

Gastroenterology in the UK: The Burden of Disease

PRISM project 9608

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Second Report

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Summary

This study was in three main parts. In the first part, citations to gastroenterology papers (GASTR) supported by the British Society of Gastroenterology and British Digestive Foundation were shown to be higher than to papers supported by other charities by a factor of about two, and higher than to papers without a funding body by a factor of about three. In the second part, citations to the 12 925 UK gastroenterology papers by US patents were examined. The GASTR papers were cited more often if they were basic rather than clinical, and if they had more authors or more funding bodies, but not if they were co-authored by different labs. The citing patents had 14% of UK inventors but only 9% of UK assignees, suggesting a relative failure of UK firms to exploit UK gastroenterological science.

The third part of the study was concerned with the burden of gastrointestinal (GI) disease. Two principal components were studied in depth: absence from work because of early death, long-term disability, and short-term illness; and NHS costs. Early deaths, mainly from cancer, are the main contributor to the first component and they cause an annual loss of production of the order of £ 2.2 billion. Long-term disability is seldom due to GI causes and may account for about £ 0.8 billion, but possibly one fifth of short-term sickness absence is so attributable and may cause losses of the order of £ 2.0 billion. The NHS costs total about £ 3.0 billion per year, of which 45% is in-patient costs, and 27% drugs dispensed under the NHS. The overall burden is thus some **£8 billion per year**, or about 1.3% of GDP. There is no evidence that this burden is declining, as it is for some other causes of illness.

1 Introduction

1.1 This forms part of the second study commissioned from The Wellcome Trust's Unit for Policy Research in Science and Medicine (PRISM) by the British Society for Gastroenterology (BSG). It was requested in a letter from Professor David Thompson dated 18 December 1996. The requirement was to estimate the economic burden of disease in the UK from gastrointestinal (GI) causes, both direct healthcare costs and the value of lost production, broken down into four components:

1. mortality and lost years of production because of early death
2. absence from work through long-term disability and short-term illness
3. morbidity costs, as revealed by Casemix data for NHS in-patients, GP consultations and other community services
4. cost of NHS prescriptions

This involved the purchase or collection of data from many different sources and their assembly to try and give an overall picture, not only of the total costs imposed on the UK by GI disease but also of the relative importance of different GI diseases within the total and, for some aspects of the burden, of its geographical distribution.

2 Method

2.1 Burden of disease: mortality and lost years.

Data on the numbers of deaths in the UK are available from the Office of National Statistics in respect of England and Wales, and from the General Register Offices in Edinburgh and Belfast in respect of Scotland and Northern Ireland, respectively. The data were obtained:

- * for three quinquennia, 1980-84, 1985-89 and 1990-94;
- * for males and females and all persons;
- * for eight age ranges:
0-14 15-19 20-24 25-34 35-44 45-54 55-54 65+
- * for each postcode area (i.e., the first one or two letters of the postcode, e.g., G = Glasgow, CB = Cambridge)¹;
- * for the principal causes of death as given in ICD9. The following gastrointestinal causes were listed:
1009 intestinal infectious diseases
150159 malignant neoplasm of digestive organs and peritoneum
530537 diseases of oesophagus, stomach and duodenum
540543 appendicitis
550553 hernia of abdominal cavity
555558 noninfective enteritis and colitis
560569 other diseases of intestines and peritoneum
570579 other diseases of digestive system
999 all other diseases.

Subsequently data were obtained on the individual sites of malignant neoplasms, as follows:

150	oesophagus	151	stomach
152	small intestine & duodenum	153	colon
154	rectum, rectosigmoid jctn & anus	155	liver & intrahepatic bile ducts
156	gallbladder & extrahepatic bile ducts	157	pancreas
158	retroperitoneum & peritoneum	159	other & ill-defined sites

for England+Wales, Scotland, and Northern Ireland, analysed by sex and age group, but not by postcode area.

In order to determine the burden of disease as a monetary cost to the UK, calculations were made of the number of “lost years” prior to age 65 for people aged 20 and over from each disease, including the individual sites of the malignant neoplasms, broken down by sex and analysed by quinquennium for the UK as a whole and by postcode area for the last 10 years (but without analysis of cancer site).

