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SOCIO-ECONOMIC MORTALITY
DIFFERENTIALS IN IRELAND

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Socio-Economic Mortality Differentials in Ireland

Introduction

Differences in death rates between socio-economic groups have been the focus of a great deal of attention internationally. In the UK, for example, these differences have been studied for over a century, and interest in the topic was given new impetus by the Black Report (DHSS 1980). This report not only pointed to very large differences in death rates between occupational classes in Britain, but suggested that these differences had increased rather than decreased from the early 1930s to 1971. Partly as a result, a substantial body of research on the interpretation of the available British data and its limitations, and on the causal factors at work, has been produced. In 1987, a follow-up report by the Health Education Council (Whitehead 1987) further fuelled the debate, concluding that inequalities in death rates between non-manual and manual groups in Britain widened in the decade from 1971 to 1981.

Clearly, socio-economic mortality differentials generate such interest not only because they are of great significance in themselves, but also because they are taken to be indicators of wider social and economic differences. As Wilkinson (1986) puts it, insofar as the shortening of life is associated with poor social and economic circumstances, class differences in health represent a double injustice: life is short where its quality is poor.

Despite their importance, until recently very little has

been known about socio-economic mortality differences in Ireland. Some small-scale local studies have been done but up until recently no statistics have been available at a national level. In 1987 the Department of Health published data on perinatal deaths in 1984 classified, inter alia, by father's occupation, revealing substantial differences across socio-economic groups. Apart from this limited data on stillbirths and deaths within the first week, no other information on mortality by socio-economic background for the State as a whole has been published.

This is despite the fact that, just as Britain, information on occupation forms part of the details obtained routinely at time of death. This data is sent to the Central Statistics Office and is there coded into socio-economic groups. While not without problems - here as elsewhere - this data represents a very important, apparently hitherto unused, source for the analysis of this critical issue.

Here we make use of data on deaths classified by age, sex and socio-economic group for 1981, made available by the CSO, together with Census data for that year, to take a first look at Irish socio-economic mortality differentials for men. Some results for children are also presented. Women are not included in the analysis at this stage, since their classification by socio-economic group is more problematic, as discussed in Section 2.

The paper is structured as follows. Section 2 describes the data employed. Section 3 presents the main results, for

men aged 15-64. Section 4 compares these\with the results of the same methodology for England and Wales, published by the British OPCS. Section 5 discusses the problems which arise due to the nature of the data and assesses the reliability of results, in particular in the light of the British Longitudinal Study which is based on quite a different methodology. Section 6 brings together the conclusions.

2. The Data

2.1 Nature of the Data

The original interest in mortality differences by occupational group in Britain focused directly on the influence of the actual occupations themselves on mortality. Thus, quite detailed data on death rates across occupations have been produced and analysed, focusing on particular causes of death and their possible relationship with occupation. Over time, though there was a shift of attention towards broader aggregates and the influence of general socio-economic environment on mortality. Thus, differentials between socio-economic groups and social classes have been intensively researched in recent years. For the most part, this has involved calculating death rates for different age/sex groups by occupational group/social class on the basis of mortality information gathered at the time of death and population totals from the Census.

In Ireland, as in Britain, when a death is registered a statistical form must be completed. This form (Form 102, shown in Appendix I) seeks information on the place and date of death, the name, age, sex, address, occupation and marital status of the deceased, and the cause of death. The question on occupation looks for "full detail", and gives examples such as farmer, farm labourer, foreman in hosiery factory, insurance clerk, and so on. Where the deceased was under 14 years of age the occupation of parent or guardian is sought. Where retired, the instruction is to state "retired" and give previous occupation. For a married or widowed woman, the husband's occupation is also sought.

The form is forwarded to the CSO and the data entered on computer tape. In doing so, the occupation itself is not entered; rather, the responses are coded into the 12-category Socio-Economic Group (SEG) classification used by the CSO, on the basis described in detail in the Census of Population occupational coding manual. Thus it is only possible at present to analyse mortality differentials across SEGs: it is not possible either to look at more detailed occupational breakdowns, or to look at social classes rather than socio-economic groups. The CSO has recently introduced an Irish social class scale for use in the 1986 Census, which will provide the denominator needed to derive death rates by class. However, the death statistics themselves are not currently coded on this basis and in certain cases insufficient information may at present be available from

this source to do so - for example, size of farm.

