Background: We aimed to determine whether obese subjects experience more gastro-oesophageal reflux (GORS) symptoms than normal subjects, and further to determine if this association was explained by oesophagitis or medications that lower oesophageal sphincter pressure.

Methods: In a representative Swedish population, a random sample (n = 1001, mean age 53.5 years, 51% women) had upper endoscopy. GORS was defined as any bothersome heartburn or acid regurgitation.

Results: The prevalence of obesity (body mass index \( \geq 30 \)) was 16%; oesophagitis was significantly more prevalent in obesity (26.5%) than in normal subjects (9.3%). There were associations between obesity and GORS (odds ratio (OR) 2.05 (95% confidence interval (CI) 1.39, 3.01)), epigastric pain (OR 1.63 (95% CI 1.05, 2.55)), any abdominal pain (OR 1.3 (95% CI 1.08, 1.59)), any heartburn (OR 1.18 (95% CI 1.13, 1.24)), vomiting (OR 2.8 (95% CI 2.35, 3.35)), any stool urgency (OR 1.74 (95% CI 1.13, 2.67)), and any abdominal pain (OR 1.6 (95% CI 1.04, 2.47)), nocturnal urgency (OR 2.57 (95% CI 1.33, 4.98)), and incomplete rectal evacuation (OR 1.64 (95% CI 1.09, 2.47)), adjusting for age, sex, and education. When subjects with oesophagitis and peptic ulcer were excluded, only diarrhoea, incomplete evacuation, and vomiting were significantly associated with obesity. The association between GORS and obesity remained significant adjusting for medication use (OR 1.9 (95% CI 1.3, 3.0)).

Conclusions: GORS is associated with obesity; this appears to be explained by increased upper endoscopy findings in obesity.

Gastro-oesophageal reflux symptoms (GORS) are highly prevalent in Western nations, and may be increasing in incidence in Asia for unknown reasons. Similarly, the development of obesity has reached epidemic proportions in the Western world, which also remains largely unexplained. Obesity is important because it induces a major psychological burden and has a substantial impact on morbidity and quality of life.

We have previously reported that body mass index (BMI) appeared to be an independent risk factor for the presence of heartburn and acid regurgitation in a community based population study in the USA. Others have observed similar associations in Sweden but there have also been contradictory reports. We have also observed an association between obesity and symptoms of diarrhoea in population based studies from the USA, Australia, and in a New Zealand birth cohort of young adults. However, these studies were all in uninvestigated subjects, and the relationship between BMI and unexplained upper and lower gastrointestinal symptoms remains to be clarified.

A number of drugs have been reported to lower oesophageal sphincter pressure and an association between the use of such drugs and an increased risk of oesophageal adenocarcinoma has also been observed. However, population based studies that include endoscopic data have not investigated how important medications are in causing oesophagitis, and whether their use mediates the possible association between BMI and GORS.

In this study, we aimed to evaluate the relationship between measured BMI and specific gastrointestinal symptoms in a community based population that was being evaluated by oesophagogastroduodenoscopy. We hypothesised that the association of obesity with symptoms of GORS would be largely explained by underlying oesophagitis or by medications that could potentially aggravate gastro-oesophageal reflux.

MATERIALS AND METHODS

Setting

The setting consisted of two neighbouring communities in Northern Sweden, Kalix and Haparanda, with 18 408 and 10 580 inhabitants (as of December 1998); 78% lived in highly populated areas during the year 2000 compared with the Swedish national average of 84%. The distribution of age and sex was similar to the national average in Sweden in both communities, although unemployment status, income, and the proportion with a higher education were slightly lower.

Sampling

Using the computerised national population register, covering all citizens in the two communities by date of birth order, a representative sample was generated. Every seventh adult (n = 3000) from the target population (20–80 years of age, n = 21 610 in September 1998) was drawn, a procedure equivalent to random sampling. The sampled subjects were then, by a computerised process, given an identity number (ID 1–3000) in random order.

