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## Sources of health inequality for Irish women

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**Sources of Health Inequality for Irish Women**

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# Sources of Health Inequality for Irish Women

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Preliminary draft; comments welcome but please do not quote without permission

**Abstract:** This paper calculates the concentration index for self-assessed health for a sample of Irish women. It then decomposes the index to investigate the sources of this inequality using both a health production function and reduced form approach. Using the health production function approach it finds that age, employment status and exercise regime make the greatest contribution to income-related inequality in health outcomes. Using the reduced form approach it finds the greatest contribution to be made by age and education.

**Keywords:** Inequality, concentration index, decomposition, health production function.

**JEL Codes:** I12.

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# Sources of Health Inequality for Irish Women

## 1. Introduction

Economists have devoted considerable attention to the measurement and study of inequality of income, expenditure or other measures of household resources. It can be argued, however, that analysis of the inequality of other dimensions of welfare is of equal importance. It is also of interest to investigate the extent to which inequalities in these other dimensions of welfare are related to income inequalities. Health is clearly an important determinant of welfare but studies of health inequality have been hampered to some extent by the absence of a cardinal measure of health which commands general acceptance, unlike the case with income or expenditure. However recent work by Wagstaff and van Doorslaer (1994) and Kakwani et al (1997) has made some progress in this direction by applying cardinal values to responses to questions on self-assessed health (SAH) and then calculating an index of income-related inequality in health, the health concentration index. This methodology has also been used to make international comparisons in income-related inequalities in health (see Van Doorslaer and Koolman, 2002).

As well as measuring the extent of income-related inequality in health it is also possible to decompose the inequality index into its constituent parts. From a policy point of view this could be of considerable importance since it indicates where resources and policies should be applied should governments wish to alleviate income-related inequalities in health. As we will see below it can also show precisely *which* policies should be applied to address income-related inequality. In some cases the appropriate policy may be a policy specifically addressing health, while in other cases it may refer to income or education inequalities. This paper calculates the health concentration index for a nationally representative sample of Irish women and also carries out a decomposition of this index. Calculations and decompositions of the health concentration index for Ireland has been carried out by Van Doorslaer and Koolman (2002) for a sample of men and women. They find that income, female age and activity status make the greatest contribution to inequality with education also important. However they do not calculate separate indices or decompositions for men and women.

Other related work for Ireland includes Nolan (1990), O'Shea (1997) and O'Shea and Connolly (2001). Nolan (1990) showed substantial differences in male mortality across socio-economic groups with men in the unskilled manual category having a standardised mortality ratio (SMR) almost three times higher than those in the professional group. This work was extended by O'Shea who also examined male mortality differences according to cause of death and once again found significant differences by socio-economic group with gradients similar to those found by Nolan. Finally O'Shea and Connolly (2001) examined socio-economic mortality differences for males using years of potential life lost (YPLL), a measure which takes account of age of death as well as the number of deaths. Once again the difference between socio-economic groups was pronounced with some (though not conclusive) evidence that differentials were greater for YPLL than for SMR.

It is noticeable that all the above studies were for males. This arises from the fact that mortality differentials were being examined according to socio-economic group. Information on socio-economic group is typically compiled from either census or death certificate data and it is generally believed that classifications for females are considerably less reliable than those for males and so frequently females are excluded from such analysis. Hopefully, this paper will go some way towards remedying this gap, though of course females here are being classified according to household income and it is SAH rather than mortality which is being examined although the former is regarded as a good predictor of the latter (see below).

Before explaining the health concentration index it is useful to stress that what we are examining in this paper is income-related inequality in terms of health outcomes, not in terms of access to health care. Recent research by Nolan and Wiley (2000) has examined, amongst other issues, access to various elements of health care and how this varies among private and public patients. Watson and Williams (2001) have examined perceptions of the quality of health care in the public and private sectors in Ireland. These studies can be regarded as concentrating on *inputs* to people's health. While access to such inputs will undoubtedly play a role in ultimate health outcomes our focus in this paper is to examine inequality in outcomes as measured by SAH and its relationship to inequality in income.

## **2. The Health Concentration Curve and Health Concentration Index**

Before explaining the measure of inequality adopted in this paper it is necessary first of all to explain the measure of health used. Health is measured through a question on SAH. Specifically, the question is: in general, how would you describe your health? Respondents are given five possible responses: excellent, good, fair, bad, very bad. This question, or very close variants on it, is frequently used in health interview and other surveys. For example, the European Community Household Panel (ECHP) used by Van Doorslaer and Koolman (2002) uses the question “How is your health in general?” with five response categories from “very good” to “very bad”. Answers to this type of question have been found to be a good predictor of mortality and the onset of disability (see Idler and Benyamini, 1997).

