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Equity in the Utilisation of Hospital Inpatient Services in Ireland? An Improved Approach to the Measurement of Health Need

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Abstract: The complex interweaving of public and private provision in Irish hospitals has led to concerns that hospital care is not available to all on the basis of need alone. Previous research on Irish hospitals found that utilisation was neutral across the income distribution controlling for health status – i.e., there was essentially equal treatment for equal need irrespective of income. However, the health indicator used in these analyses may not consistently measure health status across income groups. In this paper we combine multiple indicators into a composite 'Ill Health Index' and find that the measure used for standardisation has important consequences.

I INTRODUCTION

Health care services in Ireland are a fascinating and at times, confusing mixture of public and private provision and financing. This is particularly true in the hospital sector where public hospitals and publicly employed consultant doctors cater for both public and private patients. The intermingling of public and private medicine in Irish hospitals has been driven by the steady increase in the numbers of Irish people with medical insurance which has grown from 4 per cent in 1960 to over 50 per cent by 2003 (Health Insurance Authority, 2003), but concerns have been raised that the importance of private care in Irish hospitals means that the health system is not available to all on the basis of need alone, but instead that personal circumstances may well determine the availability and promptness of care. Past research on the Irish system (Tussing, 1985; Nolan, 1991; Callan and Nolan, 1992; Layte and Nolan, 2004) has examined the extent of horizontal equity in health service

delivery across the income distribution in Ireland – that is, the extent to which there is equal treatment for equal need irrespective of income. This research found that hospital care tends to be more heavily used by those at the bottom of the income distribution, but once we control for levels of health 'need' across income groups the distribution of utilisation is essentially neutral. This result is surprising given the advantage which the insured and higher income groups have in accessing hospital services, thus, in this paper we examine the pattern of hospital utilisation in more detail. Evidence from other countries suggests that survey evidence on the nature of health 'need', as used in previous Irish research may underestimate the true level of ill health among lower income groups as they tend to be 'sicker' per response category than higher income groups (Wagstaff and van Doorslaer, 1994). Adjustments made using single health status variables thus fail to adjust fully for differences in health need. In this paper we seek to improve on past Irish research by combining a number of different measures of health to create an index of ill health.

The paper unfolds as follows. In the next section we discuss hospital care in Ireland, in Section III we examine the data used in this paper. Section IV provides a descriptive account of the distribution of inpatient hospital nights across the population including age, sex and income groups. In Section V we turn to the issue of the measurement of health status. As we will argue this has been less than satisfactory in past papers. In Section VI we examine the equity of hospital care relative to need controlling for age and sex. In the seventh section we summarise the paper and provide some overall conclusions.

II EQUITY IN HOSPITAL CARE IN IRELAND

Health spending by the Irish state is the largest component of the budget (€12 billion in 2006) and the acute hospital sector consumes roughly half of the health budget. Public hospitals are classified into two types, Health Board and Voluntary Hospitals with the former owned, finance and administered directly by the state through the regional health boards. The latter are owned and operated by the religious orders and lay boards of governors, but are largely financed by state funds. As well as these publicly funded hospitals there are around 20 private hospitals that are run on a not-for-profit basis. The interesting and important feature of the Irish hospital sector is that private hospital care is provided in public as well as private hospitals by medical consultants who will work in the public and private sectors. Many public hospitals have private or semi-private accommodation and a private patient will have their accommodation arranged by a consultant who will

charge that patient directly for their services as well as working in the same hospital treating public patients for the state. As long as the private patient occupies a bed earmarked as private they, or their medical insurer will pay a daily maintenance charge that covers the cost of all other services outside of the care provided by their consultant. This will include all tests, nursing, junior doctor care, medications and hotel charges. This maintenance charge has been steadily increasing since the mid-1990s and now more accurately reflects the true costs of providing care although there is still a great deal of dispute about this (Nolan and Wiley, 2000).[1]

