

Health and Wealth in the North of Ireland: Is There a “Social Gradient” to Health Outcomes?

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Abstract: This paper investigates using data on 2,700 persons in the North of Ireland, whether there is a social gradient to health, both with respect to general health (self-assessed health status; long-term limiting illness; the existence of a health problem) and with respect to specific illnesses (asthma; arthritis; back pain; blood pressure problem; heart problem; mental illness). The evidence suggests that people who live in poor housing (for example, damp houses with inadequate heating) are more likely to be in bad health, in respect of both general health and specific ailments, than persons living in good housing. There is also evidence that persons without educational qualifications are more likely to be in bad health than persons who have educational qualifications. Lastly, the results point to the fact that higher levels of household income are associated with better health outcomes. If one defines the “social gradient” in terms of these three factors – housing quality, education qualifications, and income level – then the results suggest that people’s health outcomes depend upon their position on the social ladder.

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I INTRODUCTION

The publication of the Black report (Black *et al.*, 1980) spawned a number of studies which examined the social factors underlying health outcomes. The fundamental finding from these studies, particularly with respect to mortality and life expectancy, was the existence of “a social gradient” in mortality: “... wherever you stand on the social ladder, your chances of an earlier death are higher than it is for your betters” (Epstein, 1998). The social gradient in mortality was observed for most of the major causes of death: for example, Marmot (2000) shows that, for every one of twelve diseases, the ratio of deaths (from the disease) to numbers in a Civil Service grade rose steadily as one moved down the hierarchy.

Since, in the end, it is the individual who falls ill, it is tempting for epidemiologists to focus on the risks inherent in individual behaviour: for example, smoking, diet, and exercise. However, the most important implication of a social gradient to health outcomes is that people’s susceptibility to disease depends on more than just their individual behaviour; crucially, it depends on the social environment within which they lead their life (Marmot, 2000 and 2004). Consequently, the focus on inter-personal differences in risk might be usefully complemented by examining differences in risk between different social environments.

For example, even after controlling for inter-personal differences, mortality risks might differ by occupational class. This might be due to the fact that while low status jobs make fewer mental demands, they cause more psychological distress than high status jobs (Karasek and Marmot, 1996; Griffin *et al.*, 2002; Marmot, 2004) with the result that people in higher level jobs report significantly less job-related depression than people in lower-level jobs (Birdi *et.al.*, 1995).

In turn, anxiety and stress are related to disease: the stress hormones that anxiety releases affect the cardiovascular and immune systems with the result that prolonged exposure to stress is likely to inflict multiple costs on health in the form of *inter alia* increased susceptibility to diabetes, high blood pressure, heart attack, and stroke (Marmot, 1986; Wilkinson and Marmot, 1998; Brunner and Marmot, 1999). So, the social gradient in mortality may have a psychosocial basis, relating to the degree of control that individuals have over their lives.¹

Similarly, a person’s marital status or employment status might also be expected to affect his/her health. There is evidence in favour of the “support/protection hypothesis” according to which marital partners, by providing each

¹ Psychologists distinguish between stress caused by a high demand on one’s capacities – for example, tight deadlines – and stress engendered by a low sense of control over one’s life.

other with companionship and support, protect themselves from medical and emotional pathology (Ross *et al.*, 1990; Coombs, 1991). Warr (1987) and Jahoda (1992) have argued that having a job gives people a sense of well-being by providing them opportunities for control, skill use and inter-personal contact. In this context, a great deal of attention has focused on the effects of unemployment upon health (Kasl and Jones, 2000).

Consequently, in assessing the risk of an individual being in poor health, a central problem in social epidemiology is to separate individual effects from social effects. With this in mind, this paper uses a rich set of data from the North of Ireland to measure, using econometric methods, the strength of different factors contributing to a person's "state of health". The source of these data is the Poverty and Social Exclusion in Northern Ireland Survey (hereafter, the PSENI Survey) which was carried out between June 2002 and January 2003. The PSENI Survey – covering 1,976 household interviews and 3,104 individual interviews – asked respondents a range of questions about their: health-related habits (smoking and drinking); housing conditions (damp, condensation, heating); marital and family status; occupational and labour market status; educational qualifications; and income and standard of living.

Most importantly, from the perspective of this study, all of these data could be related to the respondents' "state of health". Information on the state of health of a person was provided both in *general* terms (self-assessed health status; long-term limiting illness; the existence of *any* named health problem) and also in terms of *specific* health problems (for example: arthritis; asthma; back pain; blood pressure; heart; and mental illness). For each of these specific problems, the PSENI Survey provided information on whether the respondent had the condition and, if so, the degree of severity associated with it.

Using these data, the paper addresses the issue at the heart of social epidemiology, referred to above, which is to measure the relative strengths of individual and social factors in determining health outcomes. It begins by setting out an economic model which relates health outcomes to social environment (Section II). This model argues that the "better" their social environment, the greater the investment that people will undertake in "good" health and, in consequence, the better will be their health outcomes. Section III discusses the data in the context of the different types of health outcomes analysed and the nature of the variables used to explain these outcomes; Section IV discusses the results from estimating a health outcomes model while Section V concludes the paper.²

² In addition, the PSENI Survey asked its respondents about their level of happiness and, using this information, Borooah (2006) has enquired about the effects on people's happiness of different types of health problems.

