Measuring economic inequality: deprivation, economising and possessing

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Measuring Economic Inequality: Deprivation, economising, and Possessing

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Abstract

One way of measuring the deprivation or poverty of persons is to use money based measures: a person is regarded as "poor" if his/her income (or expenditure) falls below a poverty line value. Such an approach - usually termed *poverty analysis* - has spawned a large literature embodying several sophisticated measures of poverty. The downside to this is that low income or expenditure may not be very good indicators of deprivation. Another way, usually termed *deprivation analysis*, is to define an index whose value, for each person, is the number (or proportion) of items, from a prescribed list, that he/she possesses: persons are then regarded as "deprived" if their index value is below some threshold value. This offers an alternative method of identifying deprived persons. The downside of deprivation analysis is that it measures deprivation exclusively in terms of the proportion of deprived persons in the total number of persons. The purpose of this paper is to bridge the gap between poverty and deprivation analysis by constructing a wider set of deprivation measures and showing, with data for Northern Ireland, how they might be applied.

Keywords: Poverty, Deprivation, Possessions, Economising, Northern Ireland.
JEL classification: I31, I32

1. Introduction

A definition of deprivation or poverty that has gained increasing currency, and one which has been incorporated into a variety of official formulations, including that of the Council of the European Union, is "exclusion from the life of society owing to a lack of resources" (Nolan and Whelan, 1996). The question of how to measure deprivation or poverty remains, however, vexed. One way of measuring the deprivation/poverty of persons[1] is to use money based measures: a person is regarded as "poor" if his/her income (or expenditure) falls below a poverty line value. Such an approach - usually termed *poverty analysis* - has spawned a large literature embodying several sophisticated measures of poverty[2]. The downside to this is that low income or expenditure may not be very good indicators of deprivation, as defined above (Townsend, 1979; Ringen, 1988).

An alternative to the money-metric approach, embodied in "poverty analysis" is an "item-based" approach which underpins *deprivation analysis*. Broadly speaking, this approach (as epitomised by the work of Townsend, 1979 and Mack and Lansley, 1985 for Britain, and of Nolan and Whelan, 1996 for Ireland) constructs a "possessions index". The value of this index is defined, for each person, as the number (or proportion) of items, from a prescribed list, that he/she possesses: persons are then regarded as "deprived" if their index value is below some threshold value[3].

The value of this approach is that it offers a direct method of identifying deprived persons (by whether their lack of possessions falls below a critical threshold) as an alternative to the more indirect - and, arguably, less reliable - method of identifying poor persons by whether their income or expenditure is below a "poverty line" value. The downside of the "item-based" approach is that - in contrast to the range of measures employed by the low income/expenditure approach - it measures deprivation exclusively in terms of the proportion of deprived persons in the total number of persons.

Against this background, this paper has two purposes. The first, is to extend the range of deprivation measures associated with a lack of possessions (so far

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[1] The term "person" is used to indicate the unit being analysed: this could be a person, a family, or a household.

[2] Zheng (1997) a good review of this literature.

[3] In order to account for differences in tastes, households which do not possess an item are distinguished by whether they did not want it or they wanted, but could not afford it. This meets Veit-Wilson's (1987) criticism of Townsend's (1979) work.

restricted to the proportion of deprived persons in the total sample) to parallel the range of measures routinely used in the analysis of poverty based on income or expenditure based poverty lines. The second, is to apply these extended measures to data to assess the value added (if any) from these extensions. The data to which these measures are applied come from a recent survey of Northern Ireland residents, conducted between May and June 2002, which focused on their poverty and social exclusion (hereafter, PSENI Survey)[4].

2. Deprivation Measures

Suppose that a person (i) may be said to be "deprived" if his/her "possessions" - as measured by his/her value for an indicator variable, y_i - is lower than some threshold represented by z, the "deprivation line" . If the indicator variable represents a binary phenomenon - possesses a particular item ($y_i = 1$) or not possessing it ($y_i = 0$) - then z may be taken as the higher of the two values; for continuous variables (for example, y_i is the proportion of a certain number of items which a person possesses), z may be some proportion of the mean or median value of y_i. We refer to y_i as the *possessions outcome* for person i, hereafter referred to simply as "outcome" .