The first analysis is intended to reveal time trends in the pattern of early deaths from GI disease; the second to show the geographical incidence of different diseases. The cost burden is assumed to be equal to £ 15 000 per lost year, on the basis of average earnings.

2.2 Burden of disease: absence from work. This can be considered in two parts:

- * long-term absence, which leads to the payment of benefits by the Department of Social Security (DSS). This may be Sickness Benefit and/or Invalidity Benefit (now combined as Incapacity Benefit) - this is a contributory benefit for people who have worked but are not currently covered by an employer - or, for those who are permanently unable to work, Disability Living Allowance and/or Severe Disablement Allowance;
- * short-term absence, which is normally covered by the employer, although small firms can claim an annual rebate. It may be divided into very short-term absence, normally Self-Certificated, and other absences, for which a Medical Certificate is required (usually after one week).

The data on DSS payments are classified by underlying cause, using ICD10, and the following areas were used as indicators of GI disease:

A0009	Intestinal infectious diseases
K2031	Diseases of oesophagus, stomach and duodenum
K3538	Diseases of appendix
K4046	Hernia
K5052	Noninfective enteritis and colitis
K5563	Other diseases of intestines
K6567	Diseases of peritoneum
K7077	Diseases of liver
K8087	Disorders of gallbladder, biliary tract and pancreas
K9093	Other diseases of the digestive system
999	All other causes

Data were sought on the numbers of claimants in Great Britain in receipt of either Incapacity Benefit or DLA/SDA for the week of 29 February 1996 and of 30 November 1996, but not on the amounts paid (which are a transfer payment within the UK): it was assumed as with premature deaths that each claimant not able to work was “costing” the economy £ 15 000 per year. Data were not sought in respect of Northern Ireland: the GB figures were uprated by 2.5% to allow for people living in the Province.

For short-term absences, there is no satisfactory source of data on cause. The quarterly Labour Force Survey, in which some 25 000 adults, randomly chosen by postcode, are interviewed each quarter, contains questions related to sickness absence, and those people indicating that they were absent from work for at least one day during the previous week are asked to say if they have one of 11 primary causes of ill-health that limit their work. The one corresponding most closely to GI disease is number 7, “Stomach, liver, kidney, or digestive problems”. However, this is not the reason for the respondents’ absence from work. Most respondents are basically healthy and do not state any of the 11 primary causes. Of those who say that they have a health problem that limits their work, 3.5% attributed this to cause 7, gastrointestinal problems²

However a sample analysis of sickness absence among Wellcome Trust staff for the two years 1995-96 (n ~ 340) suggested that GI causes might be responsible for approximately 20% of both Self-Certificated and Medical Certificate absences. This is much higher than the figure from the Labour Force Survey. In order to investigate this matter further, the Labour Force Survey responses for sickness absence were specially analysed by Quantime Ltd for 14 of the last 20 quarterly surveys, covering the period March 1992 to February 1997, by the length of sickness absence reported, in the following groups: 1 to 6 days; 1-4 weeks; 1-6 months and > 6 months. However because of the large number of “did not apply” answers given by those off work for short periods, only the cause for those off work for more than six months is likely to be related closely to the actual reason for respondents’ sickness absence.

2.3 Burden of disease: morbidity. Morbidity data should be set within the overall context of the NHS costs, which fall under the following heads:

- * in-patient expenditure
- * out-patient expenditure
- * primary care expenditure (including pharmaceutical services, see 2.6 below)
- * community health services expenditure personal social services expenditure

The costs incurred by the treatment of NHS in-patients vary greatly according to the procedures used, but since the development of the National Casemix Office,

it is possible to obtain data on procedures grouped according to complexity and cost. Data were obtained for the year 1994-95, and analysed by Health Resource Groups, including:

f0107	Oesophagus	f8486	Appendix
f1117	Stomach & duodenum	f9397	Anus
f2227	Small intestine	g0108	Liver
f3137	Colon & rectum	g1118	Biliary tract
f4349	General abdominal	g2229	Pancreas
f5157	Inflammatory bowel disease	999	All other groups

The individual f and g Health Resource Groups, based on the number of cases x the non-trimmed mean number of bed-days x (1 - the proportion of day cases), give an approximate measure of the resources used in gastrointestinal procedures. The cost can be calculated by reference to the total NHS in-patient costs.