II A SOCIAL GRADIENT MODEL OF HEALTH OUTCOMES

We represent by H_t a person's *stock* of "health capital" at age t and by h_t ($0 \leq h_t \leq 1$) a person's *flow* of "health outcomes" between the ages of t and $t + 1$: the greater the value of h_t , the better a person's health outcome with the extremes values, 0 and 1, representing, respectively, the worst and best possible outcomes. We assume:

$$h_t = f(H_t) + \varepsilon_t \quad (1)$$

where ε_t is an error term.

A person's stock of health capital, H_t , is assumed to depend upon: (i) I_t , the "health investment" made by a person between the ages $t - 1$ and t and (ii) the rate, δ at which the previous stock of capital (H_{t-1} , at age $t - 1$) depreciates:

$$H_t = g(I_t) + (1 - \delta_t)H_{t-1} \quad (2)$$

The quality of a person's (health-related) environment is represented by a real number E , such that the higher the value of E the better his/her environment and it assumed that:

- (i) for a given age, the *better* the environment, the *slower* the depreciation of health capital,
- (ii) for a given social environment, the *greater* the age the *faster* the depreciation of health capital.

Consequently,

$$\delta = \phi(E, t) \quad (3)$$

where: $\partial\delta/\partial E < 0$, $\partial\delta/\partial t < 0$. For a given age, t , and a prior stock of health capital, H_{t-1} , we can write:

$$H_t = F(I_t, E), \text{ where: } \partial F/\partial I, \partial F/\partial E > 0 \quad (4)$$

Equation (4) suggests that the better the social environment, the smaller the depreciation rate and consequently, by Equation (1), the higher the stock of health capital; similarly, the greater the investment between $t - 1$ and t , the higher will be the stock of capital at age t .

From Equation (4), above, we can obtain the "health capital isoquants" in $I - E$ space as the different combinations of investment (I) and environment (E) which result in the same amount of health capital. The slope of this

isoquant, representing the “marginal rate of substitution” between investment and environment, is:

$$\frac{dI}{dE} = -\frac{\partial F/\partial E}{\partial F/\partial I} < 0 \quad (5)$$

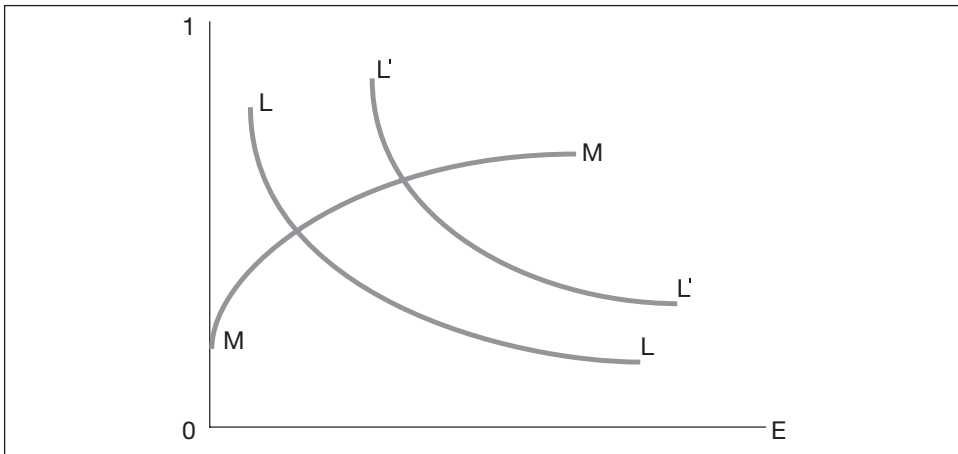
This isoquant map is shown in Figure 1, with LL and $L'L'$ as typical isoquants, the isoquant LL representing a lower level of health capital than $L'L'$. This map shows that, for any level of investment, I , the stock of health capital is larger for higher values of E ; conversely, for any value of E , the stock of health capital is larger for higher values of I .

It is assumed that the amount of investment undertaken depends upon its “price” and, further, the better the environment the lower will be this price. For example, if social class is a component of a person’s health-related environment then, for reasons of peer pressure or ignorance of consequences, it may be more difficult for a working-class person to stop smoking (or to not start smoking) than a middle class person. Consequently, the demand for investment depends positively upon the environment so that:

$$I = J(E), J'(E) > 0 \quad (6)$$

The curve MM in Figure 1 represents the demand for health investment. The health capital associated with a particular environment can be read off from the isoquant with which MM intersects. The better the environment, the larger will be investment and the stock of health capital and, in consequence, the better will be health outcomes.

Figure 1: *Social Environment and Health-Related Investment*



III EQUATION SPECIFICATION

In order to examine whether a social gradient for health outcomes existed we examined the following health indicators available from the PSENI Survey:

1. A person's self-assessed health status: excellent; good; fair or see below.³
2. Whether a person had a long-term limiting illness: yes; no.
3. Whether a person had any one of several named health problems: yes, if he/she did; no, if he/she did not have any of the named health problems.⁴
4. Whether for a person having one or more of the specific health problems, listed in Footnote 4, the condition was: very severe; quite severe; not severe.

Table 1 shows the outcomes for these indicators separately for men and women. Each of these indicators was used as the dependent variable in econometric equations which employed the same set of determining variables. These determining variables, along with the estimation results, are shown in Tables 2 and 3. The choice of variables was determined by the existing literature on the social gradient of health outcomes as well as by the constraints of the available data. Since the PSENI Survey did not contain information about the quality of the diet of the respondents or about their habits relating to physical exercise, in terms of the discussion of the previous section, investment in health could only be measured by the smoking and drinking habits of the respondents.