Death certificate information on occupation of this type is known to be subject to particular problems. Obviously the circumstances in which the information is sought are difficult. The person providing the information is usually a close relative but may not always have a clear or accurate picture of the work actually done. The information given may also be less than desired - such as just "factory worker", for example. When the deceased was retired, the response may be particularly prone to inaccuracy/imprecision or may refer to the last job rather than the principal occupation during the person's working life.

Due to these factors, the occupation recorded at time of death may not always correspond to what would be reflected in the Census. This gives use to what are termed "numerator-denominator biases" in constructing death rates on the basis of data from the two sources. Inaccurate occupational descriptions at either death certificate or Census could give rise to a considerable mismatch. This could be purely random: however, more systematic biases may arise, if for example next of kin tend to "promote the dead".

These problems may have inhibited researchers from using the Irish mortality data. However, the same problems have been encountered in Britain and considerable progress has been made there in quantifying the likely size and direction of any biases introduced. In this regard, the results appearing from the Longitudinal Study of a 1 per cent sample

from the 1971 Census for England and Wales have been
particularly valuable. It is therefore worth examining what
the Irish data show, and assessing the results in the light
of what has been learnt elsewhere about the nature of these
data sources.

2.2. Coverage of the Analysis

The analysis is limited at this stage to men aged
between 15 and 64. Others are excluded for a variety of
reasons. Women are coded in the death certs, as in the
Census, on the basis of their own occupation, or by their
husband's if this is not available. In analysing mortality
differentials, it is questionable whether some married women
are best classified on the basis of their own or their
husband's socio-economic group. If the interest were purely
in occupational effects *per se* then clearly the woman's own
occupation is the relevant one. Where wider effects of
socio-economic background are concerned, though, the
husband's situation may often be considered to determine that
of the family as a whole. On this basis, for example,
British analyses of mortality have frequently focused on
single women classified by their own occupation and married
women classified by that of their husband. There may also
be particular data problems with respect to married women's
occupations. For these reasons, the analysis at this stage
has been confined to men.

The occupational data for the retired is also known to
be particularly subject to problems. This is partly because

last job may not correspond to principal occupation during the person's career, and partly because the information is more often imprecise or missing. For this reason the British analyses based on the death certificate data have again tended to confine their attention to persons under 65. The Longitudinal Study, to be discussed in detail below, has looked at the mortality of older age groups.

Mortality of children by family socio-economic background is of course of considerable interest. The analysis of perinatal deaths recently published by the Department of Health, mentioned above, is a valuable first step in this regard. This was based on information on the Notification of Births forms: for older children, data from the death certificate on parents occupation could form the basis for a similar analysis. A preliminary examination of this data has been carried out, but the numbers in a given year are small and a high proportion are in the "unknown" SEG. Since child mortality represents a distinct area of interest in any case, this will be pursued separately: the present paper concentrates on men aged 15 - 64.

2.3 Description of Data Used

We use data for 1981, because of the availability of full Census of Population data. The published Census data for that year, giving a breakdown of the population by age, sex and SEG, provides the necessary denominator for the mortality analysis. Data on deaths by age, sex and SEG for the same year were provided by the CSO from their coding of

the death certificates.

One difficulty arises with the categorisation of individuals by SEG in the Census versus the death certificates. Students are classified by the occupation of the family `principal earner´ in the Census but by their own status ("not gainfully occupied") in the death statistics. The treatment we adopt is to exclude the "not gainfully occupied" from the deaths figures in the 15-19 age group and exclude those "not in the labour force" in the Census population figures for the same age group. Some mismatch may remain for older students but it is likely to be small.

3.   *Irish Mortality Differentials by Socio-Economic Group for Men aged 15-64*

The data on which we base the analysis of mortality by socio-economic group for Irish men are shown in Table 1: the number of men aged 15-64 in the population in 1981, and deaths of such men in that year, classified by age range and socio-economic group. The exclusion of students from the 15-19 age range, because of their different categorisation by SEG in the two sources, is the only adjustment to the population figures published in the Census and deaths data supplied by the CSO. (Given the small number of deaths involved, this in fact makes little difference to the results).

