

**COUNTING THE COST OF CHRONIC PAIN:
AN ANALYSIS OF INTENSIVE SERVICE USERS**

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Abstract

Chronic pain is pain that persists for longer than 3 months: it affects between 13% - 36% of the Irish population. The current cost of pain study was carried out in the context of the increasing need for transparency in health expenditure and allocation of scarce resources. Previous international research has considered the costs for chronic pain sufferers but not for those who require a higher level of resources.

The aim of the present study was to collect data on the economic cost of chronic pain among patients attending one Regional Pain Clinic in Ireland. Data were collected from 100 patients and focused on direct and indirect costs of chronic pain. The Client Service Receipt Inventory for Pain was adapted for the purposes of our study. Patients were questioned about health service utilization, payment methods and relevant socio-demographics. Unit costs were multiplied by resource use data to obtain full costs.

Our results indicate that, on average, direct costs are over €3,000 per patient annually for use of hospital inpatient services. Average outpatient costs were €1,376 per patient. Total direct costs were €736,950 in the previous 12 months and included many direct medical costs, some extra requirements such as home adaptations and health insurance costs. Indirect societal costs are also substantial amounting to €898,290 including lost productivity due to days off work, disability benefits and informal carers days off work. The average cost of chronic pain (direct and indirect) was €16,352 per patient over a 12 month period. In conclusion, the societal cost of chronic pain is significant, particularly for those who are the high end users and attend chronic pain clinics. The data generated may be of use to health service managers when considering resource allocation.

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1. Introduction

This paper is the first paper internationally, to our knowledge, to assess both direct and indirect costs for chronic pain clinic attendees who receive specialized pain management services. Previous research on cost of chronic pain has focused on the wider population (e.g. Raftery et al, 2011, Blyth et al. 2004). The only other study to assess some similar costs, compared to our study, is by Kronberg et al. (2008) where their paper focuses on costs for patients referred to a specialized pain clinic, but currently on a waiting list. Our contribution to international research is to assess in detail, the total costs related to chronic pain, for clinic attendees. These are the patients with more severe chronic pain and tend to be more intensive users of resources. It is essential therefore to gain detailed knowledge of the associated costs, which may be used to inform resource allocation decisions and cost effectiveness studies.

Chronic pain is pain that persists for longer than three months (International Association for the Study of Pain (IASP), 1986) and chronic non-cancer pain is estimated to affect around 19% of the European population (Breivik et al., 2006). Chronic pain may have a significant impact on physical functioning, thus influencing employment capacity and the role within the family and society. Elliot et al., (2002) found that about three quarters of individuals with chronic pain at baseline may still have chronic pain at a four year follow-up. Indeed, some patients experience persistent or recurrent pain throughout their lives. International population-based studies in Denmark, Sweden, and Germany show that pain severity (measured variously by pain intensity, number of pain sites and pain-related disability) is positively correlated with health care use Eriksen et al., (2004), Andersson et al. (1999), Chrubasik et al. (1998), Blyth et al. (2004). A thorough understanding of the economic cost of chronic pain is therefore crucial for decisions regarding health service resource allocation,

especially for high intensity service users.

Internationally, some research has focused on the economic burden of chronic pain for the wider population. For example, Australian studies (Access, 2007) have estimated the total cost of chronic pain to be \$34.3 billion, approximately 4.5% of GDP and 28% of annual health expenditure¹. This compares to \$18 billion and \$3 billion for the cost of heart disease and diabetes, respectively. In the context of a common monetary currency in Europe, it may be illuminating to compare the economic cost of chronic pain across nations – this may be helpful not only in terms of highlighting departures from the economic “norm” in some jurisdictions, but it may also be

¹The cost of chronic pain includes indirect costs that would not normally be included in health expenditure.

useful in the context of a growing trend towards cross-national research programmes, such as the European Framework programmes. Comprehensive data on the cost of chronic pain is relatively scarce, with many studies having concentrated on one type of pain only e.g. back pain (Maniadakis and Gray, 2000), or in specific populations e.g. adolescents (Sleed et al., 2005).

Back pain alone is estimated to cost 2.2% of GDP in Germany (Wenig et al., 2009) and 1.7% of GDP in the Netherlands (Van Tulder et al., 1995). More recently, in Ireland, chronic non-cancer pain was estimated to cost 2.5% of GDP in 2008, (Raftery et al., 2011). Although there is some variation in cost estimates between studies due to differing methodologies, it is nevertheless evident that chronic pain represents a substantial cost in terms of health care provision and lost productivity.