Then, an aggregate measure of deprivation is provided by any of the following deprivation indices:

1. The *Headcount Ratio* (*H*), which is the proportion of persons who are deprived: $H = M / N$, where N and M are, respectively, the total number of persons and the total number of deprived persons.

2. The *Deprivation Gap Ratio* (*I*) is the mean distance of the outcomes *of deprived persons* from the deprivation line, expressed as a proportion of the deprivation line: $I = \dfrac{\sum_{i=1}^{M}(z - y_i)}{Mz} = 1 - \dfrac{\mu^P}{z}$, where: μ^P is the mean outcome of the deprived.

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3. The *Achievement Gap Ratio* (*R*) is the mean distance of the outcomes *of the entire population* from the deprivation line - the non-deprived being assigned a distance of zero - expressed as a proportion of the deprivation line: $R = \dfrac{\sum_{i=1}^{M}(z - y_i)}{Nz} = \dfrac{\sum_{i=1}^{M}(z - y_i)}{Mz} \dfrac{M}{N} = I \times H$

4. The *Sen (1976) Measure*: $S = H \times \left[I + (1 - I) \times G^P \right]$, where: G^P is the Gini coefficient computed over the incomes of the poor[5]. If there was no inequality between deprived persons in respect of their outcomes (i.e. $G^P = 0$) then $S = H \times I = R$. But, if there was inequality between deprived persons (i.e. $G^P > 0$), then the Sen index would exceed the Achievement Gap Ratio by the amount: $H \times (\mu^P / z) \times G^P$. The Sen index, therefore, represents an *equity sensitive deprivation index* in the sense that, in addition to taking account of the proportion of deprived households and the depth of their deprivation, it also takes account of inequality in outcomes between deprived households or, as Sen(1976) termed it, *relative deprivation.*

Decomposition by subgroup

An important aspect of poverty analysis is to identify groups which make a particularly large contribution to poverty and whose members are especially at risk of being poor. In order to do this, we need a poverty index which *decomposes* aggregate poverty as the sum of subgroup poverty. This is provided by the poverty index due to Foster, Greer, and Thorbecke (1984), hereafter referred to as the *FGT* index.

In order to analyse the decomposition of deprivation, as defined above, suppose that there are *K (k=1..K)* mutually exclusive and collectively exhaustive groups and that, in group *k*, M_k, of the N_k, households in the group, are deprived. Let $\mathbf{y} = \{y_i\}$ and $\mathbf{y_k} = \{y_i\}$ now represent the vector of outcomes of, respectively, all the deprived households in the sample *(i=1...M)* and the deprived households in group *k (k=1...M_k)*. Then the *FGT* index is defined, for a parameter $\alpha \geq 0$, as:

$$FGT(\mathbf{y}; \alpha) = \left(\sum_{i=1}^{K} (z - y_i)^\alpha \right) / Nz^\alpha \qquad (1)$$

When $\alpha=0$, the *FGT* index is the *Head Count Ratio*, $H=M/N$; when $\alpha=1$, $FGT(\mathbf{y};1)=HR$, where $R=1-\mu^P/z$ is the *Achievement Gap Ratio*; when $\alpha=2$, the *FGT* index incorporates the idea of 'relative deprivation', as measured by outcome inequality among the deprived households[6].

An attractive feature of the *FGT* index is that it is decomposable in the sense that the value of the overall index can be expressed as the weighted average of the subgroup values:

$$FGT(\mathbf{y};\alpha)=\sum_{k=1}^{K}v_k\times FGT(\mathbf{y_k};\alpha) \tag{2}$$

where: $v_k=N_k/N$ is the population share of group k.

The proportionate contribution made by group k to overall deprivation is then:

$$C_k=\frac{v_k\times FGT(\mathbf{y_k};\alpha)}{FGT(\mathbf{y};\alpha)} \tag{3}$$

and the 'deprivation risk' of a group is:

$$\rho_k=\frac{FGT(\mathbf{y_k};\alpha)}{FGT(\mathbf{y};\alpha)}=\frac{FGT(\mathbf{y_k};\alpha)C_k}{v_k FGT(\mathbf{y_k};\alpha)}=\frac{C_k}{v_k} \tag{4}$$

The deprivation risk thus is the ratio of a group's contribution to deprivation to its contribution to the population: $\rho_k>1$ ($\rho_k<1$) means that it contributes more (less) to deprivation than its population share warrants. If the norm for deprivation risk is taken to be unity, then, say, $\rho_k=1.3$ means that the deprivation risk for members of group k is 30% above the norm; similarly, $\rho_k=0.82$ means that the deprivation risk for members of group k is 18% below the norm.

