The Economic Costs of Health Service Treatments for Asbestos-Related Mesothelioma Deaths

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ABSTRACT: **This article explores the complex and neglected picture of occupational and environmental disease healthcare costs specifically relating to asbestos. Diagnosed mesothelioma cases in Scotland in one calendar year were used to investigate the subject in greater depth. Data from UK sources on asbestos disease types recorded in 2000 and their disease treatment costs were obtained. Acute care economic costs of these diseases are estimated. One hundred and twenty diagnosed, recorded, and treated cases of asbestos-related diseases occurred in 2000 in Scotland. Mesothelioma accounted for 100 cases and directly cost Scottish National Health Service hospitals an estimated £942,038. The estimated UK figure in 2000 was at least £16,014,646 because official figures for diagnosed and recorded deaths from mesothelioma are running at over 1700 a year with rises predicted for 2010 of 2000 deaths. By 2003, 50,000 people in the UK had died from diagnosed and recorded mesothelioma since records began. Earlier disease treatment costs would have been significantly lower than those in 2000 but, at 2000 prices, cost to the UK was roughly £471,019,000 in acute hospital expenditure. Figures for primary care costs, including caregiver costs, are incomplete or unknown. These disease costs are substantial and have some international generalizability.**

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Treatment patterns and costs vary greatly. Many lung cancer cases due to asbestos exposure occur globally for each mesothelioma case. Hence figures provided in this article are certain to be gross underestimates of the total health service and personal economic costs of asbestos illness and treatment in Scotland.

KEYWORDS: asbestos; mesothelioma; hospital economic costs; health care costs

INTRODUCTION

The article is not concerned with the narrow health economics argument that those who die relatively quickly from a terminal illness may save the health service money. Such arguments are of limited value in their own terms because mesothelioma treatment and care costs are significant and will continue to rise over several decades. Older not younger people are the largest group affected by mesothelioma, which often has a latency period of four decades or more. Hence there will be few savings on health costs through younger people dying earlier, and such arguments are morally indefensible. The article is concerned with social justice issues surrounding those who suffer asbestos-related environmental diseases, the costs of such diseases to society, who does and who should pay those costs.[1,2] In 1993 two Harvard researchers felt able to state categorically that until the precautions and studies for asbestos substitutes were adequate: "there is no known substitute for chrysotile asbestos that, if properly applied, is *known* to be safe"[3] (p. 206). Yet the "proper" use of a carcinogen cannot be guaranteed in industrial, commercial, and domestic sites and the exposures and economic costs of asbestos-related diseases are likely to continue and, in some parts of the world, will increase significantly in line with usage or imports of material.[4]

Asbestos-related diseases have been described in the scientific literature for many centuries and include mesothelioma of the pleural cavity and lung cancer. The precise categorization and causation of such diseases has taken longer and there is some debate now about whether asbestos has been conclusively linked to laryngeal and pharyngeal cancer, colon cancer, and uterine cancer.[5] Despite these continuing areas of uncertainty, the economic costs of mesothelioma and asbestosis to society have not been fully calculated. In contrast, insurance companies since early in the 20th century have indicated the potentially prohibitive but rarely fully realized financial costs of worker compensation due to these very diseases, with one company statistician recommending that asbestos workers should not be insured in 1918 because the hazards they faced were too high.[6] Economic theory would suggest that, where the costs of a health hazard are not fully known and where an industry is allowed to externalize these costs, it will operate on an appropriately large scale. Specifically such an industry will tend to expand full costs of the hazards they impose on the workforce.[7]

French researchers have argued that the "no threshold" level for asbestos has led to "very expensive clean up operations that may have been counter-productive"[8] (p. 49). Nowhere do they document either the basis for the economic costing of this assertion or the economic and human costs of recorded asbestos diseases. Few studies from any countries have touched on the hospital or health service economic costs of this disease.[9] Others have concentrated on the costs of preventing asbestos-related disease.[10,11] In the United States in 1987, one small study attempted to work out medical costs faced by asbestos victims using research from 1975 on an average respiratory cancer case and adjusting upwards at 1984 prices. The figure per case was calculated at $18,834, and the estimate assumed no medical advances that prolonged life, cured asbestos-related diseases, or enabled physicians to separate asbestos-caused lung cancers from lung cancers due to other causes.[12] The sum computed for asbestos lung cancer treatment costs based on Selikoff's and others figures was over $3 billion in 2000 rising to just under $5 billion in 2015.