Some of the variations in cost are associated with differing models of service provision, but it is also likely that costs vary according to the profile of persons using health services. While many people with chronic pain in Ireland are managed in primary care, a significant number attend specialised pain management services - often those seen in the tertiary or specialist services are among the most seriously affected by chronic pain. Consequently, people attending a pain management service may also use more health services and incur higher costs for service provision and lost productivity.

For these reasons, this study concentrates on collection of costs among people attending a chronic pain clinic. The two central questions to be addressed in this study were (1) what were the economic costs of chronic pain among pain clinic attendees for a 12-month period? (2) what factors explain variations in these costs?

2. Method.

The approach taken in this study follows a standard cost of illness methodology and provides estimates of direct and indirect costs. Direct costs are those directly related to the illness and include both medical and non-medical costs, which are related to treatment but do not result directly from it e.g. hospital "hotel" costs. Indirect costs represent the losses resulting from premature death, morbidity or disability as a result of the illness and items such as lost leisure time, as well as the cost of unpaid activities of the patient and the carer. In this study, we calculated the direct costs based on information obtained directly from patients about hospital admissions, outpatient specialist appointments, paramedical appointments, GP visits and the cost of treatments. We also calculated the indirect costs such as lost productivity, temporary work absences, informal care and community care.

There are two main methods to estimate health system costs - Top Down disease cost data can be derived from central data collection agencies. Bottom Up costs use surveys and diaries to accumulate information from a single study or multiple smaller studies. Our study adopted a bottom-up approach, focusing on one clinic only and collecting data at the micro level and aggregating to get an overall average level of cost. For example, we asked patients how many outpatient visits they had in the previous 12 months, and multiplied average cost by outpatient utilisation visits. Bottom-up methods have the advantage of providing greater detail in relation to specific cost elements and the same study can be extended to capture further information.

Participants

A sample of 100 patients with chronic non-cancer pain (70 females, 30 males), with a mean age of 51.6 years (SD 14.1; range 20 – 83 years) completed the cost of illness survey. The sample was obtained from consecutive patients attending the Pain Clinic in a tertiary referral hospital (Galway University Hospital) in the West of Ireland over a 6 week period in July – August 2008. Recruitment to the study continued until the desired sample of 100 patients was obtained. Patients were informed of the study by mail prior to their attendance at the clinic and were then offered the opportunity to participate when they attended the clinic for a scheduled appointment with their physician. A researcher was on site to answer queries from respondents if required. Descriptive statistics for the participants are presented in Table 1. Some additional information was collected by a researcher from the medical records. The mean pain severity, measured from a pain severity index (1-10), was 6.78. It is likely this is higher than average however, as mean severity was not available for all patients. The mean number of years in pain was 6.5 years. Over one third of the sample have back related pain, almost one fifth with head pain, one fifth with upper body pain and one quarter with lower body pain. The mean number of pain areas was 2.5.

Table 1

Materials

The Client Service Receipt Inventory (Beecham and Knapp, (1992); Beecham and Knapp, 2001) was used in this study. The CSRI has been used in around 150 studies examining costs associated with mental ill-health, neurological problems, physical disability and autism. The CSRI was subsequently adapted by Slead et al. (2005) for a study of the cost of pain. It has recently been administered by Raftery, M. et al. (2011) in estimating the cost of pain in the wider population.

We adapted the CSRI-Pain questionnaire for chronic pain clinic attendees. The variant used in our study was designed to collect retrospective data on service utilisation for the previous twelve months, based on patient self-report. The CSRI has been validated as an accurate measure of frequency of health service use (Patel et al., 2005). We hypothesised that people

attending a pain clinic are likely to have higher levels of pain, use more services and hence costs should be higher.

Procedure.

The survey instrument was given to consecutive patients who attended the Galway University Hospital Pain Clinic. The Hospital Research Ethics Committee approved the study. Patients completed the questionnaire with the assistance of the researcher if necessary.

To estimate full costs, data on the intensity of service use were combined with unit costs of the relevant health services. Utilization data were obtained from responses to the CSRI and unit costs of services from a range of sources including the health service, the Central Statistics Office (CSO) and expert opinion.