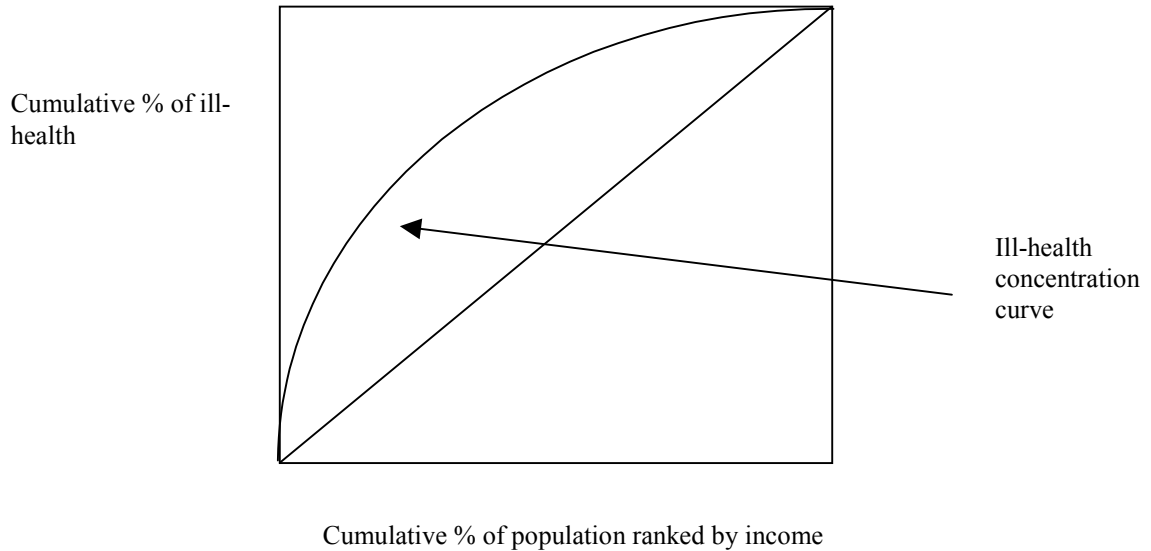
One of the principal difficulties of using such a measure as this for inequality purposes is the categorical nature of the responses. Previous practice had been to dichotomise answers to the question by setting a cut-off point above which people are said to be in good health. While such an approach may be more justified if health is an independent variable, when it is the dependent variable, and one on which most interest is centred, there is a danger that rankings of countries and periods can be very sensitive to the choice of cut-off point (see Wagstaff and Van Doorslaer, 1994).

An alternative procedure is to assign a score to each category. However, it is far from clear what scores should be assigned to each category. For example, there is evidence to suggest that an assumption of constant gaps between each category would be incorrect. When SAH measures are used in conjunction with questions underlying a health utility index (HUI) the mean values for the various SAH categories indicate that moving from “fair” to “bad” is perceived as a larger deterioration in health than moving from “excellent” to “good”.

The approach adopted here is that of Wagstaff and Van Doorslaer (1994) which is to assume that underlying the SAH responses is a latent ill health variable with a standard lognormal distribution. Latent ill-health scores can then be obtained for each category by dividing up the area under the standard lognormal distribution according to the sample proportions falling into each of the response categories. Each person is then assigned the latent ill-health score corresponding to her response.

Inequality in ill-health can then be measured via the concentration index. To derive the ill-health concentration index we must first introduce the ill-health concentration curve (figure 1). This curve plots the cumulative percentage of the

population (ranked according to income, or whatever measure of resources is being used) against the cumulative percentage of ill-health. If ill-health is equally distributed than the curve will coincide with the diagonal. If ill health is concentrated among the least advantaged then the curve will lie above the diagonal.<sup>1</sup>



**Figure 1: Ill-Health Concentration Curve**

The concentration index,  $C$ , is then defined as twice the area between the ill-health concentration curve and the diagonal.

As Kakwani et al show,  $C$  can also be computed on individual data. Suppose  $x_i$  ( $i=1, \dots, n$ ) is the ill-health score of the  $i^{\text{th}}$  individual. The  $n$  individuals are then ranked according to whatever measure of household resources is being used, beginning with the most advantaged.  $C$  is then calculated as

$$C = \frac{2}{n \cdot \mu} \sum_{i=1}^n x_i R_i - 1$$

where  $\mu = \frac{1}{n} \sum_{i=1}^n x_i$  is the average level of ill-health and  $R_i$  is the relative rank of the  $i^{\text{th}}$  person.

