid comparisons we make use of the categorical form of the Cambridge Scale mentioned earlier. It is clear from this figure that there is a great deal of overlap between the two schemes, but mostly at the top and at the bottom of the scales.

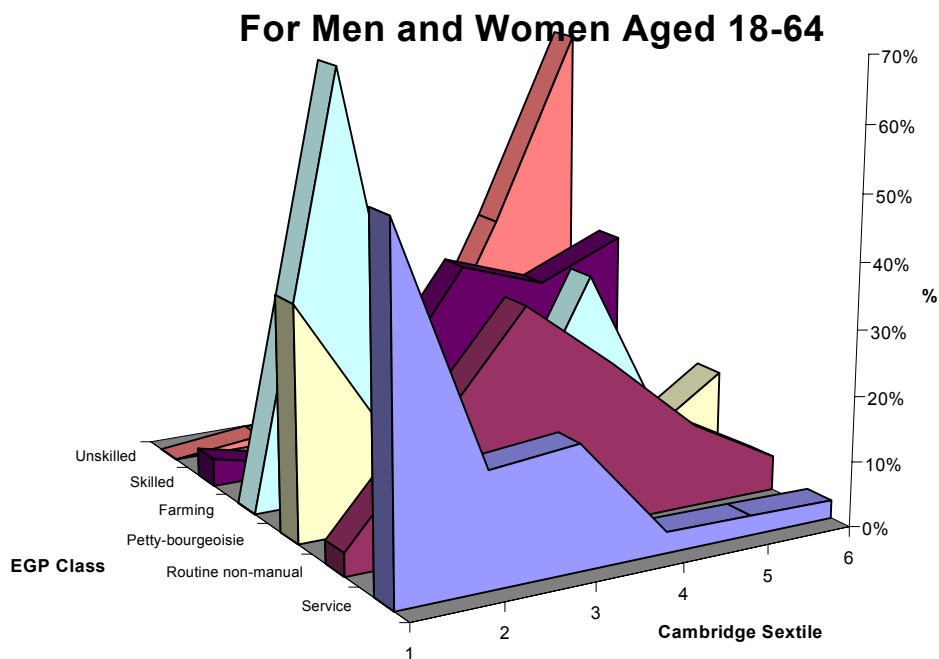| Table 1: Distribution of Variables for Men and Women in the 1994 Living in Ireland Survey Aged 18-64			
Variable	Categories	% Men	% Women
Educational Attainment	Primary	30.2	27.8
	Intermediate Level	26.9	21.1
	Leaving Level	26.0	36.7
	Tertiary	16.9	14.4
Age Groups	17-24	16.8	15.2
	25-34	24.2	26.8
	35-44	25.3	25.9
	45-54	19.6	19.1
	55-64	14.1	13.0
Employment Status	Employed	73.7	41.4
	Unemployed	17.1	4.7
	Ill/Disabled	2.9	1.6
	Retired	3.7	0.7
	Inactive	2.6	51.6
Childhood Economic Circumstances	Great Difficulty	17.8	17.7
	Some Difficulty	32.1	30.2
	A Little Difficulty	21.7	20.8
	Fairly Easily	20.7	22.4
	Easily	5.6	6.4
	Very Easily	2.2	2.6
Physical Health	Have a Chronic Condition	9.8	10.6
Lifestyle Indicators:			
Basic Lifestyle Deprivation	None	74.8	72.7
	Low	21.4	22.3
	High	2.8	4.0
Mean Secondary Lifestyle Deprivation (0-9)		1.80 (1.94)	1.93 (2.1)
Mean Housing Deprivation (0-6)		0.16 (0.54)	0.14 (0.44)
Mean Equivalised Household Disposable Income (Equiv Scale: 1, .66 & .33)		141.26 (125.73)	135.13 (110.5)
	N	3663	3370

Thus 93% of the unskilled class in the EGP scheme is made up of those in the fifth and sixth sextiles of the Cambridge scale. Similarly, 73% of the service class is made up of those in the first two sextiles of the Cambridge. Among the 'middle' groups however, the picture is more complex. As one might expect, routine non-manual workers mostly fall in the top half of the Cambridge scale, with the first three sextiles accounting for almost 60% of cases, but almost 1 in 5 are in the 5th or 6th sextiles.