Combining the two sets of figures, the death rates (expressed per 1,000 population) for each age/SEG category are readily calculated, and also shown in Table 1. Focusing

Table 1: Population, Deaths and Death Rates (per 1,000 population) by Age and Socio-Economic Group, Ireland 1981

Age	Farmers	Farm Labourers	Higher Professional	Lower Professional	Employers & Managers	Salaried Employees	Non-manual wage earners -"white collar"	Non-manual wage earners - other	Skilled manual workers	Semi-skilled manual workers	Unskilled manual workers	Unknown	Total
15-19 [a]													
population	7,124	3,313	560	669	831	816	15,068	6,908	28,428	6,962	7,093	3,453	81,225
deaths	3	7	-	1	2	1	13	12	22	12	16	13	102
death rate	0.421	2.113	-	1.495	2.407	1.225	0.863	1.737	0.774	1.724	2.256	3.765	1.256
20-24													
population	10,442	4,996	5,440	5,263	4,850	3,264	23,421	12,496	38,964	9,309	11,575	10,426	140,446
deaths	13	6	1	8	3	3	25	22	41	15	21	29	187
death rate	1.245	1.201	0.184	1.520	0.619	0.919	1.067	1.761	1.052	1.611	1.814	2.782	1.331
25-34													
population	22,331	7,925	14,480	13,030	16,384	6,957	28,891	25,297	63,987	13,924	20,675	8,784	242,665
deaths	18	10	4	6	8	4	31	30	44	15	31	60	261
death rate	0.806	1.262	0.276	0.460	0.488	0.575	1.073	1.186	0.688	1.077	1.499	6.831	1.076
35-44													
population	25,533	5,823	9,526	7,955	18,477	5,335	16,306	23,209	41,244	9,319	14,338	7,541	184,606
deaths	36	18	8	11	23	8	39	47	77	28	49	51	395
death rate	1.410	3.091	0.840	1.383	1.245	1.500	2.392	2.025	1.867	3.005	3.417	6.763	2.140
45-54													
population	32,395	5,692	6,630	4,542	13,326	3,926	12,218	16,988	28,518	7,506	12,535	8,825	153,101
deaths	183	26	23	25	60	14	95	105	177	54	134	118	1014
death rate	5.649	4.568	3.469	5.504	4.502	3.566	7.775	6.181	6.207	7.194	10.690	13.371	6.623
55-64													
population	37,307	6,792	5,091	3,154	8,673	3,096	11,072	14,161	20,378	6,153	11,996	13,414	141,267
deaths	553	103	65	50	101	47	224	285	381	136	379	348	2672
death rate	14.823	15.165	12.768	15.954	11.645	15.181	20.231	20.126	18.697	22.103	31.594	25.943	18.914
All ages													
population	135,132	34,541	41,727	34,593	62,541	23,394	106,976	99,059	221,519	53,173	78,212	52,443	943,310
deaths	806	170	101	101	197	77	427	501	742	260	630	619	4,631
death rate	5.964	4.922	2.420	2.920	3.150	3.291	3.992	5.058	3.350	4.890	8.055	11.803	4.909

a Population excludes those "not in labour force", deaths exclude "not gainfully occupied ", for this age category only (see text for discussion).

Source: Population: Census of Ireland 1981 vol. 7 Table 16.
    Deaths: supplied by CSO

10.

on particular age groups, there are marked differences between SEGs. For example, for the 55-64 age range the death rate for those in the "higher professionals" groups is 13 per 1,000, compared with 22 for those in the semi-skilled and 32 for those in the unskilled manual worker groups.

The aggregate death rates for each SEG for the entire 15 - 64 group will obviously be influenced not only by differences between SEGs in death rates within age ranges, but also by the different age composition of the SEGs. One convenient summary measure which takes this into account and is frequently used in this context is the Standardised Mortality Ratio (SMR). This standardises for differing age composition by calculating what the *expected* number of deaths for a particular SEG would be if the actual population in that SEG in each age range experienced the *average* death rate over all SEGs for that age range. The actual total of deaths for that SEG is then expressed as a percentage of the expected deaths. An SMR over 100 thus means that the SEG has had more deaths than would be expected on the basis of average age-specific death rates and the SEG's actual age composition.

"Expected" deaths and SMRs calculated in this manner for men aged 15-64 are shown for the 12 SEGs in Table 2. The SMRs range from 55 for the higher professional group to 163 for the unskilled manual one and 174 for the residual category - to which we will return.

Table 2:   *Standardised Mortality Ratios (SMRs) for Men   Aged*
            15-64 by Socio-Economic Group, Ireland 1981

Socio-economic group	Actual deaths	"Expected" deaths	SMR = (actual/ predicted) X 100
0) farmers etc.	806	1022	79[a]
1) farm labourers & fishermen	170	198	86[a]
2) high professional	101	184	55[a]
3) lower professional	101	128	79[a]
4) employers & managers	197	317	62[a]
5) salaried employees non-manual wage earners	77	109	71[a]
6) -white collar	427	406	105
7) -other	501	482	104
8) skilled manual	742	819	91[a]
9) semi-skilled manual	260	222	117[a]
X) unskilled manual	630	387	163[a]
Y) unknown	619	356	174[a]

[a] Significantly different from 100 at 95% confidence level.