Before presenting our estimates of concentration curves for Ireland, we note that so far we have implicitly assumed that demographic factors play no role in generating health inequality. Comparing the ill-health concentration curve with the diagonal suggests that all socio-economic inequalities in health are avoidable.

<sup>1</sup> It is also possible to draw the *health* concentration curve. In this case a concentration of health among the most advantaged will give a curve lying below the diagonal.

Arguably this is not realistic since there are biological influences upon health which are pretty much unalterable. We would not expect a person of 85 to have the same health as a 25 year old. One approach is to standardise our health measure to take account of such factors. With individual level data the indirect method of standardisation can be used. This involves replacing person  $i$ 's level of health by the level of health experienced *on average* by persons of that age (and gender). A corresponding ill-health concentration curve and concentration index,  $C^*$ , can then be calculated by replacing the actual health score with the indirectly standardised one.<sup>2</sup> An alternative approach, which is adopted in this paper, is that when the concentration curve is decomposed into its different constituents an explicit account is taken of the role of age in determining (ill) health.

### 3. Calculation of the Concentration Index for Irish Women

We now present estimates of the concentration curve and concentration index for a sample of Irish women. The data set used in this paper is known as the Saffron Survey which was carried out in 1998 by the Centre for Health Economics at University College Dublin. The Saffron Survey's aim was to survey women's knowledge, understanding and awareness of their lifetime needs. Much of the focus of the survey was on the issue of hormone replacement therapy<sup>3</sup> but other information regarding health, lifestyle choices and demographics was also collected. For our purposes in this paper the relevant question on SAH was: in general, how would you describe your health? Respondents are given five possible responses: excellent, good, fair, bad, very bad.

For income purposes the women were asked to place their household income into sixteen different ranges from £62 p.w. to in excess of £650 p.w. This was then adjusted to equivalent income by dividing by the square root of household size.<sup>4</sup> Unfortunately there is a problem with top-coding in that 3% of women reported themselves as having household income in excess of £650 p.w. Additionally, a number of women did not respond to the question on income, nor on a variety of other

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<sup>2</sup> Such an approach was taken and the adjusted concentration curve calculated. Results are available on request.

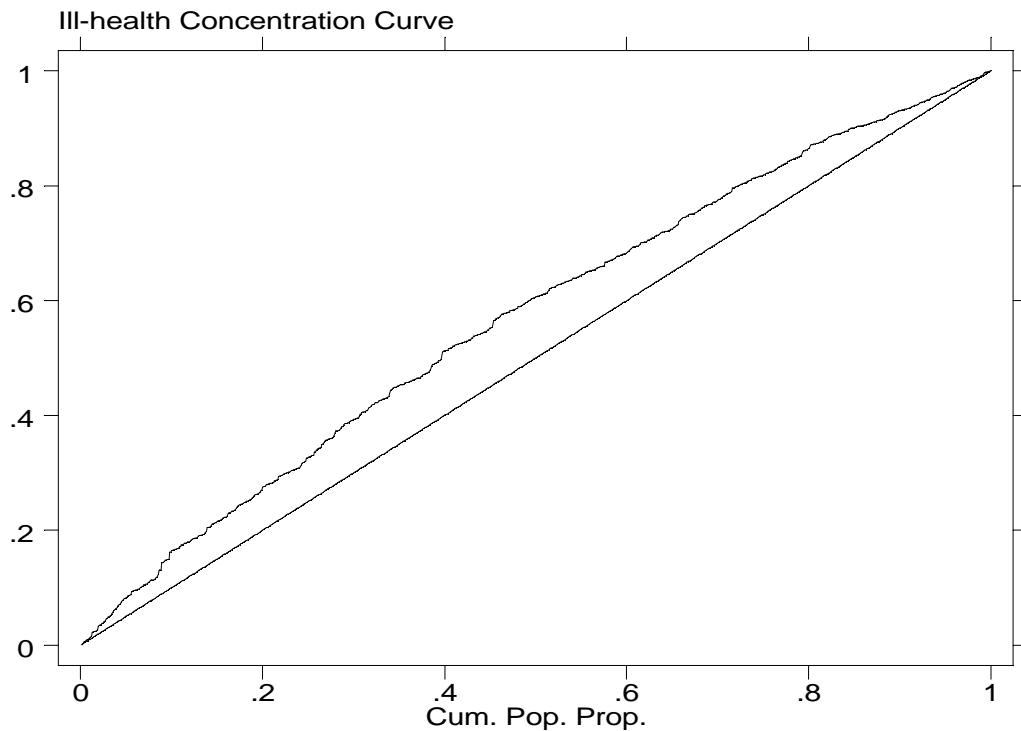
<sup>3</sup> See *Economic Aspects of Women's Health with regard to Hormone Replacement Therapy in Ireland*, unpublished MA thesis by Jill Thompson, 2000.