Data on the other four NHS cost components are given, for England in 1992/93, in the NHS Consultative Document, "Burdens of Disease"³. In Appendix 3, there are listed percentages of in-patient and out-patient costs attributable to each ICD9 code (or groups of codes). Appendix 4 provides data on primary care services (GP consultations), and Appendix 5 allocates the two remaining components of the NHS budget to disease categories on the basis of the OPCS Disability Surveys.

2.4 Burden of disease: cost of NHS prescriptions. Data in this category were obtained from the:

- * Prescription Pricing Authority, Newcastle in respect of England
- * Pharmacy Practice Division, Edinburgh in respect of Scotland
- * Welsh Health Information Services, Cardiff in respect of Wales
- * Central Services Agency, Belfast in respect of Northern Ireland

for the subchapters in chapter 1 of the British National Formulary, as follows:

- 1.1 Antacids
- 1.2 Antispasmodics and other drugs altering gut motility
- 1.3 Ulcer-healing drugs
- 1.4 Antidiarrhoeal drugs
- 1.5 Treatment of chronic diarrhoeas
- 1.6 Laxatives
- 1.7 Preparations for haemorrhoids
- 1.8 Stoma care
- 1.9 Drugs affecting intestinal secretions
- 999 All other classes

The data covered the Net Ingredient Cost in year 1995/96 of the prescriptions: to this must be added the dispensing charges in order to arrive at the total cost.

3 Results

3.1 Burden of disease: mortality and lost years. The table below shows the numbers of “lost years” (i.e., from age of death if 20 or over to 65) for both males and females together for each of the last three quinquennia, for each of the GI causes and all other deaths. The figures are expressed as annual losses in thousands of person-years.

Code	Cause of death	80-84	85-89	90-94	Mean	%G
1009	intestinal infectious diseases	0.4	0.4	0.5	0.4	0.3
150159	malignant neoplasms	102.1	98	91.6	97.2	65.9
	of which:					
150	oesophagus	11.4	12.5	13.7	12.5	8.5
151	stomach	23.2	19.3	15.6	19.4	13.2
152	small intestine & duodenum	1	1.1	1	1	0.7
153	colon	26.7	26.5	24.3	25.8	17.5
154	rectum, rectosigmoid jctn & anus	15.2	14.3	12.8	14.1	9.6
155	liver & intrahepatic bile ducts	4.1	4.9	5.3	4.8	3.3
156	gallbladder & extrahepatic bile ducts	2.3	1.9	1.5	1.9	1.3
157	pancreas	15.7	15	14	14.9	10.1
158	retroperitoneum & peritoneum	1.2	1.1	1	1.1	0.7
159	other & ill-defined sites	1.3	1.5	2.3	1.7	1.2
530537	dis. oesoph., stomach & duod.	8.9	7.4	6.9	7.7	5.2
540543	appendicitis	0.5	0.4	0.4	0.4	0.3
550553	hernia of abdominal cavity	0.9	0.7	0.6	0.7	0.5
555558	noninfective enteritis & colitis	4.3	3.8	4.8	4.3	2.9
560569	other dis. of intestines & perit.	4.5	3.9	4.4	4.3	2.9
570579	other dis. of digestive system	27.8	31	37.8	32.2	21.8
	Total gastrointestinal	149.3	145.6	147.2	147.4	100
999	all other diseases	1313	1234	1154	1234	
	TOTAL, all diseases	1462	1379	1303	1381	

Table 6. Lost years (per annum) for main GI causes of death in the UK, 1980-94.

The table shows that the burden of gastrointestinal disease in terms of premature deaths has been approximately constant in recent years and that it is currently about 147 400 x £ 15 000 per year or £ 2.21 billion. This represents some 11.3% of the total loss to the UK from premature deaths, which would amount to about £ 19 billion, or 3% of GDP.