The EGP 'farming' class has an interesting binomial pattern with 66% coming from the 2nd Cambridge sextile and 29% in the 5th. This is the result of the combining of farmers and farm employees in the EGP schema, groups who are more distant on the Cambridge measure. Formalising this relationship a little more, table 2 shows the non-parametric correlation coefficients between the EGP, (categorical) Cambridge and Irish CSO measures. This shows the measures to be significantly correlated (P<0.0001) with all the bivariate combinations achieving a value over 0.67.

The EGP and CSO measures are the most related (0.70) with the Cambridge/CSO being the weakest with a coefficient of 0.67. However, even at a value of 0.70, one could not suggest that these measures overlapped consistently enough to be interchangeable.

Table 2: Spearman Correlation Coefficient Between Three Social Stratification Measures			
	Cambridge	CSO	EGP
Cambridge	1.000	0.69	0.67
CSO	0.69	1.000	0.70
EGP	0.67	0.70	1.000

Figure 1: Distribution of Cambridge Sextiles Across E-G Classes
For Men and Women Aged 18-64

What then is the relationship between the stratification schemes and the probability of having a chronic illness? Without controlling for any of the explanatory variables discussed earlier on, table 3 gives the odds of having a chronic illness controlling for the individuals sex and age.

It is immediately obvious that there is a significant relationship between the schemes and chronic illness with the probability increasing as one moves away from the top of each scheme (shown by the odds less than 1 for the linear Cambridge Scale). Note however that the effect is not linear among any of the categorical schemes. This non-graduated effect is not a surprise in the case of the EGP as this is claimed to be a nominal scheme anyway, but it is interesting that in both the EGP and Cambridge schemes the second highest groups (routine non-manual and the 3rd sextile) have

higher odds than the third grouping. This suggests that the Cambridge scale is not hierarchically related to health, or at least this measure of health. Lower down the EGP and Cambridge schemes the effect is more graduated, although this cannot be said of the CSO where the Semi-Skilled class has higher odds than the unskilled. It is interesting though that the CSO scheme is significantly related to chronic illness without controlling for other factors. On investigation, the non-hierarchical nature of the Cambridge scale was shown to be related to the use of a UK algorithm to create the schema from Irish occupational groups. Without creating a specifically Irish scale, we simply rely on the interaction patterns of occupations being relatively similar in Ireland and the UK.

Table 3: Partial Odds of Having a Chronic Illness Controlling for Age and Sex			
Stratification Scheme	Odds	Sig.	Confidence Interval
EGP:			
Service	1	***	-
Routine Non-Manual	2.33	***	1.82 – 2.99
Petty-bourgeoisie	2.23	**	1.36 – 3.66
Farming	2.48	***	1.64 – 3.75
Skilled	2.50	***	1.90 – 3.28
Unskilled	3.75	***	2.84 – 4.96
Linear Cambridge	0.98	***	0.976 – 0.984
Cambridge Sextiles			
1 - Top	1	***	
2	2.34	***	1.66 - 3.31
3	1.89	***	1.33 - 2.69
4	3.09	***	2.20 - 4.33
5	3.30	***	2.36 - 4.61
6 - Bottom	4.15	***	2.30 - 5.73
Cambridge Sextiles: Excluding Farmers			
1 - Top	1	***	-
2	1.81	***	1.24 - 2.79
3	1.85	***	1.30 - 2.63
4	3.06	***	2.18 - 4.28
5	3.27	***	2.34 - 4.57
6 - Bottom	4.14	***	2.99 - 5.72
Irish CSO:			
Professional	1	***	-
Manag. and Tech.	1.05	n.s	0.69 - 1.59
Non-Manual	1.46	n.s	0.97 - 2.20
Skilled Manual	2.41	***	1.62 - 3.59
Semi-Skilled Manual	3.25	***	2.13 - 4.94
Unskilled	3.07	***	1.64 - 5.76
N=6589		***=P<0.001 **=P<0.01	