In Ireland, health costs are not gathered in a comprehensive manner and presently there is no complete unit reference cost database. Most cost of illness studies rely on obtaining unit costs from a range of sources. In this study, the unit costs for inpatient, day patient, outpatient, A & E visits were provided by Ireland's Health Service Executive Casemix Unit. Costs for other consultations such as home help, nurse, psychologist or social worker, were based on average salaries from Ireland's Department of Health and Children (2008) for public sector employees (Department of Health, 2008). Unit costs for private services such as chiropractic, acupuncture and homeopathy were based on expert opinion. All unit costs are given in Table 3, column 3 (cost in euro, base year 2008).

Direct costs included inpatient care, outpatient care, primary health care (GP), A & E visits, ambulance costs, practice nurse, home help, social worker, psychologist, psychiatrist, public health nurse, occupational therapy, physiotherapy, chiropractor, acupuncture and homeopathy. Resource use also included extra requirements such as adaptations to home or mobility equipment. The cost of health insurance was also calculated, based on costs provided by patients.

We assumed duration of visits at 30 minutes (Practice Nurse, Public Health Nurse, Chiropractor, Acupuncture, Homeopath, Physiotherapy) or 60 minutes (Home Help, Social Worker, Psychologist, Psychiatrist, Occupational Therapy) The costs for these visits were calculated as follows: (1) the mid-point of the annual salary scale was divided by 52 weeks and we assume a 35 hour working week to obtain the costs of salary for 30 and 60 minute visits. We then multiplied by a factor of 1.25 to include on-costs such as social insurance and pension (Curtis, 2010). Note that in Ireland, practice nurses are uncommon and people are more likely to avail of services from the public health nurse.

Patients were also asked about litigation related to their pain. Our study showed that 18% had a litigation claim in process. As these claims were still in progress, there was no information on final costs, hence this cost was excluded from our study.

Ideally, prescription medication costs (and over-the-counter medication costs) should be included in a cost-of illness study. In the CSRI, patients were asked about the types of medication they took during the previous 12 months, the dosage, number of times taken and duration of years taking the medication. We calculated total costs per patient by assessing

responses to questions on medication use and attributing unit prices from the MIMS 2008 prescribing book.

Indirect costs included lost productivity and informal care. In the CSRI, respondents were asked to report the total number of work days lost due to chronic pain. We used the human capital approach to estimate production costs, as used in previous cost of illness studies (e.g. McCrone et al., (2011)) whereby an individual's level of earnings is assumed to reflect their productivity (Weisbrod, 1961). Lost production can therefore be calculated by multiplying the time absent from work by the wage rate. We used average industrial hourly labour costs for employees (CSO, 2009), €25 per hour across all sectors to calculate the unit cost of a work day as €175. These include costs such as social insurance and pension ((CSO, 2009). We also calculated the annual cost of being unable to work and the corresponding cost to state benefits. We use the weekly rates of state benefits for the number of respondents (Department of Social Protection, 2008) who reported being in receipt of such benefits. This may underestimate the amounts people actually receive if they are in receipt of other benefits such as living alone or dependent children. It should be noted that by including disability benefits, we may be double counting those who also say they lost work days due to pain and this could lead to an overestimate of indirect costs.

The cost of informal care is another relevant indirect cost. Many families have at least one person who will lose days from work to care for a family member who has chronic pain (Sleed et al., 2005). Informal care is distinguished from services provided by people employed in the health and community sectors (formal care) because informal care is generally provided free of charge to the patient and is not regulated by the government. While informal care is provided free of charge, it is not free in an economic sense, as time spent

caring is time that cannot be directed to other activities such as paid work, housework or leisure.

The valuation of informal care is always a contentious issue and there is no agreement on how best to measure the opportunity cost of not working for care-givers. We decided on the human capital approach and viewed hours of informal care as hours that could be spent working in the formal economy at the average industrial labour cost (€175 per day).

To derive total costs, we multiplied the number of units by the unit cost. We then divided by 100 to obtain the average cost per patient. The number of users of each service is lower than 100, and we provide data on cost per patient rather than cost per user of each specific service.

Data analysis

Data were coded and analysed using the Statistical Package for the Social Sciences (SPSS 18.0). Data on variables are presented as means and standard errors. Costs are estimated as means. Statistical tests on differences between proportions were carried out using chi squared tests. The threshold for statistical significance was $p < 0.05$. Tests for normality and homogeneity of variance are carried out using the Smirnov-Kolmogorov (sktest) in *Stata Version 11*.