The distribution of this burden around the UK is rather unequal. The first map ([Figure 4](#)) shows the number of lost years per thousand population of working age from gastrointestinal causes (principally cancers) in each postcode area as an annual average figure for the decade, 1985-94. The highest incidence is in postcode area HG (Harrogate) at 8.70, and the lowest is 2.38 in HP (Hemel Hempstead).

The geographical variation in incidence of lost years owing to GI causes reflects the variation in lost years from all causes. Over the 15-year period, GI causes accounted for 10.6% of all lost years. The percentage was higher for females (11.8%) than for males (10.6%), but this partly reflects the vastly higher incidence of lost years for males from all causes (765 per 1000 persons of working age compared with 436 for females). The GI percentage has risen over the period from 10.2% in 1980-84 to 11.1% in 1990-94.

The second map, [Figure 5](#), shows the GI percentage of lost years for the different postcode areas of the UK for 1985-94. The highest level is in London E, at 13.8%; the lowest level is in Salisbury (SP), at 9.4%.

3.2 Burden of disease: absence from work. The data from the DSS on medical reasons for absence from work during the week of 29 February 1996 gave the following numbers of people in Great Britain receiving social security payments for each category of GI disease and other diseases.

Code	Disease area	Number thousands	%
A0009	Intestinal infectious dis.	5.8	0.2
K2031	Dis. of oesoph., stomach & duoden.	9.6	0.3
K3538	Dis.s of appendix	0.5	-
K4046	Hernia	7.6	0.3
K5052	Noninfect. Enteritis and colitis	7.7	0.3
K5563	Other dis. of intestines	5.5	0.2
K6567	Dis. of peritoneum	0	-
K7077	Dis. of liver	5.1	0.2
K8087	Dis. /gallbladder, biliary tr. & pancreas	2.9	0.1
K9093	Other dis. of the digestive system	1.9	0.1
All GASTR		46.7	1.7
999	All other causes	2704.7	98.3

Table 7. Numbers of people receiving Incapacity Benefit, Disability Living Allowance, and/or Severe Disablement Allowance for various GI causes at 29 February 1996.

This shows that GI causes only 1.7% of long-term sickness absence. If we assume as before that each person unable to work costs the economy £ 15 000 per year, then the cost in the UK of long-term absence from work for GI causes is approximately $46680 \times £ 15\ 000 \times 1.025 = £ 0.72$ billion per year.

The analysis of absence from work of participants in the Labour Force Survey showed that for those off work for more than 6 months, GI causes were named by an average of about 2400 people or 3.3% as the principal cause of ill health that limited their work. The economic cost of their absence can be estimated as £ 0.04 billion per year.

The percentage of short-term sickness absence attributable to GI causes is probably much higher, but the only data are from the small survey of Wellcome Trust staff, which suggested that approximately one-fifth of such absence might be due to GI causes. Since the annual direct cost to the UK of short-term sickness absence is estimated at £ 10 billion per year⁴, this means that the short-term illness burden of GI disease is $20\% \times £ 10$ billion = £ 2.0 billion per year. Obviously this figure must be treated with great reserve: however the percentage figure was consistent between the two years, 1995 and 1996, and for both self-certificated and medical certificate absences.

3.3 Burden of disease: morbidity. First, the overall costs of the NHS are tabulated and apportioned between the five headings listed under 2.5 on the basis of the Burden of Disease allocation (the NHS for England in 1992-93), with the overall UK NHS expenditure for 1996-97 of £ 44.99 billion⁵ being used as the basis for calculation.

Expenditure for:	England, 92-93	%	UK, 96-97
In-patient care	12.144	49	20.9
Out-patient care	2.295	9	4
Primary care	6.594		
(excluding drugs)	3.537	14	6.1
Community health services	2.906	12	5
Personal social services	3.3	14	5.7
TOTAL	24.944		

Table 8. Allocation of UK NHS expenditure between main types, £ billion.

The in-patient costs were obtained from the Casemix data and showed that, for England in 1994-95, gastrointestinal conditions (sections f and g) accounted for 5.51 million bed-days out of a total of 118.3 million, or 4.7%. The breakdown between different body parts is shown below.

