

Measuring Trends in Male Mortality by Socio-Economic Group in Ireland: A Note on the Quality of the Data

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Abstract: The objective of this paper is to examine measurement issues and data problems in the analysis of trends in male mortality differentials by socio-economic group (SEG) in Ireland between 1981 and 1991. The study is based on mortality data supplied by the Central Statistics Office and population data taken from the 1981 and 1991 Census. The recording of the occupation of decedents worsened between 1981 and 1991, making it impossible to discuss trends in mortality differentials by SEG in Ireland with any confidence. Significantly more deceased people ended up in the residual “unknown” occupational category in 1991 than in 1981. This is related to an increasing problem of apportioning “gainfully employed” decedents to a socio-economic group rather than to any problem with people described as “not gainfully employed”. This is all we can say at the moment with respect to the analysis of trends in mortality by 12-category SEG in this country.

I INTRODUCTION

The recent Health Strategy document *Quality and Fairness: A Health System for You* (Department of Health and Children, 2001) highlighted the importance of addressing current health inequalities in Ireland. One of the primary objectives of the Strategy is to reduce health inequalities by occupational group and social class. Almost every major health problem in Ireland has a significant social gradient and, therefore, it is not surprising that a reduction in health inequalities is a major part of the Strategy.

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Occupational class gradients are particularly striking with respect to mortality, with significant differences in mortality between the lowest and the highest socio-economic groups (Nolan, 1990; O'Shea, 1997; Barry *et al.*, 2001).

There is an explicit goal in the Health Strategy for a reduction in mortality differentials by socio-economic group (SEG); the target is a reduction in premature mortality between the lowest and the highest socio-economic groups of at least 10 per cent for circulatory diseases, cancers and injuries and poisonings by 2007. This is a reasonable and long-awaited commitment to reducing health inequalities in mortality. The emphasis in this paper is not, however, on the new commitment in Irish health policy to promoting equity in health, but with the poor quality of data on occupational mortality. Information on mortality is fundamental to the evaluation of government policy on health and the 10 per cent target referred to above can only be assessed properly if the data is available to do so. Unfortunately, the current information on mortality is not capable of providing the database for a comprehensive analysis of trends in mortality differentials, thereby making it very difficult to assess the impact of any policy designed to reduce existing inequalities.

The paper raises doubts about the appropriateness of the SEG classification system as an instrument for the measurement of mortality differentials by occupation over time in Ireland. The problem is that the proportion of decedents allocated to the "unknown" occupational category is growing. There has been an increase in the proportion of people who are in the "unknown" occupational category in recent decades, in each of the three datasets where this information is recorded: National Mortality Data; Perinatal Reporting System; and the National Psychiatric In-Patient Reporting System (Barry *et al.*, 2001). Explaining why the residual SEG group in the National Mortality Data has increased in size over the ten year period 1981-1991 is the focus of the analysis in this research note.¹ The motivation for the analysis is Breslow's (1995) observation that there are often biases in the data that cannot be controlled by statistical analysis. The quality of the data will affect the reliability of any study irrespective of the range and sophistication of the statistical techniques used to analyse that data.

II DATA

This study is based on national mortality data for males supplied by the Central Statistics Office (CSO) and population data taken from the 1981 and 1991 Census returns. The CSO provide information on the occupation of

¹ There is no comparable data on mortality by SEG before 1981.

people who have died making it possible to group deaths on the basis of a 12-category SEG classification. While there has been some criticism that the SEG classification system is not well-founded theoretically (Jones and Cameron, 1984; Illsley, 1986; Dahl, 1993), it is commonly used to assess social variation in mortality and related health status. The SEG classification system brings together people with broadly similar economic and social status and people are assigned to a particular SEG on the basis of their occupational and employment status. When the occupation of the person is unknown that person is assigned to the residual “unknown” category.

One of the difficulties of measuring mortality differentials by SEG is the fact that the numerator and denominator are drawn from different data sources – namely, death registration forms and the Census of Population (Pamuk, 1985). Information on the occupation of decedents in Ireland is gathered at the time of death, usually from close relatives, and is forwarded by the Registrar of Deaths to the CSO for coding into the twelve category SEG classification. Given the difficult emotional circumstances surrounding the collection of the data, and the indirect nature of the information, there is always likely to be a question about the reliability of the data on occupation collected at the time of death relative to data on occupations collected through the Census. There may also be problems in assigning occupation to older (over 65) retired people, which is the reason for their exclusion from this paper. Similarly, there are particular problems in assigning occupation for females working outside of the paid labour market, which is why they are also excluded from the analysis (Nolan, 1990).