It is interesting that for the farmers, farm relatives assisting, and farm workers groups the SMRs are below 100. For the "intermediate" groups of non-manual wage-earners the SMRs are about 100. For higher and lower professional groups, employers and managers and salaried employees the SMRs are well below 100. For skilled manual workers the figure is also below 100, while semi-skilled and particularly unskilled manual workers and the unknowns are the only groups with SMRs substantially above 100.

The number of deaths on which these figures are based is in most cases quite large - as many as six to seven hundred for some groups. For some SEGs the figure is about one hundred or less, though. It is therefore important to assess

the statistical significance of the results. Various tests
from a simple chi-squared to more powerful ones designed
specifically for small numbers have been applied in this
context. A useful test of whether an SMR differs
significantly from 100, based for small numbers on the
Poisson distribution as derived by Bailar and Ederer (1964)
and for larger numbers on the chi-squared distribution, is
presented in graphical form in the OPCS Occupational
Mortality Decennial Supplement 1970-72. This is reproduced
as Figure 1 here, and may be applied to the SMRs, and the
number of deaths on which they are based, shown in Table 2.
On this basis the only ones which are not significantly
different (at the 95 per cent level) from 100 are the two
which are almost exactly 100 - for non-manual wage earners.
Those for the farm labourers and semi-skilled manual workers
are on the borderline for significance below/above 100
respectively, while the remainder all differ significantly
from 100.

Clearly the high SMR for the "unknown" category merits
careful consideration. Before dealing with this in detail,
it is useful to first present a comparison of the results for
Ireland with those for the UK. Not only will this provide
some basis on which to assess the plausibility of the Irish
results, it will also allow us to discuss the in-depth
studies of the numerator/denominator bias, the importance of
the `unknown` groups, and other issues of data quality which
have been carried out for the British data.

*4:   A   Comparison   with   Mortality   Differentials   Across
Socio-Economic Groups in England and Wales*

The mortality analyses published by the British Office

of Population Census and Surveys refer to England and Wales.

The most recent detailed analysis of occupational mortality

are presented in Decennial Supplements for 1970-72 and

1979-80/1982-83 (OPCS 1978 and 1986). Mortality rates are

calculated for 6 social classes, 17 socio-economic groups, 27

occupation orders, and 223 occupation units. Here the

categorisation most relevant for comparison with the Irish

results is socio-economic group. While the British

classification distinguishes 17 SEGs compared with the Irish

12, the grouping method is conceptually similar and broad

conclusions can be reached by comparing the two.

The mortality rates are calculated by taking deaths in a

number of years centred on the Census year, and comparing

these with a 10 per cent sample from the Census. Thus the

data for deaths in 1970-72 form the numerator, and the 1971

Census data the denominator, for the 1970-72 mortality rates

and SMRs. Deaths over a period rather than for one year

provide a firmer basis on which to disaggregate down to

occupation level and also to investigate different causes of

death in detail, which can involve using quite small numbers.

The information on occupation gathered on the death certs and

in the Census corresponds quite closely to the Irish

equivalents. One important difference in the analysis,

though, is that the main British figures refer to occupied or

Table 3: *Comparison of Irish and English SMRs for Men Aged 15-64 by SEG*

| Ireland 1981[a] | | | England and Wales 1970-72[b] | | |
SEG	% of pop.	SMR	SEG	% of pop	SMR
(0) farmers, farm managers relatives assisting	14	79	(13) farmers - employers & managers	$^1/_2$	99
			(14) farmers - own account	$^1/_2$	61
(1) farm labourers, fishermen	4	86	(15) agric. workers	1	103
(2) higher professional	4	55	(3) professional self empl.	1	69
			(4) professional - employees	4	79
(3) lower professional	4	79			
(4) employers & managers (incl. shopkeepers)	7	62	(1/2) employers	2	102
			(1/2) managers	9	80
(5) salaried employees	3	71	(5.2) Foremen & supervisors -non-manual	1	67
(6) non-manual - white collar	11	105	(6) Junior Non-Manual	11	106
			(7) Personal service workers	1	134
(7) non-manual - other	10	103	(8) foremen and supervisors - manual	4	79
			(12) own account workers	4	77
			(16) Members of armed forces	1	147
(8) skilled manual	23	90	(9) skilled manual	28	113
(9) semi-skilled manual	6	117	(10) semi- skilled manual	12	115
(X) unskilled manual	8	163	(11) unskilled manual	6	139
(Y) unknown	6	174	(17) inadequately described	2	86

[a] All men except unoccupied aged 15-19.
[b] Occupied and retired only.

retired men only, excluding the unoccupied: the implications
of this are dealt with in detail in Section 5. It is most
convenient to directly compare the SMRs, rather than the
death rates for the different age groups, by SEG. This is
done in Table 3, using at this stage the 1970-72 death rates
for England and Wales rather than those for 1979-80/1981-82
because these may be more reliable, as discussed in detail in
Section 5 below. While the individual SEG categories are
not directly comparable, we have grouped them into what
appear to be broadly comparable categories.