An important cause of poor health outcomes might be bad housing conditions: people living in damp houses with condensation and inadequate heating would be more likely to have health problems than those who lived in dry, well-heated homes. The data allowed us to draw a distinction between two sources of bad housing: (i) problems relating to damp, condensation and inadequate heating ("home environment damp"); (ii) problems relating to overcrowding, noise, air quality ("home environment bad: other reasons).

We also examined the area of residence in terms of: rural; small/medium town; large town/city. There is a good deal of evidence about the isolation of

³ The wording of the question was as follows. "Please think back over the last 12 months about how your health has been. Would you say that your health has on the whole been: excellent; good; fair; poor; very poor."

⁴ The wording of the question was as follows. "Have you had any of the health problems or disabilities listed on this card for 12 months or more? None; Difficulty in seeing; Difficulty in hearing; Difficulty in speaking; Arthritis and rheumatism; ME; CFS (Chronic Fatigue Syndrome); MS (Multiple Sclerosis); Heart problems; Diabetes; Asthma or other breathing problems; Blood pressure problems; Cancer; Stroke; Back pain; Anxiety, depression or other mental health problems; Alcohol or drug abuse; Epilepsy; Autism; Memory loss; Dyslexia, or other learning disabilities."

Table 1: *Indicators of Health Status*

	<i>Percentage in Category</i>	
	<i>Men (2,187)</i>	<i>Women (912)</i>
<i>Self-assessed Health:</i>		
Excellent	24	20
Good	42	37
Fair or below	34	43
<i>Long-term limiting illness:</i>		
Ill	29	63
Not-ill	71	37
<i>Health Problem:</i>		
Has a named disorder	54	43
Does not have any disorder	36	57
<i>Asthma:</i>		
No problem	95	90
Not severe	3	4
Severe/very severe	2	6
<i>Arthritis:</i>		
No problem	89	82
Not severe	3	3
Severe/very severe	8	15
<i>Back pain:</i>		
No problem	89	86
Not severe	3	3
Severe/very severe	8	11
<i>Blood Pressure :</i>		
No problem	91	91
Not severe	5	5
Severe/very severe	4	4
<i>Heart:</i>		
No problem	93	93
Not severe	3	3
Severe/very severe	4	4
<i>Mental illness:</i>		
No problem	93	90
Not severe	2	3
Severe/very severe	5	7

Source: PSENI Survey.

farming communities in Britain, and in the North and South of Ireland. Monk (1998) suggests that isolation is experienced in many ways. As the numbers working in the industry fall and such traditional meeting places as auction markets are closed, farmers are becoming more socially isolated having fewer contacts with people who understand them and empathise with their problems (Monk, 1998). Rural isolation has received little academic attention and

indeed health care professionals who work closely with farmers have always expressed surprise that academic researchers do not consider isolation an important factor in contributing to ill-health.⁵

Another variable considered was marital status, the rationale for which was discussed earlier. The types of marital status distinguished were: married or cohabiting; divorced/separated/widowed; and single, the latter being the residual category.

Family type (single parents; couples with children; couples without children; and pensioner households, the latter being the residual category) was also included among the determining variables. Family structure has been identified as an important factor related to mental health outcomes, with single motherhood emerging as a powerful predictor of poor mental health and single mothers being particularly at risk of experiencing depressive symptoms (Jayakody and Stauffer, 2000).

We measured a person's stress level in terms of the frequency with which he/she felt "calm and peaceful": all/most of the time; a good bit/some of the time; hardly/not at all, with the latter constituting the residual category.

Lastly, there was a group of variables which collectively reflected a person's *social standing*. The first of these was educational qualifications, the residual category being a degree or above. The second variable in this group was occupational class, with unskilled occupations comprising the residual category. The third variable was household income and this was supplemented by a fourth variable which related to a person's perception of his/her standard of living (high, adequate, low).

IV EMPIRICAL RESULTS

The results from estimating the equations described in the previous section are shown in Table 2 for the dependent variables: health status, long-term limiting illness, and any health problem; and in Table 3 for the dependent variables: asthma, arthritis, back pain, blood pressure problem, heart problem, and mental illness. Equations whose dependent variables had just two outcomes (long-term limiting illness, and any health problem) were estimated using the *logit* method; equations whose dependent variables had more than two outcomes – which, however, were ordered – were estimated

⁵ For example, the Southern Health Board in Ireland has established a farm and rural stress helpline because "... people who live in rural communities are often affected by additional issues such as isolation; not just feeling lonely, but real physical isolation where they are miles from their nearest neighbour or village".