This appears not to be the case for farmers. This may be because the majority of Irish farms are rather smaller than in the UK and they thus have relatively fewer resources than UK farmers do (with the consequent effect on patterns of interaction with other occupations)[1]. For example, whereas 33% of UK farms are greater in size than fifty hectares, only 11% are in Ireland. As table 3 shows, if we exclude farmers, the probability of chronic illness across the sextiles becomes more graduated. The question is, do these relationships remain once we have controlled for other explanatory factors and the different types of deprivation?

Modelling the Probability of Having a Chronic Illness

Before examining the significance and parameter estimates for each of the stratification schemes we should first examine whether the other explanatory variables outlined earlier on have an independent effect on the probability of having chronic illness. Moreover, are they also significant in the presence of the variables representing the different types of deprivation? Table 4 shows the parameter estimates and significance of three models culminating in the 'base model' (model 3) with all variables other than the stratification schemes. By nesting the models in this fashion we can examine the predictive strengths of each of the variables. As expected, increasing age is strongly related to the probability of having a chronic illness with those aged between 55 and 64 having 3.7 times the odds of those aged 18 to 24 in model 3.

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[1] The Cambridge scheme was operationalised using a translation of the 1991 Irish CSO occupational groupings to the 1990 SOC codes used in the British context. It may be that Irish farmers should actually receive scores that reflect the size of their farms as in the CSO classes, but this would require a social survey in its own right in the Irish Republic.

Table 4: Parameter Estimates and Significance of a Logistic Regression on the Probability of Having a Chronic Illness										
		Model 1			Model 2			Model 3		
		B	*Sig*	*Odds*	*B*	*Sig*	*Odds*	*B*	*Sig*	*Odds*
Sex	Male	*Ref.*			*Ref.*			*Ref.*		
	Female	0.09	*n.s*	1.1	0.10	*n.s*	1.1	0.08	*n.s*	1.1
Age Group	18-24	*Ref.*			*Ref.*			*Ref.*		
	25-34	0.47	*	1.6	0.31	*n.s*	1.3	0.37	*n.s*	1.5
	35-44	0.87	**	2.4	0.57	**	1.8	0.65	***	1.9
	45-54	1.09	***	3.0	0.61	**	1.8	0.73	***	2.1
	55-64	1.92	***	6.8	1.15	***	3.2	1.32	***	3.7
Childhood Economic Circumstances	No Difficulty	*Ref.*			*Ref.*			*Ref.*		
	Difficulty	0.46	***	1.6	0.30	**	1.4	0.23	*	1.3
Highest Educational Level	Tertiary				*Ref.*			*Ref.*		
	No Quals				0.90	***	2.5	0.80	***	2.2
	Inter. Cert.				0.37	*	1.5	0.39	*	1.5
	Leaving Cert.				0.08	*n.s*	1.1	0.12	*n.s*	1.1
Employment Status	Employed				*Ref.*			*Ref.*		
	Unemployed				0.55	***	1.7	0.38	*	1.5
	Ill				2.77	***	16	2.71	***	15
	Retired				1.38	***	4.0	1.34	***	3.8
	Inactive				0.51	***	1.7	0.46	**	1.6
Equivalised Household Income					0.04	*n.s*	1.1	0.22	*	1.3
Basic Deprivation	None							*Ref.*		
	Deprived							0.37	**	1.4
Secondary Deprivation								0.06	*	1.1
Housing Deprivation								0.10	*n.s*	1.1
	Constant	-2.49	***		-3.13	***		-4.16	***	
Decrease in G² Over Zero Slopes Model		260.53			362.87			32.44		
DF		5			8			3		
G²=4375.18 N: 6107	Significance	***			***			***		
Key: ***=P<0.0001 **=P<0.001 *=P<0.01 *n.s*=Not Significant										

The inclusion of education, employment status and household income in model 2 reduces the age effects significantly showing the general importance and negative influence of these socio-economic variables on health outcomes. Thus, those with no qualifications are 2.2 times more likely to have a chronic illness than those with a tertiary qualification and those with an intermediate certificate 1.5 times in model 3. Similarly, the employment status of the respondent has a very significant effect on health outcomes. It is not surprising that not working because of illness is hugely related to chronic illness (increases the odds by 15 times), but there is also a strong positive effect associated with being both unemployed and being inactive. As suggested earlier on, there may be some overlap between these variables and this is given some credence by the fact that both increase the odds of having a chronic illness to around 1.5 times that of the employed.