<sup>4</sup> One issue which we cannot address in this paper, through lack of proper data, is the extent of *within-household* inequality of resources. Thus even though a household may have income of say, £500 p.w. it is possible that women will not receive their "fair share" of this income.



measures which are used in the decomposition leaving us with an eventual sample of 773 women. As a means of overcoming non-response and top-coding we estimated “fitted” income for women by running a tobit regression of income on education and age. The results for this are reported in table 1. On the basis of these results we then obtained predicted income for a larger sample of women (1019 as opposed to 773). Table 2 shows the cross-tabulation between SAH and equivalent income.

There is fairly clear evidence of a monotonic gradient as we go from “Very bad” to “Excellent”, though the numbers reporting the categories “Very bad” and “Bad” are small. This suggests that the concentration curve will be above the diagonal or, equivalently, that  $C$  will take on a value below zero.



This is confirmed by the graph of the concentration curve above and table 3 showing a calculated value of  $C$  of  $-0.136$ .<sup>5</sup>

It is possible that the use of predicted income from the tobit will bias the reported extent of income inequality and hence affect the concentration curve and concentration index. When using actual income for the sample of 773 women we obtain a concentration index of around  $-0.09$ . The lower value for the concentration index (in absolute terms) is explained by the fact that the income inequality is much

<sup>5</sup> The standard error was calculated via bootstrapping with 100 repetitions. Application of the formula in Kakwani et al. (1997) yielded high standard errors (more than twice the size of the coefficient) possibly due to too small a sample size.

higher for the sample of 773 women than for the larger sample (a coefficient of variation of 0.51 compared to 0.38) while health inequality (as measured by the coefficient of variation of the latent health measure) is practically identical. The same degree of health inequality accompanied by higher income inequality leads to smaller measured income-related health inequality. As to which measure of the concentration index is to be preferred, we favour that which uses fitted income and the larger sample of 1019 women. The possibility of bias from the use of fitted income is a worthwhile price to pay for the larger sample size. It is also worth noting that the use of fitted rather than actual values has also been adopted in labour supply studies (see Killingsworth, 1983).

We now discuss the decomposition of the concentration index to investigate what are the sources of this measured inequality..

#### 4. Decomposition of Health Inequality

The calculation of income-related inequality is of interest, but perhaps of even more interest is the extent to which such inequality can be decomposed into its different constituents. Suppose that our measure of health for individual  $i$ ,  $h_i$ , is given by

$$h_i = \alpha + \sum_k \beta_k x_{ki} + \varepsilon_i$$

where  $x_k$  is a set of determinants of health with associated coefficients  $\beta_k$  and  $\varepsilon_i$  is an error term. We assume that everyone has the same coefficient vector,  $\beta_k$ .<sup>6</sup>

Wagstaff, Van Doorslaer and Watanabe (2001) prove that given the relationship between  $h_i$  and  $x_{ik}$ , the concentration index for  $h$  can be written as:

$$C = \sum_k \frac{\beta_k \bar{x}_k}{\mu} C_k + \frac{GC_\varepsilon}{\mu}$$

where once again  $\mu$  is the mean of  $h$ ,  $\bar{x}_k$  is the mean of  $x_k$  and  $C_k$  is the concentration index for  $x_k$  (which is calculated analogously to  $C$ ). In the last term

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<sup>6</sup> Ideally this is a condition we would like to test rather than impose. The difficulty in testing it lies in the nature of  $h_i$ , which takes on only five distinct values. We tried testing the condition via quantile regression but owing to the limited number of values of  $h_i$  the results were fairly meaningless.

$GC_\varepsilon$  is a generalised concentration index for  $\varepsilon_i$ , defined as  $GC_\varepsilon = \frac{2}{n} \sum_{i=1}^n \varepsilon_i R_i$ . Thus

$C$  is composed of two components, a deterministic component comprising a weighted sum of the concentration indices for the  $k$  regressors where the weight for  $x_k$  is given by the elasticity of  $h$  with respect to  $x_k$  evaluated at the sample mean. The second term is a residual component reflecting the inequality in health which cannot be explained by systematic variation across income in the  $x_k$ .