3. Constructing the Indices

In this section we use the PSENI data to construct two indices of outcomes. The first index is based on the *possession* of items. The second index is based on *economising* on, or postponing, the purchase of items. Deprivation in Northern Ireland is then measured by applying the measures, discussed in the preceding section, to both indices.

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deprivation through I, the deprivation gap ratio; it takes account of *relative deprivation* through G^P, the Gini coefficient calculated on the achievement.

[6] $FGT(\mathbf{y};2)=H[R^2+(1-R)^2]\Phi$, where Φ is the (square of) the coefficient of variation, computed over the outcomes of deprived households.

Possession of Items

The PSENI Survey asked respondents whether they *owned* a variety of items and, if they did not, whether it was because they did not want that item or because they could not afford it. These answers were scored, for the purposes of this study, as: 1, if the respondent owned the item; 0, if the respondent did not own the item because he/she could not afford it; as a *missing value* if the person did not want the item. The aggregate score for each respondent was obtained as the sum of the item scores.

The problem with this approach is that, if there were *N* items, the aggregate score would only be defined for those respondents *who reported a non-missing value for each of the N items* (i.e. owned the items or did not own them because of not being able to afford them). In other words, an aggregate score would not be returned for a person who, say, did not have a car because he/she did not want one. Since the number of persons who reported a non-missing value for *each* of the 38 "possession items" distinguished in the PSENI Survey was very small - approximately 300 out of a total of over 3,000, respondents - we dropped the items for which the largest number of missing values (i.e. items which the largest number respondents neither had nor desired) were recorded[7]. This left us with the following items *all* of which were either owned, or not owned but desired, by 1,542 respondents: a television; a telephone; a refrigerator; a dry, damp-free home; a washing machine; a video recorder; home contents insurance; a microwave oven; fresh fruit and vegetables; deep freeze; central heating; a vacuum cleaner; new, not second hand, clothes; a warm water proof coat; two pairs of strong shoes; a good outfit to wear on special occasions; a meal with meat, chicken or fish every other day; enough money for keeping the home in a decent state of decoration, for replacing worn out furniture, for replacing or repairing non-functioning electrical goods, and for paying heating, electricity and telephone bills on time; a small amount of money for the respondent to spend on himself/herself; regular savings of £10 a month.

The scores over these 23 items were scaled so that the maximum score was 100 (a respondent possessed all these items) and the minimum was 0 (a respondent desired all, but possessed none of, these items); a score of *x* meant that a respondent owned *x*% of the 23 items. The mean and median "possession" scores, over the 1,542

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[7] For example, items which the largest number of respondents neither had nor desired were: second homes; boats; cars; dishwashers; home computers; cable television; a roast dinner every week; a decent pension; a dictionary; a daily newspaper; good clothes for an interview; a pet.

responses, were 94.2 and 100, respectively, implying that at least half the respondents possessed *all* the 23 items listed above. The distribution of the possession indicator was heavily skewed (with a skewness value of -2.63) with the observations bunched at the right of the distribution.

Economising on Items

The PSENI Survey asked over 3,000 respondents whether they had to *economise* on a variety of items. Questions under this head were prefaced as: "In the last twelve month, to help you keep your living costs down, have you..?". The items to which this question referred were: bought cheaper cuts of meat or less than you would have liked to buy; gone without fresh fruit and vegetables; bought second hand, instead of new, clothing; continued wearing worn out clothing because you couldn't afford replacements; put off buying clothing for as long as possible; relied on gifts of clothing; continued wearing worn out shoes because you couldn't afford replacements; put up with feeling cold because you couldn't afford heating costs; stayed in bed longer to save heating costs; skimped on food so that others in the household would have enough to eat; postponed visits to the dentist; not picked up a prescription; gone without, or cut back on, visits to family and friends; gone without, or cut back on, telephone calls to family and friends; gone without, or cut back on, trips to the shops or local places; spent less on hobbies than you would like; not gone to a funeral you would have liked to attend because of the costs; cut back on visits to the local pub; ever used less than you needed of gas, electricity, and the telephone because you couldn't afford it

We scored the responses to these questions as: 2, if the answer was "No"; 1, if the answer was "Sometimes"; 0, if the answer was "Often". Summing over the individual item scores, the maximum possible score for a person was 38 (no economising on any of the above 19 items) and the minimum was 0. These aggregate scores were then scaled upwards so that the maximum possible (aggregate) score for a person was 100, the minimum remaining at 0. The mean and median "economising" scores, over the 2,407 responses, were, respectively, 85.53 and 94.74. This points to a heavily skewed distribution in which the observations are bunched to the right of the distribution and, indeed, the skewness value for the distribution was -1.67.