The increasing provision of private care in public hospitals has been driven to a large extent by the increasing demand for health insurance with coverage increasing from around 4 per cent in 1960 to over 50 per cent by 2003. State-backed health insurance was introduced to Ireland in the late 1950s in the form of the Voluntary Health Insurance Board (VHI) which was created to provide health coverage for the top 15 per cent of the income distribution who had to pay both maintenance and consultant charges for their care in public hospitals. These patients were known as Category 3 individuals. Category 1 individuals were those with a 'medical card' (around a third of the population) who received free public hospital care. Category 2 individuals received free consultant care, but were liable for maintenance and out-patient charges. To encourage individuals to take out health insurance they were offered tax relief on their premia and this worked well with around 15 per cent of the population covered by 1970 and more than double that by the late 1980s. In the late 1980s the system of entitlements was rationalised with Category 3 status being abolished and all patients without medical cards now required to pay a relatively small nightly maintenance fee. This means that there are now essentially three groups: those who are covered by a medical card who pay no costs. Those who are privately insured who pay insurance premiums before treatment but bear no costs at the point of delivery either for treatment or for the nightly charge. A third group who are neither insured or have a medical card pay the nightly charge but receive free treatment.

By the late 1980s, private practice in public hospitals was well established and Barrington (1987) has detailed the numerous ways in which private practice was accepted and facilitated. For example, within hospitals, consultants treating private patients had the use of staff and facilities at no extra cost to themselves with, until very recently, their patients charged only the marginal cost.[2]

[1] The per diem charge does not vary across the hospital system.
[2] The logic was that private patients had already contributed to the overall cost through their taxation.

The importance of private care and the extent of fee paying in the Irish system has led many to argue that the system is not available to all on the basis of need alone, but instead that personal circumstances may well determine the availability, quality and speed of treatment. The Commission on Health Funding which reported in 1989 (Commission on Health Funding 1989) certainly felt that private status gave more prompt access to hospital services than public status and voiced the opinion of many that consultant physicians gave more attention to their private patients leaving more junior doctors to care for public patients. In this paper we will not be assessing these issues, but instead turn our attention to the issue of whether the level of hospital resources utilised by those with different levels of income are equitable in the light of their health 'needs' or whether higher income and the availability of health insurance increases the resources consumed.

Equity in this context is not a simple concept since it can refer both to equity in access to health care and its utilisation. If we believe that equal access to hospital services is most important then we need to examine whether individuals have an equal opportunity to get it, or rather, an equal cost in consuming it. Mooney (1983) and Le Grand (1982) have championed this approach, but there is increasing support for an approach to measuring equity which concentrates on whether there is equity in actual levels of consumption. Researchers such as Culyer, van Doorslaer, and Wagstaff (1992) have argued that although the availability and costs of access do matter, we should still nonetheless be primarily concerned with the equity of utilisation across groups. They argue that even where non-use of services by a particular social group can be explained through a lack of information about the availability of services or pure choice, it is important to understand extent of and reasons for the deficit.

In this paper we follow the utilisation approach and seek to find out whether the structure of health services in Ireland leads to higher levels of utilisation among some groups relative to their health needs.

III DATA SOURCES

The Living in Ireland Survey 2000

To examine equity in the utilisation and cost of hospital care in Ireland we require information at the individual level on income, health status and use of hospital services. Fortunately, all these data are available for a representative sample of the Irish population in the Living in Ireland Survey (LII). The LII Surveys form the Irish component of the European Community Household Panel (ECHP): an EU-wide project, co-ordinated by Eurostat, to conduct

harmonised longitudinal surveys dealing with household income and labour situation in the member states. As well as extremely detailed information on income levels and sources, the LII data also includes information on other important topics of relevance to this paper including several self-assessed health status measures, health care utilisation and a wide range of socio-demographic characteristics. The first wave of the ECHP was conducted in 1994, and the same individuals and households were followed each year. The wave conducted in 2000, therefore, was the seventh wave of the survey. The objective of the sample design was to obtain a representative sample of private households in Ireland. Those living in institutions such as hospitals, nursing homes, convents, monasteries and prisons, are excluded from the target population, in line with the harmonised guidelines set down by Eurostat and standard practice adopted in surveys of this kind (such as the Household Budget Survey conducted by the Central Statistics Office).