We now discuss the precise specification of the health function. One possible approach is to estimate a health production function so that health is explained by its proximate determinants such as diet, exercise, smoking and drinking etc. However, Rosenzweig and Schultz (1983) have argued that such an approach runs the risk of confusing the health production technology with individual preferences (this also applied to non-lifestyle factors such as income and/or employment status). Thus such lifestyle choices as diet and exercise are endogenous and so some correction should be made for such endogeneity. This lies behind the approach adopted by Wagstaff, Paci and Joshi (2001) and van Doorslaer and Koolman (2002) who estimate reduced form relationships whereby health is explained by its underlying, exogenous, determinants such as education and parental education and socio-economic background.

In this paper we first calculate a health production function making no allowance for endogeneity. We then re-estimate this production function via instrumental variables and for comparison's sake we also estimate a reduced form production function.

Our initial specification for the health production function is one where we take no account of potential endogeneity and where the health measure is not standardised for age. The regressors in the production function are: income, exercise, diet, body mass index, smoking, drinking, employment status, age and parental health. More precise details of the variables are provided in the appendix.

Before examining the decompositions of health inequality we first discuss the results for the different specifications of the health production functions in tables 4-5. Recall that the dependent variable is ill-health. Thus in the first column of table 4 we see that exercise and working both have a positive and significant effect upon health (presumably there is some simultaneity with regard to working, since those who are healthy are more likely to work). Increased age and smoking have negative and

significant effects upon health. Neither the mortality nor the health of either parent exert any significant effect. The precision of the IV estimates is considerably below those of the OLS ones with no coefficient anywhere near statistical significance. A Hausman test did not reject the null hypothesis of no systematic difference between the coefficients of the OLS and IV estimates. However, the p-value for the Davidson-McKinnon augmented regression test was 0.0286 suggesting OLS is not consistent. The excluded variables for identification purposes were highest level of education achieved, marital status, number of children, and a variable reflecting townsize. The high standard errors in the IV estimation and the conflicting results from the Hausman and Davidson-McKinnon tests presumably reflect problems in identification. On grounds of plausibility however, the results from table 4 are perhaps to be preferred.

In table 5 we give the reduced form (ill) health demand equation. Once again, we see the effect of age (the coefficient is very similar in size to that in the health production function). Education has a positive effect upon health (the omitted category is those women who left school with a primary cert or less). There is also some (albeit weak) indication that the effect of education is not monotonic. The coefficient on Leaving Cert exceeds (in absolute magnitude) that of Junior Cert and it also exceeds that of Third Level. The p-value for the test that the effect of Junior and Leaving are the same is 0.05, while that for the test that Leaving and Third Level are the same is 0.18. However previous work using this dataset found evidence of a non-monotonic impact of education of the hazard of quitting smoking. So there is some tentative evidence that completion of the Leaving Cert has a greater impact on health and health-related habits than either completion of the Junior Cert or Third Level education. It is also worth noting that the reduced-form specification is the only one showing an effect of parental health, with the presence of a health problem for the father having a negative effect on health.

Tables 6A, 6B and 7 present the decomposition of the concentration index. Recall that for a factor to contribute to income related inequality then two conditions must simultaneously be met. First, the factor must exert a non-trivial effect upon health i.e. the elasticity of health or ill-health to the factor in question must be of a reasonable magnitude. Secondly, that factor should itself be distributed unequally with respect to income. Thus even if a factor such as say, exercise, has a significant effect upon health it will not contribute to income related health inequality unless the propensity to exercise differs across income levels. The decomposition of the

concentration index thus throws light upon income related health inequality in two ways. First, it shows which factors are important and second it shows *how* they are important, via either a significant effect upon health and/or because of their own distribution with respect to income.

Table 6A suggests that two factors in particular contribute to income-related inequality: age and employment status. Together, these account for about two thirds of inequality. The precise mechanism of how they contribute to inequality is also interesting. Taking the case of employment status first, its impact upon health is relatively modest with an elasticity of ill-health with respect to employment status of  $-0.18$ . Factors such as body mass index, income, exercise and age all show higher elasticities (in absolute terms). However, employment status exerts a major effect upon inequality because of the extremely high value of its own concentration index at  $0.46$ . Thus employment is overwhelmingly concentrated amongst higher-income households. In one sense this is a trivial point, since clearly households with more than one earner (which would be the case for many households where a woman was working) will have higher income. But note that the separate effect of income has already been controlled for. The importance of employment status was also noted by van Doorsaer and Koolman (2002) when looking at this issue for Europe in general. We should also acknowledge again the possibility of simultaneity here between health and employment status.