4. Deprivation Rates in Northern Ireland

Table 1 shows deprivation rates, as they related to "economising" and "possession". The deprivation line adopted was a score of 80% of the relevant overall mean score. This turned out to be a score of 68 for "economising" and a score of 75 for "possession": any person with an "economising score" less than 68 was regarded as deprived in terms of "economising" and any person with a "possession score" less than 75 was regarded as deprived in terms of "possessions".

<Table1>

Table 1 shows that nearly 16% of the 2,407 respondents to the economising questions were deprived on the above definition; the mean normalised gap computed over deprived persons (the Deprivation Gap Ratio, *I*, defined earlier) was 29% and the mean normalised gap computed over all persons (the Achievement Gap Ratio, *R*, defined earlier) was 5%. Similarly, nearly 9% of the 1,524 respondents to the possessions questions were deprived on the above definition; the mean normalised gap computed over deprived persons (the Deprivation Gap Ratio, *I*, defined earlier) was 17% and the mean normalised gap computed over all persons (the Achievement Gap Ratio, *R*, defined earlier) was 1.5%.

The Sen index, as discussed earlier, is an equity sensitive deprivation index (in the sense that it takes account of inequality in scores between deprived households) and its values are shown in Table 1. The difference between the Achievement Gap Ratio and the Sen Ratio is, as shown earlier, due to the fact that the latter is equity sensitive while the former is not. This difference was greatest for single parents (a rise from 13.98 to 19.68 on the economising indicator and a rise from 9.43 to 13.43 on the possessions indicator) suggesting that relative deprivation (as defined earlier) was greatest for this group.

In terms of both economising and possession, single parents were, by far, the most deprived group: of the 140 single parent respondents to the economising questions, 44% were deprived and their deprivation and achievement gaps were, respectively, 31% and 14%; of the 148 single parent respondents to the possession questions, 40% were deprived and their deprivation and achievement gaps were, respectively, 23% and 9%.

The next most deprived group was the jobless: of the 918 jobless respondents to the economising questions, 28% were deprived and their deprivation and achievement gaps were, respectively, 32% and 9%; of the 918 jobless respondents to the

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possessions questions, 24% were deprived and their deprivation and achievement gaps were, respectively, 19% and 5%.

The third most deprived group consisted of the separated/divorced/widowed: 25% of this group who responded to the economising questions were deprived and their deprivation and achievement gaps were, respectively, 29% and 7% while 18% of this group who responded to the possession questions were deprived and their deprivation and achievement gaps were, respectively, 22% and 4%. So, from the group-specific results shown in Table 1, being a single parent, jobless, and separated/divorced/widowed were the three main factors influencing the risk of deprivation.

Overarching these group specific results is, of course, the issue of gender equality. The proportion of women who were deprived with respect to economising (23%) and with respect to possession (14%) was nearly twice that of the corresponding proportions for men (13% and 7%, respectively). The gender gap in deprivation remained unchanged when the definition of deprivation was broadened: both the achievement gap ratio and the value of the Sen index, for economising and for possession, were twice as high for women as they were for men.

Prosperity in Northern Ireland

Although deprivation is intensively studied in the social policy literature its obverse, prosperity, is relatively neglected. This subsection complements the study of deprivation in Northern Ireland with that of prosperity, but this time focusing only on the proportion of persons in Northern Ireland who could be regarded as "prosperous".

The aggregate score for 818 of the 2,407 respondents to the economising questions (34%), and for 1,059 of the 1,542 respondents analysed (69%), was 100. The former set of respondents did not have to economise on their expenditure on *any* of the above items and the latter set of respondents possessed *all* the above items. We define the proportion of such respondents as the *prosperity rate*. Table 2 shows prosperity rates for economising and possession for the same population subgroups distinguished in Table 1, above.