Clearly in both cases the unskilled manual groups have
relatively high SMRs and the professional and managerial ones
relatively low SMRs. For England and Wales the only group
with a higher SMR than `unskilled manual' is `members of the
armed forces' and this is believed to be artificially
inflated for a number of reasons. Compared with the Irish
figure, though, the unskilled manual group are somewhat less
far above the average in England and Wales. Likewise for the
professional and managerial groups, though the pattern is not
entirely consistent, the Irish SMRs do appear for the most
part to be somewhat lower. The pattern between the unskilled
manual and the professional/managerial groups is thus very
much the same in the two cases, but with a wider differential
in Ireland.

For other groups, the semi-skilled manual category has a
similar SMR in the two cases, while the skilled manual group
has an above average SMR in England and Wales but is below

average in Ireland. Farmers and farm labourers are obviously far less important in England and Wales, but are at or below the average SMR as in Ireland. For other groups the different categorisations make any exact comparison impossible.

Without putting too much weight on the comparative results in terms of particular occupational backgrounds, it can be concluded at a minimum that the results for Ireland certainly look quite plausible when compared with those for England and Wales. In assessing their reliability, though, one obvious contrast is between the "unknown" group in Ireland and the corresponding groups for England/Wales. The SMR for the "unknown" SEG in Ireland is higher than that of any other SEG, at 174. For England and Wales, on the other hand, the SMR for the "inadequately described" SEG is only 86. The two are not directly comparable though, as explored in more detail in the next section, which deals with this and other aspects of the reliability of the data.

5 The Reliability of the Data Used

5.1 The "Unknown" Group

Before drawing conclusions from the relative size of the SMRs for the 'unknown' SEG in Ireland compared with England and Wales, the difference between the two already mentioned in their treatment of the "unoccupied" - which affects the size of the unknown group - must be emphasized. In the Irish Census data used here, where the head of a family is "unoccupied", i.e. neither at work, unemployed or retired, the family were assigned to the SEG of the principal earner if any. If there was no such earner, which may be quite common, the family members were assigned to the "unknown" SEG. In the deaths data for Ireland, the unoccupied are all coded into the residual "unknown" SEG. Thus the unoccupied are an important element of that SEG in the Irish figures.

In the mortality analysis for England and Wales, by contrast, the unoccupied are not assigned to any SEG, and their mortality is not analysed along with that of the SEGs. The SEGs, including the "inadequately described" or unknown group, only contain men who are occupied or retired. The unoccupied only have a role in the England/Wales SEG analysis in that they are included in the overall death rate for all men aged 15-64 against which the individual SEGs are compared.

Bearing this in mind, we can compare the numbers with "unknown" occupational background in the Irish Census and death data with those for England and Wales. Looking first

at the Census, in the 1981 Census for Ireland 6.5 per cent of all men aged 15-64 were in the "unknown" SEG. In the Census data for England and Wales for 1971 used in the main analysis of mortality, only 1.8 per cent of men aged 15-64 were in the "inadequately described" SEG, as shown in Table 3. However a further 7.6 per cent, excluded from the mortality analysis were "unoccupied". These were for the most part students, accounting for 5.6 per cent, while the remainder were the disabled (1.5 per cent) and a residual group (0.6 per cent). Given that some of the students in the Irish data would have been classified into various SEGs on the basis of the family's principal earner while all the students in England/Wales would be in "unoccupied", there would not appear to be a dramatic difference between the two Censuses in the proportion for which occupation data was not successfully gathered.

Turning to the death statistics, for Ireland 14 per cent of all deaths to men aged 15-64 in 1981 were classified into the "unknown" SEG. In the death statistics for England and Wales, only 1.3 per cent of men aged 15-64 were assigned to the "inadequately described" SEG. A further 1.6 per cent of deaths were not assigned to an SEG because they were unoccupied: these comprised students (0.5 per cent) and the disabled (1.1 per cent).