Male mortality differentials by socio-economic group are measured in this paper using Standardised Mortality Ratios (SMRs). The SMR 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 SMR is then calculated as the number of deaths within a socio-economic group divided by the number of expected deaths in that group. Taking 100 as the national average ratio, groups with SMRs of less than 100 are better than the average; groups with ratios of more than 100 are worse off. The test statistic used to explore inference is based on the work of Bailar and Ederer (1964), who provide a table of confidence limits for the ratio of an observed value of a Poisson variable to its expectation. The implicit weighting in the SMR approach is that mortality differences at later stages of life are the appropriate measures of inequality, since the score is heavily influenced by deaths in the oldest age categories. Notwithstanding this caveat, the SMR does take into account differences in the age structure of the various socio-economic groups and is easy to understand.

III TRENDS IN MORTALITY

Death rates and standardised mortality ratios are shown in Table 1 for men aged between 15-64 years by socio-economic group for 1981 and 1991. There are significant mortality differentials among socio-economic groups in Ireland in both 1981 and 1991. The most favourable scores in each year occur in the higher professional category, each having an SMR score at or below 60 per cent of the average. The worst results are found in the unskilled manual group and the "unknown" residual category. Both of these groups have an SMR score significantly above 100 in 1981 and 1991. Men in the unskilled manual group have an SMR score three times higher than men in the higher professional category in 1981. The SMR score for the "unknown" group is almost four times higher than the higher professional group in 1991. A comparison of crude death rates and SMR values for farmers shows the value of the latter measure in analysing mortality differentials by SEG. Farmers have relatively high death rates in 1981 and 1991 but relatively low SMR values in both years. The reason for the difference is because of the skewed age structure of farmers (i.e. predominantly elderly), which is taken into account in the SMR calculation.

Table 1: *Death Rates per 1,000 Population and Standard Mortality Ratios for Males aged 15-64 by Socio-Economic Group, 1981 and 1991*

SEG	Male Death Rates Per 1,000 Population		Male SMRs	
	1981	1991	1981	1991
0 Farmers, Relatives Assisting	5.99	5.46	79*	91*
1 Farm Labourers, Ag workers & Fishermen	4.92	4.30	86*	111
2 Higher Professional	2.42	2.35	55*	60*
3 Lower Professional	2.95	2.14	80*	62*
4 Employers & Managers	3.15	2.94	62*	71*
5 Salaried Employees	3.33	3.07	72*	79*
6 Non-Manual Wage Earners – White Collar	4.00	2.29	105	70*
7 Non-Manual Wage Earners – Other	5.06	3.69	104	93
8 Skilled Manual Workers	3.35	2.90	90*	87*
9 Semi-Skilled Manual Workers	4.89	3.75	117*	110
X Unskilled Manual Workers	8.09	4.99	163*	127*
Y Unknown	11.79	10.63	173*	237*
All	4.92	3.96	100	100

*Significantly different from 100 at the 95 per cent level.

There was a significant decline in male death rates during the ten year period. The overall death rate fell from 4.92 per 1,000 in 1981 to 3.96 per 1,000 in 1991. While rates decreased in all SEGs, the most notable declines occurred in the non-manual wage earner–white collar category and the unskilled manual category. The death rate in the former fell by 43 per cent, while the rate in the unskilled manual SEG fell by 38 per cent, from 8.09 per 1,000 in 1981 to 4.99 per 1000 in 1991. The changes in death rates are reflected in changes in SMR values across the various SEGs. The SMR ratio between the unskilled manual group and the higher professional group fell from just under three to just over two in 1999 suggesting a narrowing of the differential between the two ends in 1981 of the SEG continuum. Important changes also appear to have occurred in the following groups: farm labourers, other agricultural occupations and fishermen, non-manual wage earners–white collar, and semi-skilled manual workers. Farm labourers, other agricultural workers and fishermen were significantly below 100 in 1981, but are above in 1991, though not significantly so. The non-manual wage earners-white collar group have moved in the opposite direction, from above 100 in 1981 to significantly below in 1991. The SMR score for semi-skilled manual workers is no longer significantly above 100. The ratio between the “unknown” group (the highest SMR) and the higher professional group (the lowest SMR) increased from just over three in 1981 to just under four in 1991.

The most important question is whether the trends in SMR values shown in Table 1 are accurate, or whether they are distorted by changes in the baseline data between 1981 and 1991. There is evidence that it has become more difficult to assign deceased people to occupational groups in the period under examination. In absolute terms, the number of males aged 15-64 assigned to the “unknown” category increased from 618 in 1981 to 737 in 1991. Given the overall decline in the death rate, the proportion of “unknown” deaths to total deaths increased markedly from just over 13 per cent in 1981 to 19 per cent for 1991 (Table 2). In contrast to the change in the deaths data, the ratio of the “unknown” category to total population in the Census data only increased slightly between the two periods, from 6 per cent to 7 per cent. While the problem is not as bad as for females (42 per cent in the “unknown” category), a discrepancy of this magnitude inevitably leads to an upwards bias in the value of the SMR for the residual category, and potentially misleading effects on relativities for all groups.²

² As pointed out by one referee, it is possible, though unlikely, that the quality of the data may have actually improved rather than deteriorated. This would happen if deaths assigned to the various SEG categories in 1981 should, more correctly, have been assigned to the “unknown” category.