Table 2: *Econometric Equations of Health Status, Long-Term Limiting Illness and Health Problems*

	<i>Ordered Logit</i>	<i>Logit</i>	<i>Logit</i>
	<i>Health Status</i>	<i>Long-term Limiting Illness</i>	<i>Health Disability</i>
Female	0.036 (0.35)	0.197 (1.58)	0.210* (1.88)
<i>Age Bands:</i>			
Age: <31	-0.844*** (4.54)	-1.295*** (5.60)	-1.304*** (6.34)
Age: 31-35	-0.891*** (6.08)	-1.272*** (7.52)	-1.162*** (7.24)
Age: 46-65	-0.482*** (3.79)	-0.571*** (4.19)	-0.714*** (5.09)
<i>Life-style habits:</i>			
Regular Smoker	0.517*** (5.34)	0.330*** (2.86)	0.141 (1.34)
Past or occasional smoker	0.220** (1.97)	0.438*** (3.34)	0.296** (2.42)
Non-Drinker	0.396*** (3.92)	0.487*** (3.73)	0.092 (0.83)
Light drinker	0.237** (2.25)	0.200 (1.42)	0.007 (0.06)
<i>Home Environment:</i>			
Home environment damp	0.456*** (4.59)	0.403*** (3.41)	0.499*** (4.63)
Home environment bad: other reasons	0.510*** (4.05)	0.581*** (3.99)	0.665*** (4.90)
<i>Area of Residence:</i>			
Rural	-0.122 (1.34)	0.016 (0.14)	-0.118 (1.18)
Small or Medium town	0.101 (1.05)	0.171 (1.45)	0.122 (1.14)
<i>Religion:</i>			
Catholic	-0.153** (1.98)	-0.174* (1.82)	-0.177** (2.09)
<i>Marital Status:</i>			
Married	0.468*** (3.61)	0.273* (1.68)	0.287** (2.02)
Divorced/separated/ widowed	0.583*** (4.05)	0.257 (1.50)	0.482*** (3.08)
<i>Family Type:</i>			
Single parent	0.052 (0.26)	-0.269 (1.10)	0.175 (0.82)
Couples with children	0.069 (0.61)	-0.037 (0.24)	-0.076 (0.61)

Table 2: *Econometric Equations of Health Status, Long-Term Limiting Illness and Health Problems (contd.)*

	<i>Ordered Logit</i>	<i>Logit</i>	<i>Logit</i>
	<i>Health Status</i>	<i>Long-term Limiting Illness</i>	<i>Health Disability</i>
Couples without children	0.202** (1.99)	0.251** (2.06)	0.153 (1.38)
<i>Education:</i>			
No qualifications	0.643*** (5.04)	0.463*** (2.95)	0.385*** (2.77)
GCSE	0.126 (1.11)	0.077 (0.51)	0.104 (0.83)
A-level	-0.144 (1.03)	-0.473** (2.21)	-0.342** (2.12)
<i>Occupational Class:</i>			
Professional or Managerial	0.057 (0.51)	-0.054 (0.39)	0.123 (1.00)
Skilled	-0.079 (0.85)	-0.191* (1.72)	0.017 (0.16)
<i>Material Welfare:</i>			
Household Income	-0.030*** (4.55)	-0.042*** (5.46)	-0.030*** (4.31)
Considers SoL high	-0.995*** (6.28)	-0.485*** (2.80)	-0.319* (1.92)
Considers SoL adequate	-0.364** (2.51)	-0.204 (1.36)	-0.141 (0.94)
<i>Stress:</i>			
Calm all/most of time	-	-	-
Calm good bit/some of time	-	-	-
Constant	0.066	0.900*** (0.21)	(3.10)
Observations	2,714	2,775	2,775
Pseudo-R2	0.105	0.156	0.109

Absolute value of z statistics in parentheses.

* significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

Dependent Variables:

1. Health status=1, if excellent; =2, if good; =3, if fair or below.

2. Long-term limiting illness=1, if present; =0, if absent.

3. Health problem=1, if present; =0, if absent.

Home environment damp if there was a problem with any one of the following:

1. Lack of adequate heating; 2. Dampness/condensation/mould; 3. Cigarette smoke;

Home environment was bad for "other reasons" if there was a problem with any one of the following:

1. Overcrowding; 2. The quality of the drinking water; 3. The level of noise; 4. Inaccessibility of some parts of the house; 5. Air pollution/quality.

Table 3: *Econometric Equations of Specific Health Problems*

	Ordered Logit Arthritis	Ordered Logit Heart problems	Ordered Logit Asthma	Ordered Logit Blood pressure problems	Ordered Logit Back pain	Ordered Logit Mental illness
Female	0.372** (2.09)	-0.153 (0.63)	0.311 (1.54)	-0.230 (1.14)	0.289* (1.80)	0.047 (0.24)
<i>Age Bands:</i>						
Age: <31	-2.049*** (4.77)	-2.072*** (3.76)	-0.434 (1.14)	-3.526*** (4.65)	0.231 (0.75)	0.646* (1.77)
Age: 31-35	-1.681*** (6.66)	-2.104*** (5.87)	-0.253 (0.92)	-1.720*** (6.33)	0.214 (0.92)	0.532* (1.87)
Age: 46-65	-0.585*** (3.58)	-1.039*** (4.77)	-0.427* (1.83)	-0.796*** (4.35)	0.100 (0.50)	0.305 (1.24)
<i>Life-style habits:</i>						
Regular Smoker	0.215 (1.31)	0.116 (0.54)	0.089 (0.45)	-0.198 (1.03)	0.346** (2.35)	0.639*** (3.69)
Past or occasional smoker	0.307* (1.75)	0.353* (1.64)	0.369* (1.70)	0.345* (1.93)	-0.136 (0.68)	0.556*** (2.61)
Non-Drinker	0.517** (2.46)	0.103 (0.39)	0.452* (1.90)	0.165 (0.76)	0.097 (0.58)	0.402* (1.95)
Light drinker	0.179 (0.78)	-0.090 (0.31)	0.442* (1.78)	0.422* (1.89)	-0.092 (0.50)	0.136 (0.60)
<i>Home Environment:</i>						
Home environment damp	0.533*** (3.22)	-0.053 (0.23)	0.628*** (3.35)	0.309* (1.66)	0.569*** (3.82)	0.637*** (3.67)
Home environment bad: other reasons	0.626*** (3.16)	0.428* (1.73)	0.390 (1.58)	0.449** (2.08)	0.511*** (2.72)	0.792*** (3.76)
<i>Area of Residence:</i>						
Rural	-0.116 (0.75)	-0.398** (1.97)	-0.085 (0.43)	-0.027 (0.16)	-0.058 (0.38)	0.139 (0.77)