The other factor contributing to inequality is age and here the crucial factor is the impact of age upon health, with an elasticity close to one. The concentration index for age is negative, indicating that younger women come from richer households. Thus higher age is associated with poorer health and since older women come from poorer households this translates into age having a significant impact upon income related health inequality.

It is interesting to note that lifestyle factors play a relatively small role in inequality. For example, smoking contributes just under 3% of total inequality. This reflects the fact that while smoking does damage your health, with a  $\beta_k$  of  $0.38$ , and smoking is concentrated among the poorer households, less than 30% of women in the sample smoked, so its overall contribution to inequality is fairly modest. A higher proportion of the population drink and it is more concentrated among higher income groups (with a CI of  $0.076$ ) but its impact upon health is fairly moderate with a  $\beta_k$  of

-0.14. Of all lifestyle components of the health production function, exercise has the greatest impact, contributing about 8%. This is owing to the fact that, like drinking, it has a positive impact upon health and it is concentrated among higher income households.

Table 6B shows the decomposition when the IV estimates are used. The values in the  $\beta$  column are clearly implausible and hence so are the contributions to overall inequality.

Table 7 shows the reduced form demand for health. The variables included here are age, education, a measure of health knowledge<sup>7</sup> and parental health. Education is typically found to be a very important explanatory variable for health although the precise mechanism is unclear. It may indicate that more educated people simply have more information regarding the effects of various lifestyle choices such as smoking or diet upon health. It may also indicate that more educated people are better able to process or act upon information on regarding the health effects of these choices. Finally it may reflect the presence of a “third” variable which simultaneously influences attitudes towards both education and health. Thus individuals with a low discount rate (i.e. they are more “future-oriented”) will invest in both their health capital (by refraining from activities such as smoking or poor diet) and their human capital. While we do include a measure of health knowledge (see above) in the absence of reliable measures of such discount rates it is difficult to distinguish between these different mechanisms but it is likely that all three (and perhaps others) are at work.<sup>8</sup>

The results from table 7 show that, apart from age, education clearly plays the dominant role in accounting for inequality, although it is also noticeable that the “unexplained” component of inequality is now around 33%, whereas in table 6A it is only around 8%. What is noteworthy about table 7 is the different effects of Junior Cert versus Leaving Cert and Third Level education in terms of both sign and magnitude. As remarked above, all three educational levels have a positive impact upon health (compared to those who leave school with only primary education or less). The Junior Cert tends to reduce income related health inequality while the other

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<sup>7</sup> The measure of health knowledge here is the response to the question “Have you ever heard of osteoporosis?”. Clearly this question refers to a fairly particular dimension of health, but we do not believe it is unreasonable to expect that knowledge regarding osteoporosis may be correlated with other aspects of health knowledge.

<sup>8</sup> For a discussion on the relative importance of these mechanisms for the link between smoking, health and socio-economic status, see Meara (2001).

two qualifications tend to increase it. This arises owing to the different signs of the concentration indices for the different education levels. Junior Cert has a negative CI, since those people whose highest level of educational achievement is the Junior Cert are concentrated among the less well-off, whereas Leaving Cert and Third Level tend to be concentrated among the better-off. Also the magnitude of the contribution of Junior Cert is less than for the other two categories of education because it makes less of a contribution to health (lower  $\beta$ ) and also the absolute value of its CI is smaller.

What are the policy implications of these results? Looking at the results from tables 6A and 7 it is useful to distinguish between those factors which are amenable to policy and those which are not (such as age). In terms of what factors are possibly open to policies, employment status has the biggest potential impact. However, given the probable problems here with simultaneity, caution is required before recommending increased labour force participation for women as a means of combating inequality in health outcomes. Of the other factors which may be amenable to policy, probably income and exercise offer the best prospect. A reduction in income inequality would clearly reduce income related health inequality while encouragement of exercise among lower income women (given the CI for exercise of 0.07) would also reduce inequality.

In terms of table 7 it is clear that improvements in educational outcomes would have a major impact in reducing inequality in health outcomes. Perhaps the other most notable feature regarding table 7 is the fairly substantial element of unexplained inequality, about 33%.