Many of the changes in the value of male SMRs between the two periods may, therefore, be an artefact of the measurement problems in the deaths data. For example, the loss of significance in the SMR score for the semi-skilled category may have more to do with measurement problems linked to missing data than with any real improvement for that group. Overall the most likely impact of the numerator/denominator problem is to bias downwards the magnitude of the mortality difference between the manual classes and the non-manual classes. The reason for this is that the majority of the people in the “unknown” category are more likely to belong to manual categories than to any other group (Valkonen, 1993). It is impossible, however, to draw any firm conclusions about changes over time in Ireland without assessing sensitivity to the way the additional missing data in 1991 might be distributed among the remaining SEGs. The data does not allow us to complete an exercise of this type for Ireland. Consequently, the strongest inference that can be drawn is that there has been a deterioration in the quality of measurement in the deaths data during the 1980s.

Table 2: *Share of Population and Share of Deaths for Males aged 15-64 by Socio-Economic Group (SEG), 1981 and 1991*

SEG	Population		Deaths	
	1981	1991	1981	1991
0	14.3	11.1	17.5	15.3
1	3.7	3.1	3.7	3.4
2	4.4	4.5	2.2	2.7
3	3.7	5.0	2.2	2.7
4	6.6	7.3	4.2	5.4
5	2.5	2.9	1.7	2.2
6	11.3	12.9	9.2	7.5
7	10.5	11.4	10.8	10.6
8	23.5	21.3	16.0	15.7
9	5.6	4.7	5.6	4.4
X	8.3	8.8	13.6	11.1
Y	5.6	7.1	13.3	19.0
Total	100	100	100	100

The question of why and where the deterioration in mortality data occurred is a difficult question to answer given the ex-post nature of the analysis. What is known with certainty is that neither the SEG classification system or the death registration form changed during the period 1981 to 1991. Moreover, the person requiring the death to be registered continued to provide

the information on the occupation of the deceased to the Registrar of Deaths during the period. The Central Statistics Office could not explain the increase in the proportion of deaths assigned to the “unknown” group, beyond confirming that all of the information supplied to them on the relevant form (Form 102) by the Registrar of Deaths is used in the social classification of deaths.³ We now consider two possible explanations for the growth in the residual category over this period.

3.1 *Social Drift*

The first explanation for the growth in size of the residual category between 1981 and 1991 might be an increase in intra-generational “social drift” during the 1980s. Some people may have dropped out of the occupational classification system due to deterioration in personal circumstances linked to economic decline during the period. The unemployment rate in Ireland almost trebled between 1980 and 1987 (Breen *et al.*, 1990), with the share of males unemployed for more than a year increasing from one-third to one-half of all unemployed males. Relative poverty also increased during the period under review (Nolan *et al.*, 1994). The “drift” problem would cause an increase in the proportion of decedents in the residual SEG category if an increase in long-term unemployment, and associated deprivation, linked to premature death, led to difficulties of occupational classification because of the length of time out of the labour force. While the data does not allow us to say anything about a possible link between unemployment and premature mortality, we can establish whether the share of the “not gainfully occupied” (the unemployed) in the “unknown” category increased significantly between 1981 and 1991.

The data does not support the hypothesis of unemployment-related social drift causing occupational classification problems in the mortality data. The “not gainfully occupied” component of the residual “unknown” category declined sharply during the period, from 59 per cent of the total in 1981 to 16 per cent in 1991. If the unemployed were causing the classification problem, we might have expected to find an increase in the share of the “not gainfully occupied” in the residual category. Instead, what we find is that the share of the “gainfully occupied” increased sharply, from just under one-third to just over two-thirds (68 per cent) of all “unknown” deaths during the period. The share of “retired” (mainly in the 55-64 age bracket) in the residual category also increased, from 9 per cent in 1981 to 16 per cent in 1991.

³ Personal communication.

3.2 Labour Market Fragmentation

Labour market fragmentation may provide a richer explanation for the growth in the residual SEG category between 1981 and 1991. It has become increasingly difficult to classify the occupation of people who remain gainfully occupied up to the time of death. The proportion of people classified as “gainfully occupied” in the “unknown” SEG increased for all age categories above age 20. In total, an additional 302 deceased people in the residual category in 1991 were classified as “gainfully occupied” compared to 1981. While it is difficult to explain why the deaths of “gainfully occupied” people could not be assigned to specific SEGs, it may be that decedents in younger age categories never established a strong attachment to the formal labour market due to the high unemployment of the period. Consequently, relatives providing information on occupation may not have had precise information on the employment history of the deceased, particularly if the latter had a number of different jobs within a short period of time. It could also be possible that relatives preferred not to provide information on occupation rather than acknowledge the fragmented and tenuous nature of the “gainful employment” engaged in by the deceased.