Abbreviations: ASQ, abdominal symptom questionnaire; BMI, body mass index; OEG, oesophagogastroduodenoscopy; GORD, gastro-oesophageal reflux disease; GORS, gastro-oesophageal reflux symptoms; ID, identity number; IBS, irritable bowel syndrome; LOS, lower oesophageal sphincter; OR, odds ratio
Study design and logistics
The study population (n = 3000) was contacted by mail and invited to take part; this invitation included a validated questionnaire, the abdominal symptom questionnaire (ASQ) (see below) to be returned by mail. Up to two reminders were applied when necessary; 140 subjects were unavailable at the time of invitation (21 dead; 38 migrated or questionnaire returned by relatives; 17 mentally retarded or having dementia; and 76 for other reasons). Thus 2860 of the original study population were eligible for inclusion.

Responders were invited to a visit in the clinic in ID order, starting with the lowest available ID. Subjects reported the absence/presence of gastrointestinal symptoms using the ASQ questionnaire at the visit, as described below. The study population was divided into five parts in ascending order for logistic reasons, ID 1–600, 601–1200, and so forth, and the first subset of study subjects was approached with the mailed ASQ questionnaire in December 1998. The study was approved by the Umeå University ethics committee and conducted in accordance with the revised Declaration of Helsinki.

Assessments
Abdominal symptom questionnaire (ASQ)
This self-administered questionnaire assesses symptoms from the upper and lower part of the abdomen and has been validated in Sweden.25,26 A standardised procedure for the administration of the questionnaire at the visit was used. The ASQ includes questions describing the presence or absence (yes/no) of 27 troublesome gastrointestinal symptoms over the preceding three months. In order to better reflect the Rome I definitions of functional gastrointestinal disorders,27 three questions were added to the present ASQ questionnaire in December 1998. The study was approved by the Umeå University ethics committee and conducted in accordance with the revised Declaration of Helsinki.

Definitions of symptom groups
Subjects were classified according to their symptom patterns as defined below:

(1) Gastro-oesophageal reflux symptoms (GORS)
GORS were defined as the presence of any troublesome heartburn and/or acid regurgitation over the past three months.25,30

(2) Dyspepsia
Dyspepsia was defined as any troublesome pain or discomfort expressed as one or more of the 11 listed pain modalities located in the upper (epigastric) part of the abdomen, and/or nausea, early satiety, or uncomfortable feeling of fullness after a meal. This is consistent with the Rome II definition (except for upper abdominal bloating which was not asked about in the ASQ).26

(3) Irritable bowel syndrome (IBS)
IBS was defined as any of the troublesome abdominal pain modalities located at any site plus concomitant bowel habit disturbances (constipation, diarrhoea, or alternating constipation and diarrhoea).26 This simple definition has been used previously and shown to produce results reasonably concordant with the Rome criteria in Sweden.24

(4) Epigastric pain or discomfort
Epigastric pain in the ASQ was defined as troublesome pain or discomfort expressed as one or more of the 11 listed pain or discomfort modalities indicated in the epigastric part of the abdomen only. This definition is based on the Rome I definition of dyspepsia.

(5) Abdominal pain
Abdominal pain was defined as troublesome pain or discomfort expressed as one or more of the 11 listed pain or discomfort modalities indicated anywhere in the abdomen.

Response rate
A total of 2122 individuals completed the postal questionnaire, which corresponds to a response rate of 74.2% after two postal reminders. These responders were representative of the local population.33 In order to complete the 1001 upper endoscopies, 1563 responders to the ASQ were approached; 364 declined, 74 had moved or could not be reached, and 124 had medical contraindications. Hence a representative cohort of 1001 invited for upper endoscopy was evaluated. Of the subjects endoscoped, 10 did not have BMI data collected, leaving 991 for analysis.