The human costs of asbestos-related diseases have been enormous in terms of physical and emotional pain of those with these diseases and the impacts on their families and caregivers. Secondary to this must be consideration of the economic and social consequences of such occupationally caused or occupationally related diseases. If such costs are adequately worked out, and if those responsible for generating those costs in society are fully penalized for the consequences of their activity along the lines of the "polluter pays principle," this may help to drive the prevention agenda. The UK Health and Safety Executive (HSE) estimated in the 1990s that around the equivalent of one year's growth in the UK economy at that time was lost due to occupational accidents and ill-health.[13] Other studies within Europe and in Australia have revealed a similar picture.[14,15] Following these reports, the HSE argued persuasively that "good health was good business" because occupational diseases cost companies money due to lost production, replacement labor and training costs, compensation claims, and the like.[16] In 2002, economist Joseph Stiglitz estimated that the "asbestos litigation crisis" has cost the American economy tens of thousands of jobs and reduced pensions for employees at bankrupt firms by 25% on average. Some 61 companies have gone bankrupt as a direct result of asbestos liabilities.[17] Hence the workforces exposed to asbestos may face quadruple jeopardy: from disease, from job losses; from reduced pensions; and from no or low compensation due to company liquidation or selling off of assets. In the UK: " one in every hundred men born in 1940s will die of malignant pleural mesothelioma which is almost exclusively a consequence of exposure to asbestos with a lag time that is rarely less than 25 years and often more than 50 years from first exposure"[18] (p. 237). In 2003, there were over 1800 mesothelioma deaths of men and women, and these figures will increase. The care and treatment implications for cardiothoracic surgeons of these figures, with regard to asbestos exposures that continued up to 1980, are considerable.[18] Direct occupational exposures to asbestos continued after

1980 and will continue for many maintenance and support workers in buildings containing asbestos as well as for others working in such buildings and being incidentally exposed for example, health workers in hospitals, teachers, cleaners.

Evidence indicates that in the United States asbestos companies were aware from the 1940s onwards that asbestos killed their workers.[19] Some companies also recognized that they would save money, presumably in terms of pensions, sick pay, and compensation, if they permitted asbestos workers to "work until they dropped dead"[19] (p. 581). In the UK, the funds set aside by government and companies to compensate and help support those workers with asbestos-related disease were minute when compared to the companies' profits. Turner and Newall spent just over £57,000 on compensating registered asbestos victims in addition to £15,690 on worker medical examinations between 1931 and 1948 versus £15 million profits in the same period although they did sometimes cover sanatorium costs on a no prejudice basis.[20] In the UK, campaigners found an unsatisfactory economic and legal positions existed for those with asbestos-related diseases.[1] Writing in 1995, one campaign group noted, "At the Asbestos Victims Support group we offer victims emotional and practical support. Asbestos victims do not want charity or sympathy. They have been denied the right to a happy and healthy retirement. They have been disabled by a material they were told was safe until quite recently by the government Factory Inspectors. That same material is now killing them. Victims often feel a great deal of bitterness. They find it extremely difficult to gain a state social security pension. Legal aid changes have made it increasingly difficult to obtain civil compensation without risking life savings or family homes"[21] (p. 109).

METHODS

The study has drawn on national statistics provided by the Information and Statistics Division in Scotland (ISD), the Office of National Statistics, UK (ONS), the General Registry Office in Scotland (GRO [S]), and HSE publications, costing provided by Scottish Government departments and additional information from those involved with treating and caring for asbestos victims to estimate the current incidence of mesothelioma, the health service resources consumed while treating the disease, and associated economic costs.

GRO(S) death records were consulted to identify our sample, that being all deaths in Scotland during the year 2000 where mesothelioma was the primary or contributory cause of death. GRO death records for 2000 used the tenth version of the *International classification of diseases and related health problems, tenth revision* (ICD10) to code mesothelioma (C45.0–C45.9) (Table 1).

The Scottish Morbidity Record (SMR) is an official database produced by ISD Scotland where information regarding all admissions to Scottish hospitals (day case and inpatient) including patient demographics and clinical details

TABLE 1. ICD10 codes for mesothelioma

Code	Condition
C45.0	Mesothelioma of pleura
C45.1	Mesothelioma of peritoneum
C45.2	Mesothelioma of pericardium
C45.7	Mesothelioma of other sites
C45.9	Mesothelioma, unspecified

relating to the patient's hospital stay is registered. Additional information stored on the SMR database includes the medical specialty under which the individual received care (defined as the division of medicine covering a specific area of clinical activity), type of admission (i.e., booked, transfer, emergency), length of stay (days), diagnosis, and any operations performed. All SMR records for our study sample were extracted from the Historic SMR1 (General/Acute Inpatient and Day Case records 1981–March 1997) and the COPPISH SMR01 (General/Acute Inpatient and Day Case records April 1997 onwards) by a statistician at ISD Scotland. A unique link number was allocated to all records relating to the same patient so that it would be possible to identify individual cases. Each individual's SMR records were then assessed to determine when they were first diagnosed with mesothelioma and all related treatments received concerning the disease from time of diagnosis until death. Time of diagnosis was defined as: (*a*) the first hospital admission date in the SMR database where the primary or secondary medical condition managed/investigated during the patient's stay was mesothelioma; and/or (*b*) the date the cancer (malignant mesothelioma) became formally known to the National Health Service (NHS) and was added to the cancer records.