As hypothesised, difficult childhood economic circumstances are a significant predictor of chronic illness, an effect that is reduced by the inclusion of other current socio-economic variables, but never disappears (1.3 times the odds in model 3). Last of the explanatory variables is the log of household current disposable income. We suggested earlier on that deprivation and income are distinct but linked concepts and this is given some credence by the lack of significance of income until secondary deprivation is controlled for. At this point (model 3) income becomes a positive and significant predictor of having a chronic illness.

Lastly, we come to the effects of what we have termed the 'outcome' variables of basic, secondary and housing deprivation. Our hypothesis is that these should be crucial predictors of lower health and this seems to gain some support from the model that shows that basic deprivation increases the odds by 1.4. In the same way, increasing secondary deprivation is significantly associated with chronic illness with each unit increase in deprivation increasing the odds by 10%. However, the same is not true of housing deprivation that increases the probability of illness, but the effect is not significant.

Table 5: Parameter Estimates and Reduction in Deviance Associated with the Irish CSO Class Scheme on the Probability of Having a Chronic Illness (Controlling for Base Model)			
	B	Sig.	Odds
Professional	Ref.		
Manag. And Tech.	-0.14	n.s	0.87
Non-Manual	0.01	n.s	1.01
Skilled Manual	0.07	n.s	1.07
Semi-Skilled Manual	0.23	n.s	1.26
Unskilled	0.22	n.s	1.25
Reduction in Likelihood Over Base Model: 5.24 for 5 d.f. (n.s) N=6107			
Key: ***=P<0.0001 **=P<0.001 *=P<0.01 n.s=Not Significant			

There is support here for the hypothesis that socio-economic status impacts on health status in that education, income, employment status and both basic and secondary deprivation increase the probability of having a chronic illness. We now add each of the stratification schemes to the model in turn to examine whether stratification processes can explain variation in health status net of the effect of the previously entered explanatory factors and outcome variables.

However, our hypothesis is that the Irish CSO's class schema will not be a significant predictor since it has no coherent theoretical basis.

Table 5 shows the parameter estimates and significance of the CSO schema whilst controlling for all of the variables in the base model as shown in model 3 of table 4. As hypothesised table 5 shows that none of the categories of the CSO measure are significant predictors of having a chronic illness and moreover, the variable as a whole is only a significant addition to the model when assessed using the extremely liberal test of a G^2 reduction of 5.24 for 1 degree of freedom. Thus, after controlling for the variables in the base model, the CSO scheme does not explain any more variance in chronic illness. What then of the two other stratification measures which are our central interest?

Table 6: Parameter Estimates and Reduction in Deviance Associated with the EGP Class Scheme on the Probability of Having a Chronic Illness (Controlling for Base Model)			
	B	*Sig.*	*Odds*
Service	*Ref.*		
Routine Non-Manual	0.52	***	1.68
Petty-bourgeoisie	0.53	*n.s*	1.69
Farming	0.79	**	2.21
Skilled	0.31	*n.s*	1.36
Unskilled	0.51	**	1.67
Reduction in Likelihood Over Base Model: 17.75 for 5 d.f. (**) N=6107 Key: ***=P<0.0001 **=P<0.001 *=P<0.01 *n.s*=Not Significant			