This discussion clearly illustrates the point made in the introduction that if governments wish to reduce the degree of income-related inequality in health then there are a variety of policies which could potentially be adopted. Policy could be directed at the labour market and education (to address educational outcomes and employment status), to health and lifestyle issues (to address exercise) or to income distribution in general. It is also likely that policies which addressed educational inequalities would in turn affect income inequalities and have second round effects upon health inequalities and so on.

## **5. Conclusions**

This paper has examined the factors lying behind income related inequality in health outcomes for a sample of Irish women. It finds that when taking a health production function approach, the results are dependent upon the estimation strategy adopted, OLS or IV, and that age and employment status contribute most to inequality. Of those factors which are realistically open to policy, employment status and exercise patterns appear to offer the best prospect for reducing income-related inequality. Other features of lifestyle such as smoking and drinking make relatively modest contributions to inequality, as do health and mortality history of parents.

When a reduced form health-demand approach is taken then age and educational achievement exert the largest effect upon inequality, with once again only a modest role for health and mortality history of parents.



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**Table 1: Tobit Regression for Fitted Income**

Dependent Variable: Income

Age	8.229 (1.339)***
Age <sup>2</sup>	-0.092 (0.013)***
Junior Cert	26.300 (11.750)**
Leaving Cert	54.383 (11.896)***
Third Level	100.163 (15.383)***
Working	80.941 (9.700)***
Constant	26.828 (34.221)
Observations	899

Standard errors in parentheses

\* significant at 10%; \*\* significant at 5%;

\*\*\* significant at 1%

**Table 2: SAH and Equivalent Fitted Income**

Health	Mean Income (IR£)	Standard Dev.	Freq.
Excellent	159.28	56.83	232 (22.77%)
Good	147.59	54.64	599 (58.78%)
Fair	129.03	52.39	163 (16.0%)
Bad	114.94	35.48	21 (2.06%)
Very bad	106.81	22.86	4 (0.39%)
<b>Total</b>	<b>146.45</b>	<b>55.35</b>	<b>1019 (100%)</b>

**Table 3: Concentration Indices (bootstrapped SE in brackets)**

<i>C</i>	-0.136 (0.0096)
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**Table 4: Health Production Function**

<b>Dependent Variable: Health (III)</b>	<b>OLS</b>	<b>IV</b>
Ln Income	-0.069 (0.174)	-9.748 (16.235)
Exercise	-0.334 (0.140)**	3.651 (13.956)
Vegetarian	0.071 (0.189)	6.047 (24.581)
BMI	0.025 (0.018)	-0.254 (0.644)
Smoker	0.382 (0.141)***	5.555 (17.098)
Drinker	-0.143 (0.170)	2.196 (3.717)
Working	-0.459 (0.121)***	12.567 (26.869)
Age	0.021 (0.005)***	0.157 (0.296)
Mother Deceased	-0.051 (0.141)	1.063 (2.010)
Mother's Health	0.093 (0.163)	-0.172 (0.821)
Father Deceased	0.102 (0.135)	1.301 (2.761)
Father's Health	0.266 (0.182)	0.657 (0.853)
Constant	0.622 (0.983)	36.105 (54.586)
Observations	1019	1019
R-squared	0.11	
Robust standard errors in parentheses		

\* significant at 10%; \*\* significant at 5%;  
\*\*\* significant at 1%

**Table 5: Reduced Form Health Demand**

**Dependent Variable:  
Health (III)**

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Age	0.019 (0.006)***
Junior Cert	-0.495 (0.207)**
Leaving Cert	-0.736 (0.209)***
Third Level	-0.592 (0.224)***
Health Knowledge	-0.183 (0.208)
Mother Deceased	-0.048 (0.150)
Mother's Health	0.095 (0.162)
Father Deceased	0.155 (0.144)
Father's Health	0.336 (0.181)*
Constant	1.093 (0.310)***
Observations	1019
R-squared	0.10
Robust standard errors in parentheses	

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 6A: Contribution to Inequality – Health Production Function, OLS**