An estimate of the NHS costs of treating mesothelioma in Scotland was then performed. ISD Scotland collects annual data on the cost of providing health care in Scotland and publishes the results in the "Scottish Health Services Cost Book." Statisticians at ISD Scotland provided figures on the specific costs per day for hospital inpatient and day case care for various medical specialties from the Scottish Health Services Cost Book, year ended 31st March 2001 (NHS Scotland) (Table 2). These costs are inclusive of all direct costs associated with hospital admissions including medical, nursing, pharmacy and professions allied to medicine (PAM) staff, drugs, equipment, supplies, and laboratory costs. Other allocated costs such as administration, catering, linen and laundry, portering, heating, cleaning and property maintenance are also included. The total healthcare costs for each subject were then calculated using these figures.

The focus is deliberately on acute hospital costs because only sparse data exist for primary care treatments.

Ethical approval was gained for the study from the relevant University Ethics Committee.

TABLE 2. Day case and inpatient costs by medical specialty

	Cost book specialty	Cost per admission
Day case	General surgery	£351.24
	Cardiothoracic surgery	£757.94
	Medical	£310.00
	Respiratory medicine	£266.77
	Radiotherapy	£421.58
Inpatient	General surgery	£324.51
	Cardiothoracic surgery	£588.82
	Medical	£221.72
	Respiratory medicine	£187.36
	Radiotherapy	£378.27
	Geriatric assessment	£129.17
	Intensive care unit	£1,279.22
	Coronary care unit	£529.02
	General practice	£160.99

RESULTS

A total of 100 mesothelioma deaths (91 male and 9 female) were identified in Scotland during the year 2000. Mesothelioma of the pleura accounted for 60% of the deaths while 30% were classified as mesothelioma, unspecified (Table 3). However, 27 of the 30 cases with unspecified mesothelioma as the main cause of death had been previously diagnosed and/or treated for pleural mesothelioma. Coding of these deaths as unspecified mesothelioma therefore suggests an underestimation of the true number of deaths from pleural mesothelioma.

While the cases were distributed widely across Scotland geographical areas where significant numbers would have worked in the shipyard industry, including Clydebank, had higher numbers of recorded cases. Specifically, the highest number of deaths occurred in Greater Glasgow and accounted for 22% of the total mesothelioma mortality in Scotland during the year 2000.[22]

Occupation and socioeconomic status were recorded for 97 of the 100 cases and classed as "not stated" in the remaining three cases. However, because occupational work histories are not available, these do not provide as useful a data set as would be hoped for. People may have changed jobs and managers may

TABLE 3. Mesothelioma deaths in Scotland during the year 2000 ($n = 100$)

Cause of death	Males (n)	Females (n)	Total (n)
Mesothelioma of pleura	53	7	60
Mesothelioma of peritoneum	4	0	4
Mesothelioma of other sites	5	1	6
Mesothelioma unspecified	29	1	30

TABLE 4. Sample occupations of those dying from mesothelioma in 2000 in Scotland (GRO codes)

Occupation	Numbers
Carpenters and joiners	12
Cleaners, domestics	2
Computer analyst, programmers	1
Construction and related operatives	4
Medical practitioners	1
Metal working production and maintenance fitters	12
Nurses	1
Postal workers, mail sorters	3
Primary and nursery teaching professionals	1
Rail transport inspectors, supervisors, guards	2
University professionals	1

have worked in shipbuilding and engineering or other occupations where exposure could have occurred. What is incontrovertible is that shipyard workers and other engineering workers do of course still provide the majority of mesothelioma cases. The highest incidence of mesothelioma deaths was observed in carpenters and joiners and metal working production and maintenance fitters (Table 4). Analysis of socioeconomic status of the sample revealed that the largest proportion, 55 of the 97 (57%) were classed as IIIM (skilled manual) (FIG. 1).

Time of diagnosis, defined as the date the malignant mesothelioma was formally made known to the NHS and entered in the cancer records was available for 46 of the 100 cases. Time of diagnosis for the remaining 54 cases was estimated from the date of the first hospital admission where the main medical condition managed or investigated during the patient's stay was mesothelioma. Seventy-three cases were diagnosed as mesothelioma of the pleura. Nineteen cases were diagnosed as other types of mesothelioma (other sites, unspecified and peritoneum) and eight cases were diagnosed as other respiratory illnesses.