Data on the prevalence of endoscopic findings in this population are presented elsewhere.32 Oesophagitis was classified according to the Los Angeles classification system; detailed data on oesophagitis and its associations with GORS are published elsewhere.31

Oesophagogastroduodenoscopy (OEG)
Upper endoscopies were performed by both primary and secondary care physicians in the two clinics who provided sole medical cover in the area. The endoscopists were unaware of the symptoms of the subjects before and during endoscopy.24

Body mass index categories
Height and weight were measured at the endoscopy visit. Data on weight and height were used to calculate BMI (kg/m²). Participants were categorised based on BMI as underweight (BMI <18.5), normal (BMI ≥18.5 and <25), overweight (BMI ≥25 and <30), obese class I (BMI ≥30 and <35), class II (≥35 and <40), and class III (≥40).35 Because there were relatively few subjects in the extreme obesity categories, these were all combined.

Medications
Data on medication use were recorded after endoscopy. In addition to any acid suppressing drug, medications that were concurrently being taken that may reduce lower oesophageal sphincter (LOS) pressure (nitrates, theophylline, calcium channel blockers, opiates, beta agonists, phenothiazines, tricyclic antidepressive drugs, nicotine substitutes, anticholinergics, and benzodiazepines) were recorded.19–24

Statistical analysis
Prevalence is shown as percentage with 95% confidence interval (CI). We used a logistic regression analysis to assess the association between the presence of each specific gastrointestinal symptom (the binary dependent variable) and BMI (entered as a categorised independent variable), adjusting for age, sex, and education use. The odds ratios

www.gutjnl.com

Downloaded from http://gut.bmj.com/ on April 7, 2017 - Published by group.bmj.com
decreased BMI by linear regression analysis (beta coefficient status. Smoking was independently associated with gender, age groups, education levels, smoking and alcohol proportion of patients in each BMI category, as a whole and was 16% (n = 162 (95% CI 14.0, 18.7)). Table 1 shows the (n = 456 (95% CI 42.9, 49.1)) while the prevalence of obesityquent analyses. The prevalence of being overweight was 46% subjects were excluded leaving 983 subjects in the subse-

RESULTS

Prevalence of obesity
The prevalence of those underweight was 0.8% (n = 8); these subjects were excluded leaving 983 subjects in the subsequent analyses. The prevalence of being overweight was 46% (n = 456 (95% CI 42.9, 49.1)) while the prevalence of obesity was 16% (n = 162 (95% CI 14.0, 18.7)). Table 1 shows the proportion of patients in each BMI category, as a whole and by gender, age groups, education levels, smoking and alcohol status. Smoking was independently associated with decreased BMI by linear regression analysis (beta coefficient –0.7) and low education was associated with increased BMI (beta coefficient 0.6); alcohol use was not significant.

Prevalence of troublesome gastrointestinal complaints and upper endoscopy findings
At the time of endoscopy, 65.6% of 1001 subjects reported one or more troublesome gastrointestinal complaints on the questionnaire completed prior to endoscopy. The prevalence of major endoscopic findings by BMI category is summarised in table 2. Of those with oesophagitis (n = 135), most were grade A (n = 109); 39 had grade B, three grade C, two grade D, and two were unable to be classified. There were more endoscopic findings in obese subjects than in normal weight subjects, and the differences were significant for oesophagitis and gastric ulcer; the prevalence of oesophagitis in obesity was 26.5% (95% CI 19.7, 33.3) versus 9.3% (95% CI 6.3, 12.3) in normal weight subjects while the prevalence of gastric ulcer in obesity was 5.6% (95% CI 2.0, 9.1) versus 1.4% (95% CI 0.2, 2.6) in normal weight subjects.

Relationship between BMI, gastrointestinal symptoms, and other exposure factors
In the total cohort, the distribution of individual gastrointestinal symptoms by BMI categories is summarised in table 3.