To identify the cost drivers for direct costs only, we estimated an Ordinary Least Squares regression² of logged costs on the number of hospital nights, number of GP visits, number of

²Cost data are generally highly skewed and with a non-constant variance. In that case, the ordinary least squares (OLS) regression may give biased estimates. Therefore it is preferable to use the log of costs and proceed with the OLS model. It can be argued that a more sophisticated model such as GLM should be estimated, but in practice, the choice of statistical model may not matter too much and results are fairly robust to model choice.

outpatient visits, number of day visits, other treatment costs (e.g. nurse, physiotherapy). We also controlled for Medical Card holders (persons in Ireland with free health care), health insurance expenditure, age and gender. In estimating the cost drivers for total costs, we also included the variables time off work, informal care and state benefits.

The variables are estimated as coefficients within the regression, so each estimate corresponds to the direction and magnitude a variable has on overall costs. For example, the higher the coefficient, the higher the effect of costs on the dependent variable. Another useful way to interpret these results is to look at the percentage effect on costs, this is achieved by taking the exponential of each coefficient from the regression results.

Results

Health Service Utilisation

In Table 2, we provide summary data regarding intensity of service use. Most of the sample had accessed pain-related outpatient hospital services (92%) and contact with their GP (91%) in the previous 12 months. About 25% had a visit as an inpatient to hospital, and 17% had attended hospital as a day patient. Almost one third had visited A & E.

There were no significant differences between utilisations for males and females or different age groups. However, the number of GP visits was significantly greater among those having both a medical card and private health insurance, compared with those who did not have these ($p = .024$). Results are reported as the average number of days in hospital and average number of visits as an outpatient, A & E patient, GP patient or day patient. The range

DUNN, G. 2003. Describing, explaining or predicting mental health care costs: a guide to regression models. Methodological Review. *British Journal of Psychiatry*, 183, 398-404.

includes zero number of days – i.e. the average is calculated from all 100 patients even if they did not use that health service.

Table 2

(a) Costs of health services utilization (Direct Costs)

Total direct costs and average direct cost per patient are provided in Table 3. Overall, the total direct costs for respondents were €736,950 and average cost per patient was €7,369.

The majority of direct costs were due to inpatient and outpatient hospital care, at 44% and 18.7% of total direct costs respectively. Other large direct costs included GP (5.8%) and day patient services (3.3%). Prescription costs amounted to 11.9% of total direct costs.

The CSRI also asks for extra costs such as transport, modifications to home, special equipment and any other costs. Total expenditure in these areas in the previous 12 months was €27,500 (3.7% of total direct costs). Health insurance was another relevant cost for people in Ireland and respondents reported a total cost of €29,876 (4% of total direct costs).

Table 3

(b) Indirect costs. In Table 4, we show that there were 2017 lost work days, with a mean of 20 days per patient costing €3,529 per patient, and representing 25% of total costs. There were 398 days of informal care for 19% of the sample in the previous 12 months for the sample, at a cost of €69,650. This amounts to 8% of total indirect costs. State benefits were about half of all indirect costs. Overall, we estimated the total indirect costs as €898,290.

Table 4

c) Variations in cost

In order to establish the main cost drivers for people with severe chronic pain, Ordinary Least Squares (OLS) regressions were conducted to identify statistically significant factors associated with costs. First the log of costs were derived, as generally costs follow a non-normal distribution. The Smirnov-Kolmogorov tests proved that costs are non-normal and the skewness is reduced once we calculate log of costs³. For direct health costs, we found that hospital inpatient stays, day visits, outpatient stays, A & E costs, were the main health service cost drivers (Table 5). Home help was also statistically significant. Health insurance had a significant marginal cost. Females were more likely to have higher costs but since the sample had a higher proportion of females overall there may be sampling bias.

When we analysed both direct and indirect costs together, we found that lost days from work and state benefits did significantly impact on costs, while the same direct costs (inpatient

stays, outpatient visits, health insurance) remained significant. These OLS models explain a large variance in costs ($r^2=0.85$ and $r^2= 0.86$ for direct and indirect costs respectively). In this model, we wished to estimate marginal effects, hence included all the explanatory variables. In theory, the r^2 is likely to be more about 0.30, explained by factors such as age and gender.