This comparison makes clear that it is not in the Census but rather in the death data that the major difference between the Irish and England/Wales figures lies. The Irish

death data appears to have a substantially larger number of deaths for which insufficient occupational data was gathered to allow classification by socio-economic group. This remains true even when the exclusion of the unoccupied from the figures for England and Wales is taken into account.

We can explore the composition of the "unknown" element in the Irish deaths data on the basis of the categorisations used by the CSO in coding the figures. Table 4 shows the breakdown of the deaths in the residual SEG by age range, distinguishing between the gainfully occupied,- retired, and not gainfully occupied. Those identified on the basis of limited information provided as gainfully occupied account for 32 per cent and the retired for 9 per cent. The remaining 59 per cent are classified as "unoccupied (though some of these in fact have no information at all on occupation and are more properly considered as missing). In each case, the older age groups are the most important, and the 'not gainfully occupied' aged between 45 and 64 account for 46 per cent of all the 'unknown' deaths.

Since the unoccupied appear to make up a major part of the unknown in the deaths data, one possible approach would be to exclude them from the mortality by SEG analysis, as is done for England and Wales. This would require appropriate data from the Census to form the denominator, though. As published, the Census classification by SEG distinguishes only between those in/not the labour force, and those not in the labour force include not only the unoccupied but also the

Table 4:   *Composition of Deaths of Men Aged 15-64 in the*
           "Unknown" SEG, Ireland 1981

% of all deaths in "unknown" SEG[a]

Age	gainfully occupied	retired	not gainfully occupied[b]	Total
15-19	2.1	-	-	2.1
20-24	1.4	-	3.2	4.6
25-34	3.7	-	6.0	9.7
35-44	4.7	-	3.6	8.3
45-54	8.7	1.1	9.2	19.0
55-64	<u>11.8</u>	<u>7.6</u>	<u>36.8</u>	<u>56.2</u>
Total	32.5	8.7	58.8	100

[a] total number of deaths = 619

[b] Includes those for whom no information was available.

retired. It would appear to be worth exploring the possibility of obtaining data from the Census for the gainfully occupied plus retired by SEG, excluding the unoccupied. If available, this could reduce the size of the unknown SEG in the analysis very substantially. Excluding those classified as unoccupied from the deaths data would reduce the percentage of deaths in the unknown SEG by almost 60 per cent, to about 6 per cent of all deaths. While still greater than the 1.3 per cent falling into the "inadequately described" SEG for England and Wales, this would clearly be considerably more satisfactory. (Some error could however be introduced by the fact that the true "unoccupied" may be overstated).

It appears likely, though, that the main impact of the exclusion of the unoccupied from the analysis would be on the SMR for the "unknown" SEG itself, not greatly affecting the relativities between the other groups. In the analysis presented above, all the unoccupied in the Irish deaths data fall automatically into the unknown SEG. It is probable that many of the unoccupied men in the Census also fall into that SEG, where it proves impossible to classify them by the occupation of a family principal earner. (Three-quarters of the men in the unknown SEG are not in the labour force: not all of these would count as unoccupied, since some would be retired, but it does indicate the probable location of most of the unoccupied). Thus the SMRs for other SEGs appear likely to be largely unaffected.

Even having excluded the unoccupied, though, the 'unknown' or residual group in the Irish deaths data would be greater than in England and Wales, and is a source of concern. Further, other numerator/denominator biases not related to the 'unknown' category may exist - that is, persons may be classified into a different "known" SEG at death than in the Census, for a variety of reasons. The Longitudinal Study being carried out by the OPCS in Britain is intended to throw light on precisely these possible biases, and we now discuss some of its principal findings.

5.2 The British Longitudinal Study

In describing the objectives of the OPCS Longitudinal study, the researchers involved state that "One of the main reasons for OPCS initiating the longitudinal study was the regular expression of doubt about the traditional occupational mortality statistics published in the series of decennial supplements which goes back to 1851. These doubts stem in particular from the method of calculating death rates for occupations and social classes which relates the number of people who die about the time of a census with the occupation or social class recorded on their death certificates (the numerator) to the number of people with that occupation or social class recorded in the census (the denominator)". (Fox et al 1985 p. 10).

Begun in 1973, the Longitudinal Study took a sample of about 1 per cent from the 1971 Census for England and Wales, of people born on any of four birthdays during the year.

These people were then traced through time and "vital events" recorded, using the data available on the National Health Service Central Register. Death rates for occupations, and the socio-economic groups and social classes derived from them, can then be based for the sample entirely on the data on occupations reported in the census.