There were significant associations between obesity and GORS (OR 2.05 (95% CI 1.39, 3.01)), epigastric pain (OR 1.63 (95% CI 1.05, 2.53)), IB5 (OR 1.58 (95% CI 1.05, 2.38)), any abdominal pain (OR 1.59 (95% CI 1.08, 2.35)), vomiting (OR 3.11 (95% CI 1.18, 8.20)), retching (OR 1.74 (95% CI 1.13, 2.67)), diarrhoea (OR 2.21 (95% CI 1.38, 3.46)), any stool urgency (OR 1.60 (95% CI 1.04, 2.47)), nocturnal urgency (OR 2.57 (95% CI 1.33, 4.98)), and feelings of incomplete rectal evacuation (OR 1.64 (95% CI 1.09, 2.47)), adjusting for age, sex, and education (table 4).

When subjects with oesophagitis, peptic ulcer, and cancer at endoscopy were excluded, diarrhoea (OR 1.94 (95% CI 1.13, 3.32)), feelings of incomplete rectal evacuation (OR 1.68

Table 1 Distribution of demographic variables by body mass index (BMI) categories

<table>
<thead>
<tr>
<th>BMI category</th>
<th>n (%)</th>
<th>Age ≤ 54*</th>
<th>&gt;54*</th>
<th>Sex Female*</th>
<th>Male*</th>
<th>Education Low*</th>
<th>High*</th>
<th>No*</th>
<th>Yes*</th>
<th>Alcohol/week &lt; 100 g*</th>
<th>&gt;100 g*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Normal</td>
<td>365</td>
<td>200</td>
<td>165</td>
<td>213</td>
<td>152</td>
<td>177</td>
<td>183</td>
<td>280</td>
<td>85</td>
<td>331</td>
<td>34</td>
</tr>
<tr>
<td>Overweight</td>
<td>456</td>
<td>211</td>
<td>245</td>
<td>197</td>
<td>25</td>
<td>281</td>
<td>166</td>
<td>384</td>
<td>72</td>
<td>399</td>
<td>57</td>
</tr>
<tr>
<td>Obese</td>
<td>162</td>
<td>72</td>
<td>90</td>
<td>92</td>
<td>70</td>
<td>55</td>
<td>72</td>
<td>399</td>
<td>72</td>
<td>399</td>
<td>57</td>
</tr>
<tr>
<td>Total</td>
<td>991</td>
<td>487</td>
<td>504</td>
<td>508</td>
<td>483</td>
<td>568</td>
<td>407</td>
<td>805</td>
<td>186</td>
<td>882</td>
<td>109</td>
</tr>
</tbody>
</table>

*Prevalence and 95% confidence interval (CI)/column.
†Current smokers at the time of endoscopy.

Table 2 Prevalence (%) of peptic ulcer disease, oesophagitis, and gastric cancer in different body mass index (BMI) categories

<table>
<thead>
<tr>
<th>BMI category (n %)</th>
<th>Underweight (n = 8)</th>
<th>Normal (n = 456)</th>
<th>Overweight (n = 456)</th>
<th>Obese (n = 162)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric ulcer</td>
<td>0 [0]</td>
<td>5 [1.4]</td>
<td>6 [1.3]</td>
<td>9 [5.6]</td>
</tr>
<tr>
<td>Duodenal ulcer</td>
<td>0 [0]</td>
<td>7 [1.5]</td>
<td>9 [2.0]</td>
<td>4 [2.5]</td>
</tr>
<tr>
<td>Cancer</td>
<td>0 [0]</td>
<td>1 [0.2]</td>
<td>0 [0.0]</td>
<td>0 [0.0]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Endoscopic finding</th>
<th>Underweight (n = 8)</th>
<th>Normal (n = 456)</th>
<th>Overweight (n = 456)</th>
<th>Obese (n = 162)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric ulcer</td>
<td>0 [0]</td>
<td>5 [1.4]</td>
<td>6 [1.3]</td>
<td>9 [5.6]</td>
</tr>
<tr>
<td>Duodenal ulcer</td>
<td>0 [0]</td>
<td>7 [1.5]</td>
<td>9 [2.0]</td>
<td>4 [2.5]</td>
</tr>
<tr>
<td>Cancer</td>
<td>0 [0]</td>
<td>1 [0.2]</td>
<td>0 [0.0]</td>
<td>0 [0.0]</td>
</tr>
</tbody>
</table>