Table 3: *Econometric Equations of Specific Health Problems (contd.)*

	Ordered Logit Arthritis	Ordered Logit Heart problems	Ordered Logit Asthma	Ordered Logit Blood pressure problems	Ordered Logit Back pain	Ordered Logit Mental illness
Small or medium town	-0.047 (0.28)	-0.131 (0.62)	0.226 (1.18)	0.087 (0.49)	0.101 (0.65)	0.001 (0.01)
<i>Religion:</i>						
Catholic	-0.256* (1.88)	-0.157 (0.89)	-0.410** (2.43)	0.049 (0.34)	0.013 (0.10)	0.168 (1.12)
<i>Marital Status:</i>						
Married	0.199 (0.82)	0.625* (1.85)	-0.162 (0.61)	0.171 (0.62)	0.504** (2.28)	0.291 (1.15)
Divorced/separated/ widowed	0.301 (1.29)	0.205 (0.61)	0.179 (0.67)	0.333 (1.19)	0.555** (2.43)	0.618** (2.42)
<i>Family Type:</i>						
Single parent	-0.457 (1.11)	0.654 (1.25)	-0.071 (0.19)	-0.534 (0.85)	-0.129 (0.43)	0.440 (1.44)
Couples with children	-0.689** (2.28)	-0.342 (0.86)	-0.396 (1.49)	-0.058 (0.21)	-0.092 (0.48)	0.138 (0.61)
Couples without children	-0.058 (0.34)	0.207 (0.93)	0.128 (0.62)	0.145 (0.78)	0.067 (0.40)	0.105 (0.52)
<i>Education:</i>						
No qualifications	1.102*** (4.08)	0.811** (2.42)	0.072 (0.26)	0.244 (1.01)	0.222 (1.02)	0.224 (0.84)
GCSE	0.593** (2.17)	0.306 (0.89)	0.127 (0.50)	0.147 (0.63)	0.103 (0.51)	0.170 (0.67)
A-level	-0.126 (0.30)	-0.698 (1.07)	-0.593 (1.49)	-0.183 (0.52)	0.044 (0.17)	-0.708* (1.82)
<i>Occupational Class:</i>						
Professional or Managerial	-0.179	0.303	-0.185	0.624***	0.146	-0.217

Table 3: *Econometric Equations of Specific Health Problems (contd.)*

	Ordered Logit Arthritis	Ordered Logit Heart problems	Ordered Logit Asthma	Ordered Logit Blood pressure problems	Ordered Logit Back pain	Ordered Logit Mental illness
Skilled	(0.91) 0.023 (0.15)	(1.23) 0.116 (0.58)	(0.79) -0.156 (0.83)	(2.99) 0.505*** (2.87)	(0.81) -0.121 (0.79)	(0.96) -0.130 (0.75)
<i>Material Welfare:</i>						
Household Income	-0.043*** (3.82)	-0.036** (2.43)	-0.000 (0.01)	-0.042*** (3.55)	-0.021** (1.99)	-0.028** (2.20)
Considers SoL high	-0.126 (0.54)	-1.164*** (3.76)	-0.218 (0.76)	-0.129 (0.50)	-0.256 (1.09)	-0.707*** (2.69)
Considers SoL adequate	0.093 (0.48)	-0.348 (1.49)	-0.195 (0.79)	-0.190 (0.84)	0.060 (0.30)	-0.319 (1.56)
<i>Stress:</i>						
Calm all/most of time	-	-0.481*	-	-0.396*	-	-
Calm good bit/some of time	-	-0.315 (1.25)	-	-0.210 (0.94)	-	-
Observations	2,702	2,736	2,734	2,703	2,627	2,717
Pseudo-R2	0.196	0.159	0.046	0.116	0.034	0.079

Problems with arthritis, heart, asthma, blood pressure, back pain, mental illness: =1, if absent; =2, if present but not severe; =3, if present and severe/very severe.

using the *ordered logit* method. Tables 4 and 5 show the marginal probabilities for those variables *whose coefficients were significantly different from zero*.

The *marginal probability* with respect to a variable *k* is the *change* in the probability of an outcome (say, being in excellent health) resulting from a small *change* in the value of that variable, the values of the other variables being held at their mean values. Most of the determining variables shown in Tables 2 and 3 were *binary* variables: for example, the variable “Rural” took the value 1 if the person lived in a rural area, 0 if he/she did not. The marginal probability associated with the variable “rural” in Tables 4 and 5 is, therefore, to be interpreted as the change in the probability of an outcome (say, severe heart problem) if *ceteris paribus* a person lived in a rural area rather than in the default area, “large town or city”. Similarly, the marginal probability associated with “married” in Tables 4 and 5 is to be interpreted as the change in the probability of an outcome if *ceteris paribus* the person was married rather than in the default marital state, “single and never married”. However, for a variable like income, which takes a continuum of values, the marginal probability is to be interpreted as the change in the probability of an outcome for every additional slice of income to that person *ceteris paribus*.