<Table 2>

Prosperity rates on the economising and possessions indicators were highest for pensioners and for persons above 65 years of age: over half of such persons were prosperous on the economising indicator and nearly three-fourths were prosperous on

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the possessions indicator. This reinforces the point made earlier in Table 1 that deprivation rates were lowest for these groups. In contrast, prosperity rates on both indicators were lowest for single parents, for separated/divorced/widowed persons, and for the jobless: only 6% of single parents were prosperous on the economising indicator and only 26% were prosperous on the possessions indicator; fewer than one in four of jobless, or separated/divorced/widowed, persons were prosperous on the economising indicator and less than half were prosperous on the possessions indicator.

5. The Decomposition of Deprivation in Northern Ireland

The risk of deprivation, defined by ρ_k in equation (4), is the ratio of a group's contribution to deprivation to its contribution to the population: $\rho_k > 1$ ($\rho_k < 1$) means that it contributes more (less) to deprivation than its population share warrants. Table 3 shows the risk of deprivation in Northern Ireland by various subgroups of its population. If the norm for deprivation risk is taken to be unity, then the values in Table 3 show the percentage amounts by which the risk of deprivation for a group is above or below the norm.

When the sample was divided by religion, Catholics, on the ownership indicator of deprivation, had values 1.10, 1.22, and 1.33 for, respectively, $\alpha=0$, $\alpha=1$, and $\alpha=2$. In other words, when deprivation was measured using the headcount count ratio ($\alpha=0$), the risk of Catholics being deprived was 10 percent above the norm; when the Achievement Gap Ratio was used to measure deprivation ($\alpha=1$), this risk was 22 percent above the norm; and when 'relative deprivation' was included in the measure ($\alpha=2$), the risk was 33 percent above the norm. By contrast, the risk of Protestants being deprived, on the ownership indicator of deprivation, was 7, 15 and 23 per cent below the norm for, respectively, $\alpha=0$, $\alpha=1$, and $\alpha=2$.

Women had a much a higher risk of being deprived than men. On the ownership indicator, the risk of men being deprived rose from 52 percent above the norm ($\alpha=0$) to twice the norm ($\alpha=2$); by contrast, the risk of being deprived for men fell from 18 percent below the norm ($\alpha=0$) to 33 percent below the norm ($\alpha=2$).

The two groups in Northern Ireland most at risk of being deprived were the unemployed and single parents. With $\alpha=0$ (i.e. on a Headcount measure of deprivation) the unemployed had a risk of being deprived, on the ownership indicator,

which was 2.5 times the norm while for lone parents the corresponding risk was 4.5 times the norm; with $\alpha=2$, the risk for the unemployed rose to three times the norm while for lone parents it rose to seven times the norm. These risks were lower on the economising indicator: with $\alpha=2$, the unemployed had a risk of being deprived which was twice the norm while for lone parents the corresponding risk was three times the norm.

6. Conclusions

This paper made two contributions. First, using data for Northern Ireland it constructed deprivation indices of the genre pioneered by Townsend (1979). Second, in using these indices to measure deprivation in Northern Ireland, the paper constructed a range of measures routinely used in the analysis of poverty, but never in the analysis of deprivation. This meant that the measurement of deprivation, through "economising" and "possession" outcomes, took account not just of the number of deprived persons but also - as poverty analysis has long done - of the depth of their deprivation and of inequality of outcomes between them.

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Table 1
Deprivation Rates for Economising on and Possession of Items