Overall, the results currently available from the Longitudinal Study have confirmed the estimates of mortality differentials by social class from the 1970-72 Decennial Supplement, (see Fox et al 1985, OPCS 1986). The SMRs by social class produced by the two are not identical. Rather, those produced by the Longitudinal Study were in general lower (once the sample had been followed through to 1976-81). However the *gradient* between the classes is very similar in the two studies.

The difference in the level of the SMRs arises primarily because those who are permanently sick and therefore have no identified occupation in the census, and those who are inadequately described for some other reason, are *excluded* from the Longitudinal Study. In the death certificates, though, such people may be categorised by a stated previous occupation, and therefore included in the Decennial Supplement analysis. This leads to a higher SMR for the SEGs in which these persons are categorised than in the Longitudinal Study and a relatively low level of SMR for the inadequately described and the unoccupied in the Supplement's analysis.

For the later Decennial Supplement analysis, using deaths in 1979-80 and 1982-83 and Census data for 1981, some biases have however been identified compared with the Longitudinal Study. The later Decennial Supplement shows a substantial widening in mortality differentials across social classes compared with the 1970-72 Decennial Supplement. The Longitudinal Study suggests that this widening is exaggerated and that part of the 1979-83 differential is spurious (see OPCS 1986, Wilkinson 1986). For this reason, we have concentrated on the earlier data in our comparison with the Irish results in Section 4 above. This greater bias in the 1979-83 Supplement appears to have been produced by two factors, both to do with the 1981 census. First, improvements were made in the classification of persons by occupation in 1981, reducing the numbers coded to loosely defined categories such as labourers and unskilled workers not elsewhere classified. Corresponding improvements in the Death Certificate data were not made, increasing the 'mismatch' between the two. Secondly, major changes in the actual occupational classification were implemented in the 1981 Census, making comparability with earlier years problematic.

Even for the 1970-72 Supplement, the Longitudinal Study has shown significant numerator/denominator biases for particular occupations and social classes. A substantial proportion of those followed in the Study who died were found to have been classified to a different social class by the

census than when the death was registered (see OPCS 1978 chapter 3). However, there was no consistent tendency to either `promote` or `demote` when registering the deaths of men aged 15-64. Thus, despite mismatches in the classification, no substantial bias in the differentials between social classes was found. A corresponding analysis based directly on socio-economic groups rather than social classes has not been published. However, similar conclusions appear likely to apply to broad comparisons between, for example, professional/managerial SEGs and semi-skilled/ unskilled manual categories.

The main implications of these findings for the Irish data may be first that numerator/denominator biases do indeed exist in the conventional methodology matching death certificate data with census data. Secondly, though, such problems need not necessarily seriously bias the overall pattern provided by the methodology in terms of differentials between broad socio-economic groups. Clearly the data deficiencies do need attention, in order to minimise as far as possible both the size of the unidentified group and the mismatch between allocation to identified socio-economic groups in the Census vis-a-vis the death certificate data. Such improvements would increase confidence in the results of the methodology. As the results currently stand, neither the existence of a significant unidentified group per se, nor the likelihood of other numerator/denominator biases, invalidates the approach, but they must be kept in mind in assessing its

reliability.

6. *Conclusions and Implications*

This paper has taken a first look at Irish mortality differentials across socio-economic groups for men aged 15-64. The conventional methodology, widely used in Britain and elsewhere, was applied. This involves relating data on deaths by socio-economic group, gathered at time of death, to the total population in these groups as shown in the Census. Data for 1981 was used, with deaths by SEG provided by the CSO forming the numerator and 1981 Census figures the denominator in calculating death rates. A number of different age ranges were distinguished, and overall mortality ratios standardising for age composition calculated for each of the 12 SEGs used by the CSO.

The results showed significant differentials in standardised mortality rates between those in professional/managerial occupational groups and those in semi-skilled or unskilled manual occupational groups. When compared with the results produced by the same methodology applied to data for England and Wales in 1970-72 the Irish differentials showed a similar general pattern, with perhaps a somewhat steeper gradient between these groups.

The problems which arise due to the nature of the data used in this exercise, which have been explored in some depth in Britain, were discussed in detail. The number of deaths which were not allocated to an identified socio-economic group, but rather fell into the "unknown" SEG, was considerably higher in the Irish figures. This was partly,

though not wholly, because the "unoccupied" group - with a high proportion having no stated previous occupation - were included in the Irish figures but excluded from the British SEG analysis. In terms of the comparison with Britain, their inclusion is likely to have primarily affected the "unknown" SEG rather than the identified ones for Ireland.