In terms of percentage effects, we can approximately interpret these results to show that a one unit increase in hospital nights is associated with a 5% increase in costs, or a one unit increase in outpatient attendance is associated with a 2.4% increase in costs⁴. A one day increase in time off work is related to almost 1% in total costs – based on this sample of clinic pain attendees, if one day per person of work absence was avoided, the economy would save €10,000. Assuming an average of 20 days off work per patient annually, and if 4% of the population have severe chronic pain, this amounts to €360 million per year, almost 1% of GDP.

³In the SK tests, $p<0.05$ for both direct and total costs, and $p=0.2059$ and $p=0.1933$ for log of direct and total costs respectively.

⁴Since the data are not normally distributed and transformed to logs, it is necessary to back transform using the Duan (1983) smearing estimator. Results are available from authors – the percentage effects are slightly lower, so the coefficients here may be viewed as a slight over-estimate.

Table 5 and 6

5. DISCUSSION

Our results indicate a significant cost of over €1,600,000 for all 100 chronic pain clinic attendees in the previous 12 months. The hospital costs were the main driver for health care utilization costs, at €3,244 per patient or over €300,000 in total. To put our estimates into the context of overall health costs in Ireland, we applied prevalence estimates of severe chronic pain to the cost data to obtain an overall cost of severe chronic pain in the population. The Breivik (2006) study suggests chronic pain affects 13% of the adult population, but this is probably a conservative estimate as it does not include children and it uses a 6 month pain duration criterion rather than the 3-month criteria used in the IASP definition. More recently, the overall prevalence of chronic pain in Ireland was estimated at 36% across all levels of pain severity (Raftery, M. et al., 2011). However, our pain clinic population were intensive service users. Breivik et al. (2006) found that 31% of those in Ireland with pain rated themselves in the range 8-10 on a 0-10 pain intensity scale, conservatively 12% were taking opioids (which would indicate severe pain), and 13% had seen a pain specialist. Using these figures we conservatively estimate that 1.7% to 4% of the Irish population has pain at a level that would make them similar to our pain clinic population. By extrapolating our calculated cost per pain clinic attendee of €16,352 to the number of people with severe chronic pain (4%), we estimate the costs at approximately €2.5 billion. This amounts to about 1.2% of GDP. This proportion of GDP is lower than that obtained by Raftery, M. et al. (2011) but in their paper they focused on all prevalent cases at a lower cost of €5,600 per patient, whereas now we focus on the 4% with severe pain and at a much higher cost per patient. In their study, the cost per patient with most severe pain (Grade 4 pain) was €10,454, lower than our estimate but we have also included an estimate for informal care costs and in general the level

of costs are higher for our sample of chronic pain clinic attendees with more severe chronic pain.

These findings have important implications for pain management and policy and suggest a possible cost benefit of early intervention in pain management, in order to avoid substantially higher costs among those who transition from acute to chronic pain. It is thus important to assess the effectiveness of early interventions and to target risk factors for prolonged pain (Phillips et al., 2008).

While our study was targeted at those attending a specialist pain management service rather than the general population of chronic pain patients, it is interesting to compare our sample with the sample in the Pain in Europe survey (Breivik et al., 2006). In that survey, 43% were working full time, compared to 14% in our sample. In Australia, Kerr et al., (2004) found that less than 20 % of chronic pain clinic attendees were employed. Our rates are more comparable to the latter study, since both focus on pain clinic attendees who are more likely to be at the higher end of the pain spectrum with a concomitant higher probability of not being able to work. Breivik et al. (2006) found that in Ireland, 83% of patients went to their GP, similar to that proportion found in our study. In Australia, Kerr et al. (2004) showed that 94 % visited their GP, 22 % went to A & E and 20% had an inpatient stay. In comparison to the general profile outlined by Breivik, Kerr show that the clinic attendees are more intensive users of health care services overall. We showed similar estimates from our sample of chronic pain clinic attendees.

The average number of hospital inpatient days over the previous 12 months was 4.18. This is considerably higher than the figure of 0.46 days found by Blyth et al. (2004) in Australia and

0.3 days by Eriksen et al. (2004) in Denmark – but both of their samples were from the wider population of chronic pain sufferers. Blyth et al. (2004). reported 10.7 GP visits, similar to our figure of 10.6 visits. Their A & E attendance rate was 0.85 visits, similar to our finding of 0.93 visits.