Tables 2 and 3 show that there did not exist significant gender differences in health outcomes except for: *any health problem*, where women were more likely (by 5 percentage points) to have a health problem than men;⁶ *arthritis* and *back pain*, where women were more likely (by 2 percentage points) to have a severe/very severe problem than men.

In contrast, age effects on health outcomes were very marked: compared to the over 65 year olds, persons in the other age groups were more likely to have better health outcomes whether these were defined in general terms or in terms of specific ailments. There were, however, two exceptions to this. The first was *mental illness*: persons who were under 31 years of age, followed by those in the 31-35 year age group, were *more* likely (by, respectively, 3 and 2 percentage points) to have severe or very severe mental health problems than those in the older age groups. Second, there were no significant differences between the age groups in the likelihood of having severe/very severe back pain.

Compared to those who had never smoked (the default category), regular smokers were more likely to be in poor health (by 12 percentage points), have a long-term limiting illness (by 7 percentage points), and have some health problem (by 3.5 percentage points). Similarly, compared to those who had never smoked, past (and occasional) smokers were more likely to be in poor health (by 5 percentage points), have a long-term limiting illness (by 9

⁶ We assume, hereafter, that the probabilities take values between 0 and 100.

Table 4: *Marginal Probabilities of Health Status, Long-term Limiting Illness and Health Problems**

	<i>Ordered Logit Poor Health Status</i>	<i>Logit Long-term Limiting Illness</i>	<i>Logit Health Problem</i>
Female	–	0.039	0.053*
<i>Age Bands:</i>			
Age: <31	–0.168***	–0.195***	–0.297***
Age: 31-35	–0.191***	–0.226***	–0.280***
Age: 46-65	–0.106***	–0.107***	–0.176***
<i>Life-style habits:</i>			
Regular Smoker	0.120***	0.067***	0.035*
Past or occasional smoker	0.051**	0.092***	0.074**
Non-Drinker	0.089***	0.096***	–
Light drinker	0.054**	0.040*	–
<i>Home Environment:</i>			
Home environment damp	0.106***	0.083***	0.124***
Home environment bad: other reasons	0.121***	0.125***	0.162***
<i>Area of Residence:</i>			
Rural	–0.027*	–	–
Small or medium-size town	–	0.034*	–
<i>Religion:</i>			
Catholic	–0.034**	–0.034*	–0.044**
<i>Marital Status:</i>			
Married	0.103***	0.053*	0.072**
Divorced/separated/ widowed	0.137***	0.052*	0.119***
<i>Family Type;</i>			
Single parent	–	–	–
Couples with children	–	–	–
Couples without children	0.047**	0.051**	0.038*
<i>Education:</i>			
No qualifications	0.148***	0.094***	0.096***
GCSE	–	–	–
A-level	–	–0.084**	–0.085**
<i>Occupational Class:</i>			
Professional or Managerial	–	–	–
Skilled	–	–	–
<i>Material Welfare:</i>			
Household Income	–0.007***	–0.008***	–0.008***
Considers SoL high	–0.212***	–0.092***	–0.080**
Considers SoL adequate	–0.082**	–0.040*	–

*Only marginal probabilities whose associated z scores were significantly different from zero are shown. * significant at 15 per cent; ** significant at 5 per cent; *** significant at 1per cent

Table 5: Marginal Probabilities of Severe or Very Severe Condition

	Arthritis	Heart Problems	Asthma	Blood pressure Problems	Back Pain	Mental Illness
Female	0.018**	-	0.009*	-	0.022*	-
<i>Age Bands:</i>						
Age: <31	-0.051***	-0.019***	-0.010*	-0.034***	-	0.033*
Age: 31-35	-0.065***	-0.031***	-	-0.035***	-	0.023*
Age: 46-65	-0.024***	-0.016***	-0.011**	-0.017***	-	-
<i>Life-style habits:</i>						
Regular Smoker	-	-	-	-	0.027***	0.030***
Past or occasional smoker	0.015*	0.007*	0.011*	0.009*	-	0.027***
Non-Drinker	0.023**	-	0.013*	-	-	0.016**
Light drinker	-	-	0.013*	0.011*	-	-
<i>Home Environment:</i>						
Home environment damp	0.027***	-	0.021***	0.008*	0.048***	0.031***
Home environment bad: other reasons	0.035***	0.009*	0.013*	0.012*	0.044***	0.042***
<i>Area of Residence:</i>						
Rural	-	-0.006**	-	-	-	-
Small or medium-size town	-	-	-	-	-	-
<i>Religion:</i>						
Catholic	-0.011**	-	-0.011***	-	-	-
<i>Marital Status:</i>						
Married	-	0.010**	-	-	0.034***	-
Divorced/separated/ widowed	-	-	-	-	0.047**	0.030**
<i>Family Type:</i>						
Single parent	-	-	-	-	-	-
Couples with children	-0.026***	-	-0.010*	-	-	-
Couples without children	-	-	-	-	-	-
<i>Education:</i>						
No qualifications	0.059***	0.016**	-	-	-	-

Table 5: Marginal Probabilities of Severe or Very Severe Condition (contd.)