The sampling frame used was the Register of Electors. This provides a listing of all adults aged 18 years and over who are registered to vote in the Dáil, Local Government or European Parliament elections. This means that the target sample selected using the ESRI's RANSAM procedure was a sample of persons, not of households. Since the probability of selection is greater for households with a larger number of registered voters, this means that the resulting sample will tend to over-represent larger households. This was taken into account in reweighting the sample for analysis. The Electoral Register is not a complete listing of the Irish population and may under-represent young mobile groups, migrants, those ineligible to vote and those who are politically apathetic. Even so, analyses have shown that it compares well to census and administrative data (Callan *et al.,* 1996).

The total number of households successfully interviewed in 1994 was 4,048, representing 57 per cent of the valid sample. The number of households and individuals being interviewed declined with attrition over time so in 2000 the original sample was supplemented with an additional 1,500 households selected using the same procedure.

The sample supplementation exercise, together with the follow-up of continuing households, resulted in a completed sample in 2000 of 11,450 individuals in 3,467 households. Individual interviews were conducted with 8,056 respondents, representing 93 per cent of those eligible (born in 1983 or earlier). This sample was reweighted to take account of sampling error from the actual population in 2000 and these weights are used throughout this paper, thus the data is fully representative of the Irish population in private households in that year. Details of the variables used in analyses plus descriptive statistics for each are given in Appendix 1.

IV THE DISTRIBUTION OF INPATIENT NIGHTS

In this section of the paper we examine the distribution of utilisation of hospital inpatient services. As just described, the LII survey in 2000 included a question on the number of nights that the individual spent in hospital in the last year and whether, for women, this was due to the birth of a child. Unfortunately, respondents were not asked the number of nights that they spent in hospital as a result of childbirth, but analysis showed that having a child tended to increase usage by three nights on average and so three nights were deducted for each respondent having a child. Table I shows some basic statistics on the distribution of hospital nights by sex and age group and shows that, on average women are more likely to experience a night in hospital and only in the group aged 61-70 are men more likely then women to experience a night in hospital. Both men and women are more likely to use inpatient services as they get older, but whereas for women this process seems linear, for men aged over 80 years, the proportion requiring hospital inpatient nights decreases.

Table 2 shows a different pattern of usage, however, for those experiencing one or more nights in hospital in the last year with men having a higher median number of nights in hospital in all age groups except the 31-40s and 71-80 year olds. Therefore, although men are less likely than women to be an inpatient on average, when they are it tends to be for longer.

Table 3 examines the distribution of number of nights in hospital across income quintiles. This shows that there is a rough gradient in inpatient utilisation with those in the lowest two income quintiles more likely to have had a night in hospital.

This gradient in usage of services is also reflected in the shares of hospital nights across the income groups. The last row of Table 3 shows that the lowest quintile utilise over 27 per cent of hospital nights and the second quintile 26 per cent. The share of hospital nights then falls until the fifth and highest quintile whereupon we see a slight upturn in the share. Wagstaff *et al.* (1991) have put forward the concentration index (CI) as a useful summary measure of the distribution of service utilisation across the income range. If use is equally distributed across income groups then the index will be zero. If, on the other hand, service use is concentrated in lower income groups the index will be negative and vice versa. The CI for hospital inpatient nights is –.142 (standard error of 0.048; P=0.003) which confirms that lower income groups have higher numbers of nights in hospital on average than higher income groups. However, Layte and Nolan (2004) showed that lower income groups are also far more likely to have a worse health status and this is likely to influence their utilisation of hospital services. We cannot assess the level of