We found that the mean number of lost work days was 20 days in the previous year – this is consistent with the findings of Breivik et al. (2006) whose pain patient sample had lost an average of 9.5 days in the previous six months. This estimate indicates the need to get people who suffer from chronic pain back to work as soon as possible. Indeed there has been emphasis on “presenteeism” or reduced productivity while at work. Our data did not provide good estimates of self-reported reduced hours of productivity but it has been estimated that in Australia at least a further eight days of work per patient are lost in the year, due to “presenteeism” (Access, 2007).

It is useful to compare our cost estimates to those obtained in other studies, particularly in an Irish setting. A study by Sheehan et al. (1996) used a sample of 95 patients from a Pain Clinic in Dublin to estimate the cost of chronic benign pain. Focusing on loss of earnings, social welfare payments and the cost of health care, Sheehan et al. (1996) concluded that the costs were significant. For example, they found that up to the time of referral to the pain management programme, 95 patients had cost £1.9 million (€4.64 million in 2008 prices) in health services, social welfare payments and loss of earnings. This important study identified the enormous indirect costs of chronic pain in Ireland [lost earnings were about 50% of total costs]. It is difficult to make direct comparisons with our study, however, since Sheehan et al. focused on all costs up to time of referral, whereas we focused on costs over 12 months in total.

The reduced quality of life experienced by people as a result of chronic pain is a very important consideration, however, it is an intangible cost and is very difficult to quantify in economic terms. Breivik et al. (2006) found that two thirds of people were less able or unable to sleep because of their pain. Half of the people found walking and household chores difficult because of pain. One fifth was diagnosed with depression as a result of their chronic pain. Kerr et al. (2004) and Becker et al. (1997) showed that patients attending chronic pain clinics report very low quality of life. Our study did not ask questions about quality of life and therefore it is beyond the scope of the study to analyse associated costs. Previous research on the impact of fractures on quality of life found a mean reduction in quality of life of 0.17, 0.26 and 0.06 for hip, vertebrae and Colles' fracture patients, respectively. Eichler et al. (2004) in Sweden assumed that the societal value of a full quality of life year (QALY) is €66,000. Therefore, their estimate of the value of lost quality of life for a hip fracture is €11,220. Chuck et al. (2009) measured pain patients' "willingness-to-pay" for reduced pain intensity and/or improved disability in the context of a specialised pain centre. They found that the morbidity associated with severe chronic pain is worth \$1,428 for every month in the chronic pain health state.

Kronberg et al. (2009) use a similar approach to our analysis, to assess the impact of factors on costs for patients that are on a waiting list to attend a pain clinic. Our study focused specifically on patients who are already attending the clinic. In their analysis, they did not include the impact of health care utilization on cost, hence it is difficult to compare results. They did however find that age and duration of pain were significant indicators, both leading to an increase in overall costs. In comparison to our study, Kronberg et al. (2009) explain 8 % of variation in their model, clearly indicating the need to control for a range of other factors

in their analysis. We have attempted to control for as many observed variables as possible in our analysis. There may be further unobserved characteristics between individuals that could help explain more variation in the cost. A follow up study on chronic pain would help identify such unobserved effects and should be considered for future studies on chronic pain.

There are a number of limitations to our study. First, unlike other health care systems (for example in the UK) there is no comprehensive database with reference costs in Ireland. The costs provided in Table 3 are taken from several sources, including expert opinion and provide the best available unit costs. Second, the sample size is quite small to provide accurate estimates in the explanatory model. A sample size of at least a few hundred would be preferable for estimation with precision in economic models and this should be borne in mind for future research on costs of chronic pain. This would provide even greater detail on the cost drivers in total costs for chronic pain clinic attendees. Third, previous research in Australia showed that pain-related legal claims, increased to \$120,000 million between 1991-1992 and 1995-1996 (Access, 2007). While we know that 18% of our sample had claims in process, we do not know the monetary value of the outcomes, hence we do not report costs of claims in this study.

In addition, the data has been collected via retrospective self reports over the previous 12 months and hence may suffer from recall bias. Patel et al. (2005) found that while frequency of GP visits was collected accurately, the duration was underestimated. For more accurate recording of data, objective methods such as routine data are more preferable. Alternatively, data could be collected prospectively using a diary system to record health service utilisation.

6. CONCLUSION

The cost of chronic pain amongst intensive service users is significant and our study shows a cost per patient of €16,352 over a 12 month period. In terms of overall resource allocation, the impact is significant, with total population costs estimated at 1.2% of GDP. While our study has some limitations, it makes a significant contribution to knowledge of costs of chronic pain in Ireland.