Code	Procedure	Bed-days	% G
f3137	Colon & rectum	1239203	22.5
f4349	General abdominal	854089	15.5
f0107	Oesophagus	671010	12.2
f1117	Stomach & duodenum	651968	11.8
g1118	Biliary tract	442584	8
f6367	GI bleeding	317180	5.8
f5157	Inflamm. bowel dis.	246536	4.5
g0108	Liver	236142	4.3
f7277	Hernia	235231	4.3
f2227	Small intestine	168571	3.1
f8486	Appendix	168267	3.1
g2229	Pancreas	155581	2.8
f9397	Anus	125739	2.3

Table 9. Analysis of in-patient bed-days attributable to different gastrointestinal procedures, England, 1994-95.

However, the total of 118 million bed-days for in-patient care includes 38 million for "other admissions" and 27 million for psychiatric/mental illness. The daily cost of these two types of care is approximately half that of acute provision, so the equivalent number of acute bed-days would have been about 90 million, of which gastrointestinal disease would have represented 6.1%.

By way of comparison, the Burdens of Disease document, Appendix 3, gives details of in-patient expenditure on the basis of ICD-9 codes. Table 10 gives the percentages of in-patient expenditure for England for 1992-93 relevant to gastrointestinal disease.

Code	Disease group	Percent
150	Oesophagus cancer	0.21
151	Stomach cancer	0.25
153-4	Colorectal cancer	0.93
157	Pancreatic cancer	0.16
152, 155-6, 158-9	Other digestive cancers	0.13
530-1, 533-7	Ulcers & other dis. of oesophagus & duodenum	0.96
540-3	Appendicitis	0.28
550-3	Hernias	0.55

555-8	Enteritis & colitis	0.58
560-9	Other dis. of intestine & peritoneum	1.31
571	Chronic liver disease & cirrhosis	0.16
570, 572-9	Other digestive diseases	1.30
Total		6.82

Table 10. Analysis of in-patient data on the basis of numbers of Finished Consultant Episodes and bed-days for each, England, 1992-93.

There is reasonable agreement between the two estimates, and it is probably sufficiently accurate to take the mean value of 6.5% and then apply this to the NHS in-patient bill of £ 20.9 billion to give a cost of in-patient care of £ 1.36 billion.

The second component of NHS costs is out-patient care. The Burdens of Disease report gives 6.9% as the total attributable to gastrointestinal causes (listed in Table 10, above), and when applied to the out-patient cost of £ 4.0 billion, the cost of out-patient care is £ 0.28 billion.

The third component is primary care (GP visits). The Burdens of Disease report gives the total attributable to GI causes as 3.85%, or primary care costs = £ 0.24 billion. The component of primary care attributable to pharmaceutical costs is described below in section 3.6.

The fourth and fifth components of NHS costs (community health services + social services for adults = community care services) are not completely allocated, but the Burdens of Disease report suggests that the GI part may account for about 3% of the total, or community care costs for the UK of £ 0.32 billion. Thus the total cost to the NHS of gastrointestinal disease (excluding pharmaceutical drugs dispensed in the community) are as shown in Table 6.

Component	Cost (1996-7, £ bn)
In-patient care	1.36
Out-patient care	0.28
Primary care	0.24
Community care	0.32
TOTAL	2.2

Table 11. NHS costs of gastrointestinal disease in the UK.

3.4 Burden of disease: cost of NHS prescriptions. Data were obtained for the year 1995/96 from the four territories, whose populations are also shown in Table 12.

BNF	Class of drug		Engl.	Wales	Scotl.	N Irel.	UK
1.1	Antacids		23	2	3	1	29
1.2	Antispasmodics & gut mot.		25	2	3	1	31
1.3	Ulcer-healing drugs	398	31	65	27	522	
1.4	Antidiarrhoeal drugs		5	0	1	0	6
1.5	Chronic diarrhoeal drugs		31	2	4	1	37
1.6	Laxatives		43	3	5	2	53
1.7	Prep's for haemorrhoids		8	1	1	1	10
1.8	Stoma care		0	0	0	0	0
1.9	Intestinal secretion drugs		10	1	1	0	12
1	Total GASTR		542	41	82	34	699
	Population, millions	47.1	2.79	6.43	1.6	57.9	
	Cost per inhabitant (BNF1) (£)		11.5	14.6	12.8	21.4	12.1

Table 12. Consumption of NHS pharmaceuticals in the UK, 1995-96 (£ million).