Table 7: Parameter Estimates and Reduction in Deviance Associated with both the Linear Cambridge Scheme and Sextiles on the Probability of Having a Chronic Illness (Note: Farmers Excluded, Controlling for Base Model)			
	B	*Sig.*	*Odds*
Linear Cambridge Scale	-.0083	**	0.99
Reduction in Likelihood Over Base Model: 6.87 for 1 d.f. (**)			
1 - Top	*Ref.*		
2	0.56	**	1.75
3	0.36	*n.s*	1.43
4	0.57	**	1.76
5	0.40	*n.s*	1.49
6 - Bottom	0.62	**	1.85
Reduction in Likelihood Over Base Model: 12.6 for 5 d.f. (*) N=5735 Key: ***=P<0.0001 **=P<0.001 *=P<0.01 *n.s*=Not Significant			

Tables 6 and 7 show that both the EGP class schema and Cambridge scale are significant additions to the base model. Looking at the parameter estimates themselves, the routine non-manual, farming and unskilled manual classes in the EGP schema have a greater probability of experiencing a chronic illness than the service class. Interestingly, the farming class is at a greater risk than the unskilled manual working class. The Cambridge scale is a significant addition to the base model in both linear and categorical formats, although this degree of fit requires the exclusion of farmers.

Therefore, we have evidence here that stratification processes are, first of all conceptually and empirically separate from both other explanatory variables and outcome variables such as deprivation. Second, among stratification schemes, those with a clear theoretical grounding such as the EGP and Cambridge, are better predictors of health inequalities. Others such as the Registrar General's scheme in the UK and the Irish CSO's are simply collections of occupations that have a general link to health status because of their rough manual/non-manual splits and skill differentiation. However, if one controls for other socio-economic variables such as income, education and employment status this relationship quickly disappears. The question remains though as to whether the EGP class categories are simply approximations of an underlying continuous scale. The next section investigates whether this is so.

Continuous Stratification or Categorical Class Measures?

One way to test the appropriate format of the EGP is to examine whether we can detect any variance in the probability of having a chronic illness that can be explained by a linear Cambridge Scale *after* the EGP classes themselves have been controlled for. If the Cambridge scale still predicts variance in the probability of having a chronic illness net of the EGP then this suggests that *within* classes there is a linear trend in the relationship.

To do this we enter the EGP measure into an equation predicting chronic illness after controlling for the other explanatory variables (such as employment status and education) and the confounding variables such as age and sex. We then enter the variable representing the Cambridge Scale. If the latter is significant this implies that the EGP leaves unexplained a significant degree of variance that can be understood with the Cambridge Scale.

Table 8 shows the results of this procedure, first only controlling for sex and age (model A), but then also controlling for other explanatory variables in the base model (Model B). In the first model all of the categories of the EGP schema and the linear term for the Cambridge scale are significant. The positive coefficients for the EGP indicate, as shown before that compared to the 'service' class the other classes have an increased likelihood of chronic illness (although here we have removed farmers from the sample due to the complication with the Cambridge Scale). The negative coefficient for the Cambridge scale shows that the there is an inverse relationship between the scale and health outcomes as expected. However, does this relationship remain once we have controlled for the other explanatory variables in the model? Model B shows that once the other explanatory variables have been added both the EGP and Cambridge scales are still significant predictors of having a chronic illness, though the effect of both is much reduced. Thus among the EGP categories, only that for the routine non-manual class remains significant and the estimate of the Cambridge scale is reduced by 50%. The main finding of Model B is still though that when both the EGP schema and Cambridge scale are entered into the same model, the latter is still a significant predictor suggesting that there is within class variance in the probability of having a chronic illness that is not explained by the EGP.