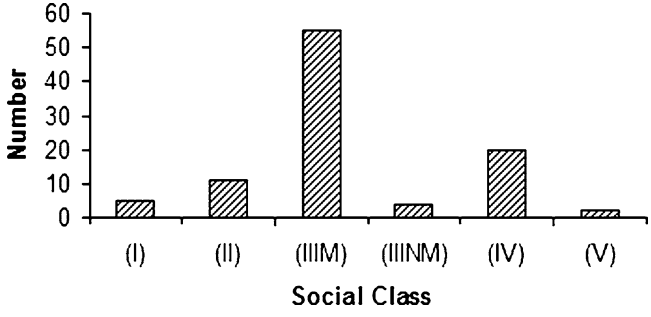

FIGURE 1. Socioeconomic breakdown of the study sample ($n = 97$).

TABLE 5. Total number of days of hospital treatment and total costs of hospital treatment for the 100 cases from diagnosis until death

	Number of days of treatment	Cost
Day cases	103	£ 35,073
Inpatients	3,285	£ 906,965
Total	3,388	£ 942,038

The mean (SD) age at diagnosis was 68.5 (9.2) years for males and 72.8 (10.3) years for females.

HOSPITAL COSTS OF MESOTHELIOMA

The total estimated cost of hospital care for the 100 individuals in Scotland who died in 2000 from the asbestos-related disease, mesothelioma, came to £942,038 of which £35,073 relates to day cases and £906,965 relates to inpatient treatment. The total number of days of hospital treatment from diagnosis until death for the 100 individuals was 3388 (Table 5).

DISCUSSION

The Primary Care Sector

Data for primary care treatments are not readily available. Health Boards do not have data readily to hand on the total costs of treating asbestos-related diseases in acute, primary care and palliative settings. Other costs including primary medical care or general practitioner (GP) costs, practice nurses, and pharmaceutical costs are very high but are not included in our costing. The polypharmacy regime required for an individual mesothelioma patient can exceed £500 per month depending on the patient needs/program.

Palliative Care

Those working in palliative care indicate that in patient bed days for such patients is around £223-18 and home care visits cost is around £64.

UK and Great Britain Wide Figures for Economic NHS Mesothelioma Treatment

The following provide some crude estimates of that cost. In 2000, there were 100 diagnosed, recorded, and treated cases of asbestos-related mesothelioma in

Scotland. Their hospital and NHS day hospital costs totaled £942,038. By 2003, 50,000 people had died just from diagnosed and recorded mesothelioma.[23,24] Earlier disease treatment costs would have been significantly lower than those in 2000 but in terms of figures at 2000 prices, this totals roughly £471,019,000 in acute hospital costs. The official figures for UK and Great Britain diagnosed and recorded deaths from mesothelioma are running at over 1700 a year (2003) with rises predicted for the year 2010 of 2000 deaths. These figures are almost certainly underestimates particularly because most existing projections assume that inflation in the NHS is likely to run between 4% and 9% over the next years.[25] As lung cancer deaths due to asbestos kill at least twice the number of people who die from mesothelioma and asbestosis deaths, the economic costs just to UK hospitals of asbestos are enormous.

Additionally the costs of treating other asbestos-related diseases such as cancer of the pharynx and larynx, cancer of the colon, and cancer of the kidney for which industrial disease compensation has been granted to asbestos-exposed workers in Canada, will not be recorded. This is because the means available to identify such causes have been limited or nonexistent. Hence the economic costs of treating those made ill by asbestos in Scotland are grossly underrecorded here. Nevertheless, the picture is very grim. With mesothelioma and asbestosis alone, the costs of NHS treatment are enormous and will continue to be so over coming decades.[26] Those paying for the NHS therefore cover the costs of employers who have profited from selling and using asbestos. Victims and their families, along with the public, will pay a disproportionate amount of such treatment costs.

The numbers of people with asbestos-related diseases within Scotland are difficult to estimate. Even where there is little doubt about the etiology of diseases, such as asbestosis or mesothelioma of the pleural cavity caused by asbestos exposure, data in the past have been patchy. This has been partly due to the disease recording process, in some instances diagnosis and in some instances disease classification or a combination of all three. ICD did not specifically identify asbestos-caused mesothelioma cases. It is not possible therefore to assess accurately the number of people with the two asbestos-related diseases in question and calculate the economic costs to the NHS of their treatment. The economic costs are accordingly seriously underestimated.

Much asbestos disease research has rightly focused on the human costs of asbestos; how to prevent or reduce asbestos exposures in the future, how to gain financial compensation and effective support and care for those with asbestos-related diseases. Germany collects information about asbestos treatment costs through its insurance schemes and the United States has similar cost data available from completed legal cases. However, the global environmental justice case on asbestos should include charging those companies for the full economic costs of treating the diseases they caused. This will be another small step for justice for the victims and the public as a whole. It may also serve to deter, through heavy economic sanctions, those in the future who think they

may kill employees and people in communities exposed to their hazardous materials and processes almost with impunity.

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CONFLICT OF INTEREST

There were no conflicts of interest in this study. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

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