Thus the Net Ingredient Cost of NHS drugs for GI disease amounted to £ 0.70 billion. To this must be added the dispensing cost: it was estimated by the Office of Health Economics to be about £ 0.85 billion in total in 1994⁶, of which drugs used for “digestive” disorders were estimated to account for some 15% or £ 0.13 billion, to give a total cost of £ 0.83 billion.

4 Discussion

4.1 Burden of disease: overall costs to the UK economy. The results presented in sections 3.3 to 3.6 are recapitulated and summarised in Table 13.

Cause of burden	Cost	Cost
Not working:		4.97
Dying early	2.21	
Long-term absence	0.76	
Short-term absence	2	
NHS costs:		3.03
In-patient care	1.36	
Out-patient care	0.28	
Primary care: GPs	0.24	
Primary care: drugs	0.83	
Community health services	0.15	
Personal social services	0.17	
TOTAL		8

Table 13. Estimate of total annual burden of GI disease

in the UK in 1995-96; £ billion

Thus the burden of the indirect costs to the economy because people are not working is somewhat greater than the direct costs to the NHS. The figures are likely to be reasonably reliable because the major components (other than short-term sickness absence) are soundly based, although there must be some doubt on whether English and Scottish practices in completing death certificates are the same in view of the sharp dividing line along the border between the countries seen in [Figure 4](#).

Although in-patient costs were based on Casemix data rather than Hospital Episode Statistics (HES), the data on these for 1988-89 and 1993-94 suggest that the numbers of bed-days attributable to GI disease have not fallen as fast as those for all other causes, see Table 14.

Code	Diagnosis	88-89	93-94
1	Intestinal infectious diseases.	196	146
9	Cancers of digestive organs	1463	1215
34	Dis. of other parts of digestive system	3882	3532
444	Other deformities of digestive system	63	56
	Total GASTR	5604	4949
	All causes	148200	77538
	GASTR as %	3.8	6.4

Table 14. NHS bed-days (England) for different causes in two years

This trend is similar to that seen for lost years, where GI causes have increased their “share” from 10.2% to 11.3% over ten years (Table 6). It suggests that the burden of GI disease is not falling as fast as that from other diseases.

The maps give some indication of the geographical incidence of the GI disease burden in terms of people not working, but there are no data in the present report on the detailed geographical breakdown of NHS costs. It is possible to obtain HES data broken down by the postcode area of the patient, or of the treating hospital, for different classes of disease, but this was not attempted here. [Figure 5](#) shows that lost years from GI causes vary by a factor of about 3.6 between the most affected and the least affected areas. However since [Figure 5](#) shows a variation in percentage incidence of only 1.5, the biggest variation is in terms of overall lost years from all causes. This is probably attributable to psychosocial and lifestyle factors in different parts of the country.

Within England and Wales, there is a clear divide along a line between the Severn and the Humber, with the highest incidence of lost years in the older industrial cities of the Midlands and North. South Lancashire seems particularly affected. In London, the EC and WC areas are the most affected, followed by W,

E and SE. This may be because of the patients who attend hospitals in these areas who do not have a UK residence and whose postcode is that of the hospital for the purposes of their death certificate.

References

1 However data were not available from ONS for 1980-84 analysed by postcode area.

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5 Department of Health: Government Expenditure Plans 1997-98 to 1999-2000: Annex B, p. 115.

6 Office of Health Economics: Health Expenditures in the UK (1996 edition)

7 Lewison, G and Dawson, G. The effect of funding on the outputs of biomedical research. *Proceedings of the Sixth International Conference on Scientometrics and Informetrics*, Jerusalem, June 1997. See [Figure 2](#).

8 Narin, F, Hamilton K and Olivastro, D. Linkage between agency-supported research and patented industrial technology. *Research Evaluation*, vol 5 no 3, 1995, pp 183-7.