These data are important for health service resource allocation and suggest that early interventions and programmes focused on self-management are necessary so that patients who have severe chronic pain become less reliant on health care services.

Direct costs were responsible for the greater part of the overall cost in this population. In particular, hospital stays were extremely expensive. Alternative treatment models should be considered. Indirect societal costs were also substantial, amounting to €898,290 including lost productivity due to days off work and informal carers' days off work.

In conclusion, the societal economic cost of chronic pain is significant, particularly for those who are intensive health service users. This study highlights the costs involved with each day of work lost per chronic pain sufferer and indicates the need to target vocational rehabilitation at this group. Furthermore, cost effectiveness analyses of these interventions are recommended and necessary in future research on chronic pain management and intervention.

Table 1: Sample Characteristics

| | N |
|----------------------------|----|
| Male | 30 |
| Female | 70 |
| Age <65 | 79 |
| >65 | 21 |
| Primary education | 26 |
| Secondary education | 46 |
| Third level education | 28 |
| Full time | 14 |
| Part time | 11 |
| Work at home | 3 |
| Unable to work due to pain | 37 |
| Early retired | 13 |
| Student | 1 |
| Retired | 19 |
| Medical Card | 77 |
| Health Insurance | 31 |

Note in some cases figures do not add to 100 – for example, some patients have both medical card and private health insurance. In 2 cases, data were missing on education and work status.

Table 2: Mean frequency of patient health service utilisation (with standard error)

| | Hospital Inpatient (N days) | Outpatient (N days) | A & E (N visits) | GP (N visits) | Day Patient (N Visits) |
|--|-----------------------------------|------------------------|---------------------|------------------|---------------------------|
| All | 4.18 (1.16) | 8.24 (1.19) | 0.91 (0.18) | 9.54 (2.48) | 0.47 (0.14) |
| Male | 4.23 (2.30) | 6.5 (1.79) | 0.83 (0.30) | 7.83 (2.02) | 0.50 (0.34) |
| Female | 4.16 (1.31) | 8.9 (1.53) | 0.94 (0.23) | 10.6 (3.1) | 0.46 (0.50) |
| Age <65 | 4.44 (1.27) | 8.67 (1.46) | 0.86 (0.20) | 5.5 (1.5) | 0.53 (0.17) |
| Age >=65 | 3.19 (2.79) | 6.61 (1.57) | 1.09 (0.41) | 5.52 (1.51) | 0.24 (0.12) |
| Medical Card | | | | | |
| Yes | 5.09 (1.47) | 7.75 (1.35) | 1.01 (0.23) | 11.79 (3.34) | 0.53 (0.18) |
| No | 1.13 (0.83) | 9.86 (2.61) | 0.56 (0.21) | 5.47 (1.44) | 0.26 (0.16) |
| Health Insurance | | | | | |
| Yes | 3.96 (2.14) | 9.59 (2.40) | 0.90 (0.22) | 17.34 (10.2) | 0.25 (0.13) |
| No | 4.31 (1.45) | 7.84 (1.37) | 1.04 (0.30) | 8.28 (1.11) | 0.56 (0.19) |
| Both Medical Card & Health Insurance | | | | | |
| Yes | 5.66 (3.66) | 7.53 (2.76) | 1.20 (0.48) | 24.33 (15.54) | 0.33 (0.18) |
| No | 3.91 (1.21) | 8.36 (1.32) | 0.86 (0.19) | 7.85 (1.03) | 0.49 (0.16) |

Table 3: Direct medical costs

| | N visits | Cost per visit/ € unit costs(2008 prices) | Total cost(€) | % of total direct costs | Average cost per chronic pain clinic attendee (€) |
|-----------------------------------|-------------|--|----------------|----------------------------|--|
| Hospital inpatient | 418 | 776 | 324,368 | 44% | 3,244 |
| Outpatient | 824 | 167 | 137,608 | 18.7% | 1,376 |
| GP | 954 | 45 | 42,930 | 5.8% | 429 |
| Day patient | 47 | 663 | 31,161 | 4.2% | 312 |
| A & E | 91 | 264 | 24,024 | 3.3% | 240 |
| Home Help | 572 | 20.5 | 11,726 | 1.6% | 117 |
| Physiotherapy | 386 | 15 | 5,790 | 0.8% | 58 |
| Ambulance | 15 | 83 | 1,245 | 0.2% | 12 |
| Psychologist | 29 | 46 | 1,341 | 0.2% | 14 |
| Occupational therapy | 29 | 30 | 900 | 0.1% | 9 |
| Practice Nurse | 24 | 18 | 435 | 0.1% | 4 |
| Social Worker | 18 | 30 | 540 | 0.1% | 5 |
| Public health nurse | 13 | 18 | 231 | 0.02% | 2 |
| Chiropractor | 22 | 62.5 | 1,375 | 0.1% | 11 |
| Acupuncture | 67 | 62.5 | 4,187 | 0.6% | 33 |
| Homeopath | 8 | 50 | 400 | 0.1% | 4 |
| Extra requirements (11 people) | | | 27,500 | 3.7% | 281 |
| Health Insurance (25 people) | | | 29,876 | 4.1% | 299 |
| Prescription costs | | | 87,597 | 11.9% | 875.97 |
| Total Direct Cost | | | 736,950 | 100% | €7,369 |