	Economising				Possession			
	Headcount Ratio	Deprivation Gap Ratio	Achievement Gap Ratio	Sen Index	Headcount Ratio	Deprivation Gap Ratio	Achievement Gap Ratio	Sen Index
Religion:								
Catholics	18.97	29.31	5.56	7.79	9.54	18.84	1.78	2.67
Protestants	13.12	28.32	3.72	5.32	8.06	15.48	1.25	1.86
Family Type:								
Pensioners	3.39	12.44	0.42	0.57	2.63	35.07	0.92	1.12
Couples with children	16.77	28.30	4.75	6.54	8.26	14.04	1.16	1.54
Childless couples	12.86	26.62	3.42	4.97	7.80	14.70	1.15	1.75
Single parents	44.29	31.46	13.93	19.68	40.35	23.38	9.43	13.43
Age:								
<35 years	21.58	29.13	6.29	8.83	12.50	20.73	2.59	3.69
≥36 years & ≤65 years	15.93	29.26	4.67	6.61	8.92	14.78	1.32	6.61
>65 years	5.13	16.0	0.82	1.14	3.76	23.12	0.87	1.08
Marital status:								
Single (never married)	26.10	29.03	7.58	10.68	18.54	19.72	3.66	5.33
Married (living with spouse)	12.54	28.38	3.56	5.07	5.73	12.42	0.71	1.03
Separated/divorced/widowed	24.68	29.00	7.16	10.02	17.54	22.17	3.89	5.77
Employment Status:								
Employed	10.87	24.73	2.69	3.82	3.67	8.08	0.30	0.44
Jobless[*]	28.38	32.00	9.08	12.73	23.96	19.26	4.61	6.75
Sex:								
Men	13.33	27.28	3.64	5.19	7.38	15.43	1.14	1.69
Women	23.05	31.10	7.17	10.04	13.59	19.49	2.65	3.97
Overall	15.66	28.63	4.48	6.37	8.95	16.99	1.52	2.28

The deprivation score was set at 68, i.e. 80% of the overall mean score of 85.5.

[*]Non-pensioners who are not in paid employment.

Table 2
Prosperity Rates for Economising on and Possession of Items

	Economising	*Possession*
	Prosperity Rate[*](%)	**Prosperity Rate[**](%)**
Religion:		
Catholics	32	65
Protestants	36	71
Family Type:		
Pensioners	55	73
Couples with children	34	71
Childless couples	38	74
Single parents	6	26
Age:		
<35 years	24	63
≥36 years & ≤65 years	34	70
>65 years	51	73
Marital status:		
Single (never married)	22	57
Married (living with spouse)	37	75
Separated/divorced/widowed	24	47
Employment Status:		
Employed	38	79
Jobless	21	44
Sex:		
Men	36	72
Women	28	59
Overall	**34**	**69**

[*]The prosperity rate is the proportion of persons who did not economise on *any* item, i.e. persons whose aggregate score was 100.

[**]The prosperity rate is the proportion of persons who possessed *every* item, i.e. persons whose aggregate score was 100.

Table 3
The Risk of Deprivation in Northern Ireland,
By Subgroup of Population

	Ownership:										
	Religion		*Employment*		*Family Type*					*Gender*	
	Protestant (58.5)	*Catholic (41.5)*	*Employed (70)*	*Unemployed (30)*	*Pensioners (12.3)*	*Couples with Children (27.5)*	*Couples without children (23.3)*	*Single Parents (3.7)*	*Single without children (33.2)*	*Men*	*Women*
Head Count Ratio: α=0	0.93	1.10	0.38	2.46	0.29	0.92	0.87	4.51	1.03	0.82	1.52
Average Normalised Poverty Gap: α=1	0.85	1.22	0.19	2.90	0.61	0.76	0.75	6.20	0.94	0.75	1.74
Average Squared Normalised Poverty Gap: α=2	0.77	1.33	0.09	3.12	0.82	0.46	0.74	7.33	0.99	0.66	2.00
	Economising										
	Religion		*Employment*		*Family Type*					*Gender*	
	Protestant (56.7)	*Catholic (43.3)*	*Employed (65.6)*	*Unemployed (34.4)*	*Pensioners (9.8)*	*Couples with Children (26.3)*	*Couples without children (25.8)*	*Single Parents (5.8)*	*Single without children (32.3)*	*Men*	*Women*
Head Count Ratio: α=0	0.84	1.21	0.64	1.68	0.22	1.07	0.82	2.83	0.99	0.85	1.47
Average Normalised Poverty Gap: α=1	0.82	1.23	0.55	1.86	0.09	1.06	0.76	3.11	1.04	0.81	1.60
Average Squared Normalised Poverty Gap: α=2	0.83	1.22	0.49	1.98	0.04	0.97	0.79	3.35	1.06	0.80	1.66

Figures in parentheses represent population shares.

The risk of deprivation is the ratio of a group's contribution to deprivation to its contribution to the population:

$\rho_k > 1$ ($\rho_k < 1$) means that it contributes more (less) to deprivation than its population share warrants.