Variable	$\beta$	Mean	Elasticity	CI	Contr. to overall CI	% contr.
Ln Income	-0.069	4.917283	-0.33929	0.042989	-0.00946	6.973268
Exercise	-0.334	0.703631	-0.23501	0.072771	-0.01109	8.176302
Vegetarian	0.071	0.022571	0.001603	0.152963	0.000159	-0.11719
BMI	0.025	24.28084	0.607021	-0.01072	-0.00422	3.110723
Smoker	0.382	0.2895	0.110589	-0.04878	-0.0035	2.578968
Drinker	-0.143	0.713445	-0.10202	0.075944	-0.00503	3.704209
Working	-0.459	0.392542	-0.18018	0.464588	-0.0543	40.01976
Age	0.021	46.89303	0.984754	-0.05927	-0.03786	27.90392
Moth. Dec.	-0.051	0.483808	-0.02467	-0.12288	0.001967	-1.44953
Moth. Hlth	0.093	0.192345	0.017888	-0.00333	-3.9E-05	0.028475
Fath. Dec.	0.102	0.611384	0.062361	-0.06899	-0.00279	2.056907
Fath. Hlth	0.266	0.153091	0.040722	0.048911	0.001292	-0.95223
Residual					-0.01081	7.966421
<b>Total</b>					<b>-0.13567</b>	<b>100</b>

**Table 6B: Contribution to Inequality – Health Production Function, IV**

Variable	$\beta$	Mean	Elasticity	CI	Contr. to overall CI	% contr.
Ln Income	-9.748	4.917283	-47.9337	0.042989	-1.33659	985.151
Exercise	3.651	0.703631	2.568957	0.072771	0.12126	-89.3763
Vegetarian	6.047	0.022571	0.136488	0.152963	0.013542	-9.98134
BMI	-0.254	24.28084	-6.16733	-0.01072	0.04288	-31.6049
Smoker	5.555	0.2895	1.60817	-0.04878	-0.05088	37.50306
Drinker	2.196	0.713445	1.566724	0.075944	0.077177	-56.8842
Working	12.567	0.392542	4.933072	0.464588	1.486582	-1095.7
Age	0.157	46.89303	7.362206	-0.05927	-0.28304	208.615
Moth. Dec.	1.063	0.483808	0.514288	-0.12288	-0.04099	30.21269
Moth. Hlth	-0.172	0.192345	-0.03308	-0.00333	7.15E-05	-0.05266
Fath. Dec.	1.301	0.611384	0.79541	-0.06899	-0.03559	26.23565
Fath. Hlth	0.657	0.153091	0.100581	0.048911	0.003191	-2.35194
Residual					-0.13328	98.23835
<b>Total</b>					<b>-0.13567</b>	<b>100</b>

**Table 7: Contribution to Inequality – Reduced Form**

<b>Variable</b>	<b><math>\beta</math></b>	<b>Mean</b>	<b>Elasticity</b>	<b>CI</b>	<b>Contr. to overall CI</b>	<b>% contr.</b>
Age	0.019	46.89303	0.890968	-0.05927	-0.03425	25.24707
Junior Cert	-0.495	0.255152	-0.1263	-0.11556	0.009467	-6.9779
Leav. Cert	-0.736	0.316977	-0.2333	0.220057	-0.0333	24.54491
Third Level	-0.592	0.156035	-0.09237	0.44601	-0.02672	19.6974
Hlth. Know	-0.183	0.836114	-0.15301	0.049812	-0.00494	3.643919
Moth. Dec.	-0.048	0.483808	-0.02322	-0.12288	0.001851	-1.3643
Moth. Hlth	0.095	0.192345	0.018273	-0.00333	-3.9E-05	0.029088
Fath. Dec.	0.155	0.611384	0.094764	-0.06899	-0.00424	3.125775
Fath. Hlth	0.336	0.153091	0.051439	0.048911	0.001632	-1.20285
Residual					-0.04512	33.25688
<b>Total</b>					<b>-0.13567</b>	<b>100</b>

### Appendix: Definition of Variables and Summary Statistics

Description of variable	Mean	St. Dev.
Health: "In general, how would you describe your health?" ranging from excellent (=1) to very bad (=5)	1.98	0.71
Income: Fitted income from tobit in table 1, equivalised by division by square root of household size	146.45	55.35
Exercise: Value of "1" if person exercised at least once a month	0.70	0.46
Vegetarian	0.02	0.15
Body Mass Index: Weight in kg divided by height in metres (squared)	24.28	4.08
Smoker	0.29	0.45
Drinker	0.71	0.45
Working (incl. Self-employed)	0.39	0.49
Age	46.89	17.57
Mother Deceased	0.48	0.5
Mother's Health: Answer to "In addition to the illness which caused her death, did your mother suffer from any other major or significant illnesses in her life?"	0.19	0.39
Father Deceased	0.61	0.49
Father's Health: see above for mother's health	0.15	0.36
Junior Certificate	0.26	0.44
Leaving Certificate	0.32	0.47
Third Level	0.16	0.36
Health Knowledge: "Have you ever heard of osteoporosis?"	0.84	0.37