	Arthritis	Heart Problems	Asthma	Blood pressure Problems	Back Pain	Mental Illness
GCSE	0.029**	-	-	-	-	-
A-level	-	-0.009*	-0.013*	-	-	-0.022**
<i>Occupational Class:</i>						
Professional or Managerial	-	-	-	0.016***	-	-
Skilled	-	-	-	0.012***	-	-
<i>Material Welfare:</i>						
Household Income	-0.002***	-0.001***	-	-0.001***	-0.002**	-0.001**
Considers SoL high	-	-0.018***	-	-	-	-0.026***
Considers SoL adequate	-	-0.006*	-	-	-	-0.013*
<i>Stress:</i>						
Calm all/most of time	-	-0.008*	-	-0.009*	-	-
Calm good bit/some of time	-	-	-	-	-	-

*Only marginal probabilities whose associated z scores were significantly different from zero are shown. * significant at 15 per cent; ** significant at 5 per cent; *** significant at 1 per cent

percentage points), and have some health problem (by 7 percentage points).

However, in respect of specific illness, the evidence on smoking was mixed. Being a regular smoker, compared to being a non-smoker, did not change significantly the probability of severe/very severe: arthritis, heart problems, asthma, and blood pressure problems; being a past, or occasional, smoker, compared to being a non-smoker, did, however, increase these probabilities significantly. A possible explanation for this is that persons who had these health conditions – all of which might reasonably be expected to be aggravated by smoking – gave up, or reduced their smoking; in consequence, we observe a positive correlation between persons who described themselves as “past or occasional smokers” and persons who had the above health conditions. The two areas in which outcomes were positively related to smoking were back pain and mental illness but, even here, it might be more plausible to argue that those who had severe/very severe back pain or mental illness were more likely to be regular smokers than that regular smoking was the cause of these ailments!

The relationship between drinking and health outcomes also holds the possibility of a large measure of “reverse causality”. Generally speaking, non-drinkers had significantly worse health outcomes (poor health; long-term limiting illness and severe/very severe: arthritis, asthma, and mental illness) than “heavy drinkers” (i.e. those persons drinking more than seven units per week). Similarly, “light drinkers” (seven, or fewer, units per week) were more likely to be in poor health – and more likely to have severe/very severe asthma and blood pressure problems – compared to “heavy drinkers”. Again, a possible explanation for this is that being in poor health, or having these two specific conditions, was the cause – rather than the result – of stopping, or curtailing, drinking.

There was evidence that a poor home environment resulted in adverse health outcomes. As the marginal probabilities in Tables 4 and 5 show, people living in damp houses, with condensation, and inadequate heating were more likely, compared to those living in dry, well-heated homes, to have: poor health (by 11 percentage points), a long-term limiting illness (by 8 percentage points), and a health disorder (by 12 percentage points). They were also more likely to have severe/very severe arthritis, asthma, blood pressure problems, and mental illness.

As regards the area of residence, persons living in rural areas were less likely to describe themselves as being in poor health than those living in big towns or cities and they were also less likely to have severe/very severe heart problems. There was also evidence that, in terms of overall health, Catholics were more likely to be better off than Protestants: they were less likely to have poor health (by 3 percentage points), a long-term limiting illness (by 3

percentage points), and a health disorder (by 4 percentage points); they were also 1 percentage point less likely to have severe/very severe arthritis or asthma.

Compared to single persons, married persons and divorced/separated/widowed persons were more likely to describe themselves as being in poor health (married: by 10 percentage points; divorced: by 14 percentage points); report a long-term limiting illness (married and divorced: by 5 percentage points); or a health problem (married: by 7 percentage points; divorced: by 12 percentage points). Married persons were 1 point more likely to have severe/very severe heart problems and both married and divorced persons were more likely to have severe/very severe back pain (by, respectively, 3 and 5 percentage points).

There was no significant difference in the probabilities of being in poor health, having a long-term limiting illness or a health problem between single parents and couples with children, on the one hand, and the comparison group of pensioner couples on the other. However, compared to pensioner couples, non-pensioner couples without children were more likely to: be in poor health (by 5 percentage points); have a long-term limiting illness (by 5 percentage points); have a health problem (by 4 percentage points).

Compared to degree holders, persons with no educational qualifications were unambiguously more likely to be in poorer health (by 15 percentage points), have a long-term limiting illness (by 9 percentage points), and have a health problem (by 10 percentage points). In contrast, persons with A-levels, compared to degree holders, were less likely to have a long-term limiting illness (by 8 percentage points) or a health problem (by 9 percentage points).

There was also evidence that income was positively related to good health outcomes. Furthermore, even after controlling for income, persons who considered their standard of living to be high (or even adequate) had considerably better health outcomes compared to those who considered their standard of living to be low. Compared to those with a low standard of living, persons with a high standard of living were less likely to: be in poor health (by 21 percentage points), have a long-term limiting illness (by 9 percentage points); have a health problem (by 8 percentage points); have severe/very severe heart problems or mental illness. However, after controlling for education, income and the standard of living, the data did not offer any evidence that occupational class affected health outcomes.

Lastly, we considered the role of stress on two illnesses which might be expected to be stress related: heart and blood pressure problems. There was some evidence that, compared to those who were calm some of the time or hardly at all, persons who described themselves as calm all or most of the time were less likely to have severe/very severe heart or blood pressure problems.