Table 1: *Distribution of Nights as an Inpatient by Sex and Age Group*

Hospital Nights	*<21 Years*		*21-30 Years*		*31-40 Years*		*41-50 Years*		*51-60 Years*		*61-70 Years*		*71-80 Years*		*80+ Years*		*All*	
	Male	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*
Zero	95.4	93.8	93.3	90.8	93.0	80.9	91.8	88.7	89.6	88.4	80.2	85.9	78.4	76.3	84.3	73.8	90.3	86.3
1-5	2.4	4.9	4.3	7.7	4.9	15.2	4.2	6.1	5.0	6.9	7.7	4.7	9.4	6.9	5.6	15.6	5.0	8.4
6-10	1.2	0.6	1.9	0.6	0.5	1.3	1.6	3.2	2.1	1.5	4.0	4.7	6.5	3.7	5.6	4.1	2.1	2.0
11-20	0.6	0.6	0.1	0.5	0.1	1.0	2.0	1.2	2.3	0.5	5.0	3.0	2.0	12.0	3.4	0.0	1.5	1.9
21-50	0.3	0	0.3	0.3	1.3	0.6	0.4	0.6	0.7	1.6	2.9	1.0	2.4	0.9	1.1	5.7	1.0	0.9
51-365	0	.0	0.1	0.1	0.0	0.9	0.0	0.3	0.2	1.1	0.3	0.7	1.2	0.3	0.0	0.8	0.2	0.5
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: Respondents give actual nights in hospital in survey and this is used in analyses below. Groupings are used here to aid presentation.

Table 2: *Distribution of Nights as an Inpatient by Sex and Age Group For Those with 1+ Inpatient Nights*

	<21 Years		*21-30 Years*		*31-40 Years*		*41-50 Years*		*51-60 Years*		*61-70 Years*		*71-80 Years*		*80+ Years*		*All*	
	Male	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*
Median	5.98	2.00	4.00	2.00	1.60	3.00	5.17	5.00	7.00	4.00	7.00	7.00	7.00	14.00	7.67	5.00	5.00	4.00
Mean	9.41	4.01	12.60	5.12	8.58	7.02	8.38	9.11	8.76	13.12	13.78	13.23	13.16	11.40	18.27	13.60	11.24	9.27
Std	13.86	6.80	40.69	11.04	12.67	14.71	7.72	14.62	11.35	20.28	20.24	18.48	20.25	12.27	56.30	19.28	23.81	15.40

Table 3: *Distribution of Number of Nights as an Inpatient by Equivalised Disposable Income Quintile*

Inpatient Nights	*Lowest*	*2nd*	*3rd*	*4th*	*Highest*
Zero	86.2	86.2	90.3	88.0	88.7
1-5	6.5	6.2	4.2	8.8	7.6
6-10	3.3	2.4	3.2	1.5	2.2
11-20	2.0	3.5	1.4	0.9	0.7
21-50	1.5	1.3	0.8	0.4	0.5
51-365	0.5	0.4	0.2	0.4	0.3
Total	100%	100%	100%	100%	100%
Share of Nights	27.1%	25.9%	17.7%	14.3%	15.0%

inequity in inpatient care unless we control for differential health status since horizontal equity implies identical levels of utilisation for the same health status. Layte and Nolan (2004) controlled for health status using three different measures of health and found an equitable distribution, but it may be that a single measure of health may underestimate the level of ill health of lower income groups. In the next section we investigate this probability and develop a health status measure which combines several different types of health measures in a single 'ill health' index.

V STANDARDISING FOR HEALTH NEED TO MEASURE EQUITY

The measurement of horizontal equity in the utilisation of hospital services requires that we control not only for factors such as age and sex, but also the distribution of health status. Equity here is defined as equal treatment for equal health need and this requires that we have adequate measures of health need. In Layte and Nolan (2004) three different health status measures were used to standardise for the level of health need – a medical measure based on whether the respondent had a chronic illness, a functional measure based on whether the respondent had 'cut down due to mental or physical illness or injury' and a subjective measure based on the question "in general, how good would you say your health is?". These measures were all inversely related to income in the sense that those lower down the income distribution were more likely to have a chronic illness, a limiting health condition or assess their health as bad. However, the three measures varied in the extent to which they were concentrated on poorer individuals, as can be seen from Figure 1 which utilises 'concentration curves' Wagstaff *et al.*

(1991) to illustrate the point. Concentration curves cumulatively rank individuals (or groups) by their income against their proportion of illness. If illness is equally distributed across the population then the curve will coincide exactly with the diagonal, or 'line of equality'. If, on the other hand, illness is concentrated in lower income groups the line will lie above the diagonal, and vice versa.

Figure 1 confirms that all three measures are concentrated among lower income groups, but also that chronic illness is the most unequally concentrated with level of self-assessed health the least concentrated. These differences in distribution across income mean that the measures will differentially standardise for health need and thus yield different estimates of the extent of equity in hospital utilisation, but there may also be more worrying problems.