The fact that there is a significant "unknown", unallocated group particularly in the deaths data (even if the unoccupied were excluded), and the possibility of other numerator - denominator biases due to mismatches between allocations in the two data sources, must be kept in mind in assessing the reliability of the results. Any improvements in the data collection at registration of death which allowed the "unknown" and other mismatches to be reduced would be extremely valuable. The Longitudinal Study underway in Britain has however demonstrated that the existence of these problems per se does not necessarily introduce substantial biases into the results of applying the standard methodology, in terms of the mortality differentials produced.

Having presented the first results of an analysis of socio-economic mortality differentials for Ireland, and leaving aside the issues of data reliability etc., what implications are to be drawn when significant differentials across such groups are identified? This is an extremely complex and controversial issue, which will not be addressed in any detail here, but it may be useful in concluding to outline the main themes of the arguments which have been put

forward in this debate.

In Britain, the Black Report attributed such mortality differentials - as well as similar ones in morbidity - to a range of factors, but emphasized the effects of poverty, deprivation and work conditions on health. Some have argued, though, that these differentials are largely a product of social selection and mobility (notably Illsley 1955, Stern 1983), with the healthy moving up and the unhealthy moving down the social scale. The recent results of the Longitudinal Study have not supported the latter argument (see Fox, Jones, Moser and Goldblatt 1985, Fox, Goldblatt and Jones 1985). A recent review of this and other British evidence concluded that the health differences associated with socio-economic disparities are if anything understated by the results of the standard Decennial Supplement methodology (Wilkinson 1986 p.12 - useful reviews are also provided by Hart 1986 and Carr-Hill 1987). The factors which could work to produce such differentials and their implications are extremely difficult to measure and assess.

It is particularly hard to obtain an overview of how such factors may operate and interact - the Black Report, for example, while emphasizing socio-economic influences, is somewhat unconvincing in specifying the channels through which these may actually have their effects. Drawing on a range of sources, largely from Britain, Table 5 set out some of the suggested channels of influence. These include firstly the hazards associated with particular occupations

Table 5:   *Suggested Socio-Economic Influences on*
Health/Mortality

1)   occupational hazards

2)   poverty affects health directly through

       maternal health (birthweight)
       nutrition
       housing conditions

3)   `indirect' effects include

       stress
       environmental factors - pollution
       accidents/violence

4)   `lifestyle'

       tobacco & alcohol
       drugs
       eating patterns
       exercise

5)   health care

       quality of care
       readiness/ability to avail of care

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themselves (which is of course where the interest in mortality differentials began). What we may term "direct" effects of low income/poverty include the impact of poor maternal health - though for example low birthweight and its long-term implications - poor nutrition and poor housing conditions. Less direct effects include stress and associated physical and psychological health problems, a higher exposure to environmental pollution, and a high incidence of accidents. Differences in style of living which influence health are also evident - from relatively heavy consumption of tobacco and alcohol, to drug usage, less healthy eating patterns and less awareness of the value of

exercise. Finally, there may also be differences in the health care received across socio-economic groups. This could reflect both variations in the quality of care available, and differences in the readiness or ability of individuals to avail of such care.

The interpretation of trends over time in mortality differentials has if anything aroused even more controversy than their significance at a point in time. This is enormously complicated by changes in the actual classifications of occupations etc. used over time, and by major shifts in the importance of particular occupations. It has been argued, for example, that the apparent increase in social class mortality differentials in Britain during this century are a statistical artefact produced by a combination of these factors. This has been intensively researched from a number of perspectives, and again Wilkinson's review of recent evidence concludes that underlying mortality differentials have indeed been widening. The interpretation of such a finding, particularly when the class composition of the population is changing substantially, must however be approached with great care.

For Ireland there is obviously some way to go before changes over time in socio-economic mortality differentials become the major issue. The priority must be to obtain estimates of these differentials at a point in time which are as reliable as possible. The present paper is intended to begin this process, by drawing attention to the available

data, the results of a first analysis, and the nature of the problems which arise. Extensions of the analysis would include looking at the possibility of excluding the unoccupied group, and combining deaths data from a number of years. The latter would not only allow overall differentials across socio-economic groups to be estimated with more precision, but also the major causes of death and their pattern by socio-economic background could be analysed. The possibility of extending the coding of deaths by SEG to include the new social class categories may also be worth exploring with the CSO. Clearly any improvements in the underlying data would be extremely valuable: only if they are used is this likely to be given priority.

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