V CONCLUSIONS

This paper investigated whether there was a social gradient to health in the North of Ireland, both with respect to general health (self-assessed health status; long-term limiting illness; the existence of a health problem) and with respect to specific illnesses (asthma; arthritis; back pain; blood pressure problem; heart problem; mental illness). The evidence suggested that people who lived in poor quality housing (for example, damp houses with inadequate heating) were more likely to be in bad health, in respect of both general health and specific ailments, than persons living in good quality housing. There was also evidence that persons without educational qualifications were more likely to be in bad health, in respect of both general health and specific ailments, than persons with educational qualifications. Lastly, the results clearly pointed to the fact that higher levels of household income were associated with better health outcomes, in respect of both general health and specific ailments. However, after controlling for these three variables, occupational class did not exert a significant influence on health outcomes.

If one identifies the social gradient in terms of the three factors of housing, education, and income, then the results point to the existence of a social gradient to health in the North of Ireland. However, our conclusions in this respect must be qualified by our inability to adequately measure the effects on health outcomes of individual behaviour: in particular, behaviour relating to diet, smoking, drinking, and exercise. The available data suggested that there was a “perverse” relationship between smoking and drinking, on the one hand, and, on the other, health outcomes: non-drinkers and non-smokers more likely to be in poor health than those who drank and smoked. The likelihood is that the relation between health-related behaviour and health outcomes is vitiated by reverse causality, with behaviour being the consequence, rather than the cause, of health outcomes.

REFERENCES

- BIRDI, KAMALJIT, PETER WARR and ANDREW OSWALD, 1995. “Age Differences in Three Components of Employee Well-Being,” *Applied Psychology*, Vol. 44, pp. 345-373.
- BLACK, DOUGLAS, JERRY MORRIS, CYRIL SMITH and PETER TOWNSEND, 1980. *Inequalities in Health: A Report of a Research Working Group*, London: Department of Health and Social Security.
- BOROOAH, VANI K., 2006. “What Makes People Happy? Some Evidence From Northern Ireland”, *Journal of Happiness Studies*, Vol. 7, pp. 427-465.
- BRUNNER, ERIC and MICHAEL MARMOT, 1999. “Social Organisation, Stress and Health” in M. Marmot and R. Wilkinson (eds.), *The Social Determinants of Health*,

- Oxford University Press: New York, pp. 17-43.
- COOMBS, ROBERT H., 1991. "Marital Status and Personal Well-being: a literature review", *Family Relations*, Vol. 40, pp. 97-102.
- EPSTEIN, HELEN, 1998. "Life and Death on the Social Ladder", *The New York Review of Books*, Vol. XLV, pp. 26-30.
- GRIFFIN, JOAN. M., REBECCA FUHRER, STEPHEN A. STANSFELD and MICHAEL MARMOT, 2002. "The Importance of Low Control at Work and Home on Depression and Anxiety: Do These Effects Vary by Gender and Social Class?", *Social Science and Medicine*, Vol. 54, pp. 783-98.
- JAHODA, MARIE, 1992. "Reflections on Marienthal and After", *Journal of Occupational and Organizational Psychology*, Vol. 65, pp. 355-358.
- JAYAKODY, RUKMALIE and DAWN STAUFFER, 2000. "Mental Health Problems Among Single Mothers: Implications for Work and Welfare Reform", *Journal of Social Issues*, Vol. 56, pp. 617-634.
- KARASEK, ROBERT and MICHAEL MARMOT, 1996. "Refining Social Class: Psychosocial Job Factors", paper presented at *The Fourth International Congress of Behavioral Medicine*, Washington, D.C., March 13-16.
- KASL, STANISLAV V. and BETH A. JONES, 2000. "The Impact of Job Loss and Retirement on Health" in L. Berkman and I. Kawachi (eds.), *Social Epidemiology*, New York: Oxford University Press, pp. 118-136.
- MONK, ALISON S., 1998, *Rural Isolation as a Stressor: Physical, Cultural, Social, and Psychological Needs*, Newport: Countryside Development Unit, Harper Adams University College.
- MARMOT, MICHAEL, 1986. "Does Stress Cause Heart Attacks", *Postgraduate Medical Journal*, Vol. 62, pp. 683-686.
- MARMOT, MICHAEL, 2000, "Multilevel Approaches to Understanding Social Determinants" in L. Berkman and I. Kawachi (eds.), *Social Epidemiology*, New York: Oxford University Press, pp. 349-367.
- MARMOT, MICHAEL, 2004. *Status Syndrome: How Our Position on the Social Gradient Affects Longevity and Health*, London: Bloomsbury Publishing.
- NATIONAL OPINION POLL RESEARCH CENTER, 1999. *General Social Surveys, 1972-1998: Cumulative Codebook*, Chicago: National Opinion Poll Research Center.
- ROSS, CATHERINE E., JOHN MIROWSKY and KAREN GOLDSTEEN, 1990. "The Impact of Family on Health: A Decade in Review", *Journal of Marriage and the Family*, Vol. 52, pp. 1059-1078.
- WARR, PETER B., 1987. *Unemployment and Mental Health*, Cambridge: Cambridge University Press.
- WILKINSON, RICHARD G. and MICHAEL MARMOT, 1998. *Social Determinants of Health: The Solid Facts*, Copenhagen: World Health Organisation.