Table 8: Logistic Model of Having a Chronic Illness Testing for within EGP Class Variance						
	Model A			Model B		
	Controlling Only for Age & Sex			Controlling for Age, Sex, Employment Status and Childhood Conditions		
	B	*Sig.*	*Odds*	*B*	*Sig.*	*Odds*
Service	*Ref.*			*Ref.*		
Routine Non-Manual	0.55	***	1.73	0.43	**	1.54
Petty-bourgeoisie	0.59	*	1.80	0.40	*n.s*	1.48
Farmers (removed)	-	-	-	0.51	*n.s*	1.66
Skilled	0.46	**	1.58	0.14	*n.s*	1.15
Unskilled	0.73	***	2.07	0.31	*n.s*	1.37
Linear Cambridge Scale	-0.016	***	0.98	-0.008	*	0.99
Reduction in Likelihood Over Base Model:	129.32 for 6df Sig:***			21.92 for 6 df Sig:**		
N=5724						
Key: ***=P<0.0001 **=P<0.001 *=P<0.01 *n.s*=Not Significant						

The implication of this is that underlying the EGP are at least some continuous elements that lead to intra-class variance in health outcomes.

Conclusions

In this paper we have attempted to differentiate among the various factors grouped together in previous health inequalities research as 'material' causes. The main aim of the paper was the separation of outcome variables from explanatory factors so that causal narratives could be constructed that were empirically testable. In doing this we focused on the concept of social class as a theoretically informed way of bringing together a large set of social and economic resources or constraints that could impact on inequalities in health. We outlined two such schemes, the EGP schema (Erikson and Goldthorpe 1992) and the Cambridge (Stewart, Prandy and Blackburn 1980) which specify different structuring principles and thus different theoretical mechanisms. These schemes are conceptually different from other explanatory factors such as education and employment status.

On the outcome variable side, the paper used the work of Callan et al (1989) and Nolan and Whelan (1996) to clarify and make empirically useful the concept of 'deprivation', which lies at the heart of many debates over class inequalities in health. This was shown to be both theoretically and empirically separate from income and moreover divisible itself into three conceptually distinct types. Having clarified the notion of 'material' explanation, the paper then tried to establish whether this conceptual clarification had any empirical bite. Using logistic regression models to estimate the probability of having a chronic illness the paper showed that educational level, employment status, income and childhood economic

circumstances were all significantly related to having a chronic illness. This relationship remained even after controlling for the more immediate causes of health inequalities in the form of the dimensions of deprivation.

More importantly however, controlling for these factors, both of the class schemas were significant predictors of chronic illness indicating that stratification processes are separable from both other socio-economic explanations and the effects of material factors such as income, deprivation and poverty. As predicted the non-theoretical scheme in the form of the Irish CSO's class schema was only a significant addition to the models after controlling for other factors using the most liberal test, reiterating the importance of a coherent theoretical base.

Both the EGP and Cambridge schemes were significant additions to the base model and roughly equal in explanatory power until farmers were removed from the sample. This was necessary as translation problems between the UK SOC and Cambridge schemas meant that Irish farmers were being given an unrepresentative Cambridge scale score. The probability of chronic illness among Irish farmers was one of the highest among all groups and yet using the UK scoring algorithms they were given a Cambridge score near the top of the scale. However, in Ireland the majority of farms are relatively small and this is reflected in farmers resources, lifestyle and health status. Work is ongoing to construct a Cambridge type scale using Irish information and this should provide a better basis upon which to include farmers.

Empirically speaking the EGP and Cambridge schemes proved to be alternative and equally useful predictors of variation in health outcomes. However, is the operationalisation of the EGP scheme as classes a good representation of the underlying phenomenon, or is it actually a simplification of an underlying continuous scheme as upon employment relations? As discussed, there has been debate about the appropriate validation of the EGP schema, but this paper has shown that within the EGP classes, there is still variation in health status that can be explained by the Cambridge scake. This suggests that the EGP is in fact a grouped continuous scale rather than discreet classes. If so, the question has to be asked as to whether classes are the appropriate unit of analysis outside of mobility research.

However, it could be argued that the EGP has a better-developed theoretical structure given that it specifies an underlying mechanism in the form of systems of employment relations and authority structures. The Cambridge Scale on the other hand is an empirically grounded measure of a number of possible systems of stratification. Although it could be argued that the structure of social interaction could underlie the pattern of health outcomes, this would only be so if health promoting behaviours and lifestyles were almost perfectly congruent with the occupational hierarchy. This poses difficult questions, though questions that could be tackled through further research.

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