The standard assumption when using these measures is that, within categories, they reflect the same health status across different groups, e.g those with 'bad' health in the lowest income category are no sicker than those with 'bad' health in the highest income category. But this assumption may not be warranted. In the absence of some 'gold standard' against which subjective assessments can be judged (such as clinical appraisal of an individuals health status), it is difficult to fully validate responses to social survey questions, but Table 4 shows that answers across groups may not be comparable.

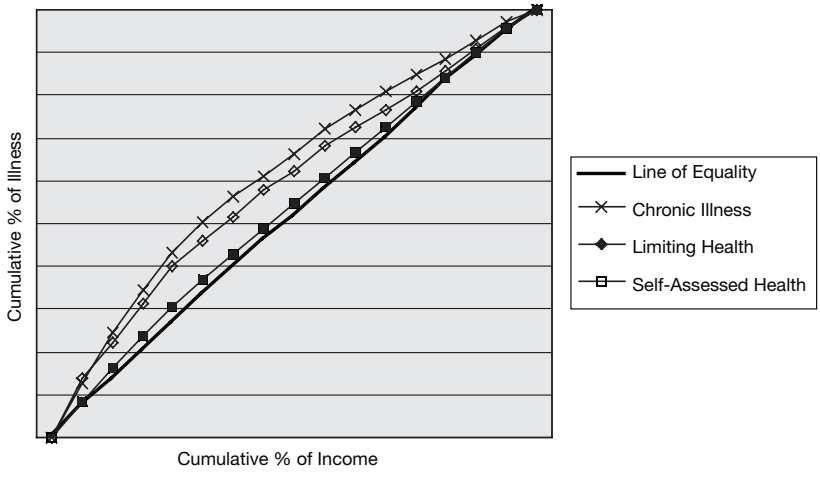
Using a three category variable representing self-assessed health we can see that for both those with and without a chronic illness, those in the lowest income quintile have a lower self-assessed health than other categories, but that the differential is particularly large for the latter where the highest income category are 76 per cent more likely to have 'good' health than the lowest income category and 11 per cent more likely than the other income categories. Similarly, the lowest income categories are more likely to have 'bad' health with a chronic illness with bad health displaying a pronounced gradient across the income groups.

These results suggest that for the measure of chronic illness at least, those in lower income groups seem to be 'sicker' in what is ostensibly the same category. If so, this would suggest that we should be careful in using the measure of chronic illness for standardisation purposes. Using a range of measures may militate the inadequacies of any one and provide a better measure of health status. In doing so it may also provide more substantial standardisation for health differences between income groups and indeed, research (Waagstaff *et al.*, 1991) has shown that use of multiple health measures can lead to pro-rich measures of inequity. It would be possible to simply add all three of the health measures shown in Figure I into the

Table 4: *Distribution of Self-Assessed Health by Chronic Illness and Disposable Household Income Quintile*

	Self-Assessed Health	*No Chronic Illness*	*Chronic Illness*
Lowest	Good	85.8	27.4
	Fair	13.4	55.7
	Bad	0.8	16.9
	Total	100	100
2nd	Good	94.6	41.9
	Fair	5.4	42.4
	Bad	0.0	15.7
	Total	100	100
3rd	Good	96.0	43.5
	Fair	3.8	45.4
	Bad	0.2	11.1
	Total	100	100.0
4th	Good	95.0	43.4
	Fair	4.9	42.9
	Bad	0.1	13.7
	Total	100	100.0
Highest	Good	93.8	48.2
	Fair	6.2	42.0
	Bad	0.0	9.8
	Total	100	100