Table 4: Indirect Costs

| | N Days | Mean (S.E) | Total Cost € | % of total indirect | Cost per patient € |
|-----------------------------|--------|-------------|----------------|---------------------|--------------------|
| Lost productivity | 2017 | 20.2 (7.46) | 352,975 | 39% | 3529 |
| Informal Care | 398 | 3.9 (1.89) | 69,650 | 8% | 696 |
| State disability benefits | - | - | 475,665 | 53% | 4,757 |
| Total Indirect Costs | | | 898,290 | 100% | 8,983 |

Table 5 Factors associated with costs: OLS regression of Logged Direct Costs

| | Direct Costs |
|--|---------------------------------|
| Hospital visits | 0.0514** (0.0045) |
| GP Visits | -0.0027 (0.0022) |
| Outpatient visits | 0.0242** (0.0059) |
| Day visits | 0.1665** (0.0299) |
| Ambulance | 0.1574 (0.0979) |
| A & E | 0.0886** (0.0264) |
| Practice Nurse | -0.0413 (0.0613) |
| Home help | 0.0079** (0.0029) |
| Social worker | -0.0030 (0.0673) |
| Psychologist | 0.0372 (0.0384) |
| Psychiatrist | 0.0261 (0.0491) |
| Occupational therapy | -0.0101 (0.0528) |
| Physiotherapy | 0.0261 (0.0491) |
| Alternative treatment | 0.0257 (0.0149) |
| Other treatment costs (public health nurse, adaptations to home) | 0.1049 (0.0911) |
| Lost Days Work | n/a |
| Social welfare benefits for disability | n/a |
| Days off work by informal carers | n/a |
| Medical Card Yes (Reference: No) | 0.0233 (0.1178) |
| Health Insurance Yes (Reference: No) | 0.0003** (0.0001) |
| Gender Female (Reference: Male) | 0.2306 (0.0948) |
| Age Under 65 (Reference:65 and over) | -0.1037 (0.1033) (0.1847) |
| Constant | 7.404** (0.1366) |
| N Observations | 100 |
| R ² | 0.8577 |

** $p < .05$ Estimates are presented as coefficients (e.g. magnitude of effect in this log OLS model) and standard errors are in parenthesis

Table 6 Factors associated with total (direct and indirect costs): OLS regression of logged total costs

| | Both Direct and Indirect |
|--|--------------------------|
| Hospital visits | 0.0346** (0.0048) |
| GP Visits | -0.0043 (0.0024) |
| Outpatient visits | 0.0169** (0.0042) |
| Day visits | 0.1053** (0.0319) |
| Ambulance | 0.0251 (0.0931) |
| A & E | 0.0334 (0.0284) |
| Other treatment costs (includes all services with less utilisation, adaptations to home) | 0.2668** (0.0961) |
| Lost Days Work | 0.0061** (0.0006) |
| Social welfare benefits for disability | 1.2463** (0.1044) |
| Days off work by informal carers | 0.1431 (0.1020) |
| Medical Card Yes (Reference: No) | -0.1305 (0.1201) |
| Health Insurance Yes (Reference: No) | 0.0001** (0.0001) |
| Gender Female (Reference: Male) | 0.0723 (0.1006) |
| Age Under 65 (Reference:65 and over) | -0.1910 (0.1268) |
| Constant | 7.998** (0.1896) |
| N Observations | 100 |
| R ² | 0.8646 |

** $p < .05$ Estimates are presented as coefficients (e.g. magnitude of effect in this log OLS model) and standard errors are in parenthesis

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