The labour market fragmentation argument may carry even more weight at the upper end of the age structure. Participation rates for men aged 55-59 declined from 92 per cent in 1971 to 80 per cent in 1991, while rates for men aged 60-64 declined from 89 per cent to 59 per cent in the same period (Walsh, 1993). The increasingly fragmented labour market for older workers means that many of them now exist in a kind of occupational “limbo”, available for work but not officially recognised as workers, either by employers or by the authorities. The difficulty that older workers experience in returning to formal employment after being laid off means that if they are to keep working it is likely to be work of an occasional, seasonal, or voluntary type. This type of casual employment is not easy to pick-up in the official statistics once death occurs. Moreover, if retired workers are receiving Pre-Retirement Allowance instead of unemployment assistance, then any work they do must, by definition, be outside the formal system of work.⁴ Consequently, it may be difficult to establish for some of these people what their principal occupational category is at the time of death. Informants may find it difficult to classify the deceased in occupational terms because the work they engaged in prior to death may bear little or no relationship to their life-time work.

⁴ The Pre-Retirement Allowance Scheme is an official government allowance paid in lieu of unemployment assistance without any of the availability for work conditions associated with the latter.

IV CONCLUSION

The objective of this paper has been to explore data problems in examining trends in socio-economic mortality differentials in Ireland. An increase in the size of the residual SEG category between 1981 and 1991 means that any discussion of changes in mortality differentials over time is very suspect. Consequently, there is no point in speculating whether mortality differentials have become better, or worse, for certain occupational groups in recent years. All we can say for sure is that they have become more difficult to measure. What is urgently required is a more formal approach to coding occupation on death registration forms. The CSO does an enormous amount of work to ensure that the proper coding of occupation has taken place, but much of that work is retrospective and mostly too late. The critical juncture for the maximisation of information on occupation is in the Registrar's office, before the form is sent to the CSO. It is here that any deficiencies in data collection and initial coding must be rectified.

The deterioration in the quality of measurement in the mortality data between 1981 and 1991 is associated with an increase in the share of the gainfully occupied in the "unknown" category. This may be linked to the reliability of occupational mortality data for older workers especially, whose attachment to the labour force became increasingly fragmented between 1981 and 1991. Early retirement from the formal labour force is now more common for older workers and is likely to remain so in the future. Older workers may, however, retain an attachment to work even when they retire early from their lifetime occupation, working on an informal basis outside of mainstream employment. Labour market fragmentation can also affect the occupational classification of younger deceased workers, some of whom, in periods of high unemployment, may have a number of different and short-term jobs outside of the formal labour market. Some informants may also be reluctant to provide information on occupation for deceased kin with little attachment to the labour force.

In general, it is likely to be more difficult to identify precise occupational categories for workers in a fragmented labour market of part-time, occasional and voluntary work. Therefore, if the SEG classification system is to become an appropriate instrument for measuring socio-economic mortality differentials over time then the question on occupation on the death registration form must include reference to both last occupation before death and main occupation during life if sense is to be made of the life-time occupational status of the deceased. This should be linked to the development of a new Form 102 to register deaths which will provide a more detailed and sensitive recording of occupations by the Registrar. Formal responsibility for

the provision of information on occupation should be transferred from the informant (the next of kin) to the Registrar. In the meantime, the most useful approach to documenting social variation in mortality may be to disaggregate the existing data into broad manual and non-manual categories, thereby reducing the deleterious effects of the residual category on the trend analysis (Marmot and McDowall, 1986).

While criticism of the occupational coding mechanism in SEG classification system is not novel and suggestions have been put forward for alternative approaches to measurement in Ireland (O' Hare *et al.*, 1991), the problem of inadequately described occupations for people at the time of death seems to be more serious in this country than elsewhere. Overall, the data problems highlighted in this paper point to the need for a review of the whole process of collecting information on the socio-economic circumstances of deceased persons in the country. The optimal approach would be a system of personal identification numbers that would allow for computerised linkage of census and death records. Existing information on differentials based on the SEG categorisation need to be cross-checked with other indicators of socio-economic position such as wealth, education and housing. Where this has been done and complemented with data from longitudinal studies, many of the methodological problems associated with analysis based on SEG classification and decennial supplements have been overcome (Fox and Benzeval, 1995). After all, there is little point in having increasingly sophisticated statistical techniques available to analyse data if the fundamental quality of that data is poor.

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