Figure 1: *Ill Health Concentration Curves*



standardisation procedure, but it is likely that each of our observed health variables is in fact a flawed measure of an underlying, latent dimension of ill health. If so, simply using two or more measures of health simultaneously will be a poorer measure of this latent health state than combining the different measures of health status into a single indicator which summarises health and distils from the three indicators their common component. Adda, Chandola, and Marmot (2003) has suggested a method through which different health indicators can be combined based upon principal components analysis (PCA) and this is the procedure we adopt here. Using PCA we seek to establish the hypothetical factors which are common to our three health variables, that is:

$$Z_j = a_{j1}F_1 + a_{j2}F_2 + a_{j3}F_3 + d_jU_j \quad (1)$$

Where Z_j is variable j in standardised form, F_i are the hypothetical factors, a_{ji} the standardised regression coefficients of variable j on factor i and Uj the unique factor for variable j (d_j is the regression coefficient for this unique factor). Having derived a_{ji}, examination of the common factors showed a single dimension that we could label 'ill health'. We then weight each of the variables by a_jF[ill health] to create a single 'Ill Health Index' (IHI). A full description of the procedure used is given in Appendix 2. Table 5 gives the mean and standard deviations for this index cross-tabulated for different income quintiles and presence of chronic illness. As described in Appendix 2, we use a z-score to standardise the IHI so negative scores denote better health (i.e. less ill health). Not surprisingly, those with a chronic illness have a higher score, but within this group those in the lower income groups have worse health. Among those with no chronic illness the differentiation is between the lowest quintile and all others.

As a more refined measure of health status, the IHI should perform better than single or multiple items when standardising for health need in the measurement of equity in utilisation. This is the aim of the next section.

Table 5: *Ill Health Index*[3] *By Income Quintile and Chronic Illness*

	No Chronic Illness		*Chronic Illness*	
	Mean	*Std*	*Mean*	*Std*
Lowest	–0.40	0.31	1.94	0.80
2nd	–0.47	0.22	1.76	0.80
3rd	–0.47	0.21	1.68	0.81
4th	–0.49	0.17	1.60	0.84
Highest	–0.48	0.22	1.58	0.79

VI MEASURING EQUITY IN THE UTILISATION AND COST OF HOSPITAL SERVICES

In this section we apply the ill health index in an analysis of the degree of equity of inpatient care. We saw in Table 3 that hospital utilisation tends to be distributed in a pro-poor manner, but to what extent is this a consequence of a greater need for hospital care among lower income groups because of a worse health status? To examine this question we will seek to standardise for health status using the Ill Health Index, but we will also need to control for other factors that may confound the relationship such as age and sex. We have seen that higher utilisation is strongly associated with age and older persons also tend to have lower incomes and thus we will need to control for this when assessing equity across the income groups.

Here we want to estimate the partial correlation of the confounding variables sex and age on total inpatient nights conditional on health status. After the concentration index of utilisation has been standardised, the Health Inequality (HI) index is computed as the unstandardised CI minus the standardised CI. If after this procedure HI is negative we will have evidence that the distribution of health usage is actually skewed toward the worse off. If, on the other hand the HI index is positive, usage is skewed toward the better off. Given our previous methodological discussions one would expect that the estimation procedure that we use should take account of the fact that the dependent variable is inherently non-linear because of the preponderance of zeros in the population. It would be possible to use various specifications of two-part models to overcome this problem, but their intrinsic non-linearity makes (linear) decomposition impossible. However, van Doorslaer and Koolman (2000) have shown that the measurement of horizontal inequity hardly differs between OLS-based two-part models and non-linear two-part model specifications such as the logistic model combined with a truncated negative binomial model. To estimate the concentration index we thus rely on linear decomposition methods based on an indirect method of standardisation using OLS regression as shown in:

$$y_i = \alpha + \beta \ln inc_i + \sum_k \gamma^k \chi^{k,i+\varepsilon i} \qquad (2)$$

where use of health care (y_i) is predicted by log of household equivalised income (ln *inc*) of individual i and a set of k need and confounding variables (χ^k). α, β, and γ are parameters and ε_i is an error term.

[3] For ease of interpretation, the Index of Ill Health is rescaled to have mean 10 and standard deviation of 2.

This can be used to generate need-predicted values of y, i.e., the expected use of medical care by individual i on the basis of their need characteristics. It indicates the amount of medical care they would have received if they had been treated as others with the same need characteristics on average. Combining OLS estimates of the coefficients in Equation (1) with actual values of the χ_k variables and sample mean values of ln inc_i, we can obtain the need-predicted, or 'x-expected' values of utilisation, $\hat{\gamma}_i^x$ as:

$$\hat{\gamma}_i^x = \hat{\alpha} + \hat{\beta} \ln in_c^m + \sum_k \hat{\gamma}^k \chi^{k,i}$$

Estimates of the indirectly need-standardised utilisation, $\hat{\gamma}_i^{IS}$ are then obtained as the difference between actual and x-expected utilisation, plus the sample mean (y_m):

$$\hat{\gamma}_i^{IS} = y_i - \hat{\gamma}_i^x + y^m \tag{3}$$

Table 6 gives the resulting figures from this standardisation for the measure of hospital nights. As explained earlier, previous analyses of Irish patterns of hospital utilisation (Layte and Nolan, 2004) have used single indicators of health status and utilisation measures alone. To examine the individual impact of using a composite measure of health rather than different individual health measures, Table 6 gives results for standardisation using the ill health index as well as three different single indicator measures. We also include results entering the three health measures together in the same standardisation.

The results in Table 6 are very interesting. As found in Layte and Nolan (2004) the single indicator measures based on chronic illness and self-assessed health both produce pro-rich estimates of equity, the exception being the

Table 6: *Standardised Concentration and Health Inequality Indices for Hospital Utilisation by Health Status Measure*

	Health Index	*Chronic Illness*	*Self-Assessed*	*Limiting Illness*	*3 Single Indicators Simultaneously*
CI			–0.142		
(s.e)			(0.048)***		
HI	0.076	0.027	0.042	–0.034	0.058
(s.e)	(0.106)n.s	(0.057)n.s	(0.36)n.s	(0.47)n.s	(0.21)n.s

n.s=Non-Significant *=P<0.05; **=P<0.01; **=P<0.001.

'limiting illness' measure. The extent of divergence from neutrality varies considerably across the measures. Standardisation using chronic illness yields the least positive result, followed by self-assessed health. Combining all three measures increases the pro-rich result, but this increases again when we adopt the ill-health index as the standardising measure.

VII SUMMARY AND CONCLUSIONS

The Irish hospital sector is a complex and often confusing mixture of public and private provision which has developed since the late 1950s. The present system is still deeply influenced by the decision in the late 1950s to establish the tripartite system of entitlements where only one-third of the population received free care, married to a policy of subsidised health insurance. This system strongly incentivised the purchase of health insurance for those outside of the free care group that could afford it. Up until the 1980s medical insurance provided relief from the possibility of expensive medical bills plus prompt access to medical services. After the reforms of the 1980s, however large medical bills are no longer an issue and insurance serves mainly as a method of avoiding public health service queues. Since the early 1960s the proportion insured has gradually increased and in 2004 roughly half the population had insurance. This raises a number of issues including equality in speed of access to hospital services and the quality received, but here we have sought to answer a different question: does the extent of paying in the Irish system lead to inequities in the overall utilisation across the income distribution? That is, do those with higher incomes use hospital care to a greater extent than those with lower incomes with the same health status? Previous attempts at answering this question have suggested they are not, but there are concerns that this research has not adequately measured differentials in the level of health need across the population which leads to biased estimates of the degree of equity across the income distribution.

In this paper we set out to rectify this methodological problem by developing an improved measure of health needs. Analysis of the utilisation of hospital services showed that the elderly tend to have a higher tendency to have a night in hospital and had a higher number of nights in the last year on average. Our main interest was the role of income, however, and analyses showed that those with higher incomes had had fewer inpatient nights in hospital than those with lower incomes. Such inequalities do not necessarily imply inequities since income based inequity implies a greater use of hospital care among higher income groups for the same level of health. The fifth section of this paper showed that past research based on a single health status

measure may have under-estimated health differences between income groups. Analyses showed that lower income groups with a chronic illness are more likely to state that they have fair or poor self-assessed health compared to higher income groups with a chronic illness which could suggest that the health of lower income groups with a chronic illness is worse.

The final section of the paper examined the implications of using a composite measure of health for the equity of hospital utilisation. We found that the distribution of hospital utilisation is pro-poor in the sense that the less advantaged had a higher number of days in hospital. However, standardisation for health 'need' using a composite measure and three individual measures revealed interesting results. The impact of the standardisation procedure varied depending on the measure used. Whereas the 'limiting illness' measure produced a 'pro-poor' distribution of health care, the two other measures produced a pro-rich distribution. Using all three measures together increased the positive (pro-rich) finding, but the use of the composite 'ill health index' gave the most pronounced pro-rich distribution. At face value this implies that higher income groups have a higher number of inpatient nights for a given health status than do lower income groups. However, this result was not statistically significant suggesting an essentially neutral result.

These results do not imply that higher income groups utilise a higher level of resources overall. Our measure of utilisation is simply inpatient nights and this does not take account of differential cost between those with higher and lower incomes (or any other characteristic). It may be that the cost of hospital utilisation actually varies considerably across groups and this could significantly impact on measured equity. More research is needed to clarify the role of differential cost across different population groups.

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APPENDIX 1

Table A1: *Variable Definitions for Dependent and Independent Variables*

Variable	*Definition*
Nights in hospital in the last 12 months	Continuous variable in response to question: "Have you been admitted to a hospital as an inpatient during the past 12 months? Please exclude any nights spent in hospital due to the illness of other people, for example to accompany a child".
Age 17-20	=1 if aged 17-20 years, =0 otherwise
Age 21-30	=1 if aged 21-30 years, =0 otherwise
Age 31-40	=1 if aged 31-40 years, =0 otherwise
Age 41-50	=1 if aged 41-50 years, =0 otherwise
Age 51-60	=1 if aged 51-60 years, =0 otherwise
Age 61-70	=1 if aged 61-70 years, =0 otherwise
Age 71-80	=1 if aged 71-80 years, =0 otherwise
Age 81+	=1 if aged 81+ years, =0 otherwise (Base Category = aged 17-20 years)
Female	=1 if female, =0 otherwise (Base Category = male)
Income	Net Household Weekly Income in IR£ (adjusted for household size and divided by 100). Equivalence Scale Modified OECD (1, .5,.3)
Chronic Illness	=1 if have any chronic, physical or mental health problem, illness or disability, =0 otherwise (Base Category = no chronic illness)
Limiting Illness	=1 if cut down on normal paid or unpaid work or activities in free time due to illness or injury or emotional or mental health problems; =0 otherwise (Base Category = no limiting illness)
Self Assessed Health	Response to: "in general, how good would you say your health is?" =1 if very bad =2 if bad =3 if fair =4 if good =5 if very good (Base Category = very good health)

Table A2: *Summary Statistics for Independent Variables (Weighted Proportions)*

Age 17-20 years	8.1
Age 21-30 years	22.2
Age 31-40 years	18.9
Age 41-50 years	17.2
Age 51-60 years	13.8
Age 61-70 years	9.7
Age 71-80 years	7.4
Age 81+ years	2.6
Male	49.1
Female	50.9
Chronic Illness	20.8
No Chronic Illness	79.2
Limiting Health Problem	9.3
No Limiting Health Problem	90.7
Very Good Self-Assessed Health	45.7
Good Self-Assessed Health	36.2
Fair Self-Assessed Health	14.9
Bad Self-Assessed Health	2.7
Very Bad Self-Assessed Health	0.5
Mean Log(Equivalised Income) with Std	5.97 (0.71)

Table A3: *Weighted Frequency of Inpatient Nights in the Last Year*

Inpatient Nights	*Frequency*	*Percentage*
0	7,073	87.9
1 to 10	739	9.2
11 to 30	179	2.2
31 to 100	56	7.0
101 or more	5	0.06
Total	8,051	100.0

APPENDIX 2

Factor Analyses

Those with bad and very bad self-assessed health were combined due to small numbers to produce a three category self-assessed health measure. Factor analysis was based on a principal components extraction and varimax rotation with Kaiser normalisation. Dummy variables for health components were weighted using the factor weights given. The resulting index was standardised using a z-score procedure to have a mean of zero and a standard deviation of one.

Table A4: *Rotated Factor Weights*

Variable	*Component Weights*
Limiting Health Problem	.633
Chronic Illness	.814
Very Good Self Assessed Health	–.452
Good Self Assessed Health	–.246
Fair/Bad/Very Bad Self Assessed Health	.891