www.gutjnl.com
Medication use, BMI, and reflux

Use of acid reducing drugs was a significant predictor for overall GORS (OR 9.8 (95% CI 6.5, 14.7)) and for the following individual symptoms: heartburn (OR 6.4 (95% CI 4.5, 9.2)), acid regurgitation (OR 6.2 (95% CI 4.3, 8.8)), and retching (OR 3.0 (95% CI 2.1, 4.2)). Drugs that potentially reduce LOS pressure (nitrates (n = 24), theophylline (n = 10), calcium channel blockers (n = 44), opiates (n = 20), beta agonists (n = 22), phenothiazines (n = 2), tricyclic antidepressants (n = 2), nicotine substitutes (n = 0), anticholinergics (n = 0), and benzodiazepines (n = 2) as a group were univariately associated with the symptom of a burning feeling rising in the chest (Carlsson-Dent question) (OR 1.8 (95% CI 1.1, 3.1)) and with central chest pain (OR 1.6 (95% CI 1.0, 2.6)), but were not significantly associated with overall GORS. Only calcium channel blockers (OR 3.0 (95% CI 1.5, 5.9)) were univariately associated with the symptom of a burning feeling rising in the chest; none of the other individual drug classes were significant. LOS relaxing drugs were not individually or as a group significantly associated with oesophagitis. Adjusting for medication use, the association between GORS and being overweight remained significant (OR 1.4 (95% CI 1.04, 2.0)) and similarly, the association between GORS and obesity remained significant (OR 1.9 (95% CI 1.3, 3.0)). The association between oesophagitis and BMI did not alter substantially adjusting for medication use (OR for overweight 1.7 (95% CI 1.1, 2.6) and OR for obesity 3.4 (95% CI 2.0, 5.8)).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight loss</td>
<td>16 [4.3]</td>
<td>5 [1.1]</td>
<td>1 [0.6]</td>
</tr>
<tr>
<td>Acid regurgitation</td>
<td>80 [21.6]</td>
<td>115 [25.5]</td>
<td>62 [38.3]</td>
</tr>
<tr>
<td>Heartburn</td>
<td>100 [26.9]</td>
<td>159 [35.1]</td>
<td>68 [42.5]</td>
</tr>
<tr>
<td>Central chest pain</td>
<td>71 [19.2]</td>
<td>98 [22.0]</td>
<td>42 [26.1]</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>64 [19.9]</td>
<td>106 [26.1]</td>
<td>46 [33.1]</td>
</tr>
<tr>
<td>Feeling incomplete rectal evacuation</td>
<td>100 [27.3]</td>
<td>125 [27.8]</td>
<td>60 [37.7]</td>
</tr>
<tr>
<td>Borborygmi</td>
<td>106 [28.7]</td>
<td>140 [30.9]</td>
<td>43 [27.0]</td>
</tr>
<tr>
<td>Abdominal distension</td>
<td>133 [36.2]</td>
<td>152 [33.5]</td>
<td>55 [34.2]</td>
</tr>
<tr>
<td>Black stools</td>
<td>8 [2.2]</td>
<td>9 [2.0]</td>
<td>1 [0.6]</td>
</tr>
</tbody>
</table>

(95% CI 1.04, 2.71)), and vomiting (OR 3.98 (95% CI 1.26, 12.52)) remained significantly associated with obesity. However, GORS was no longer significant.
DISCUSSION

We have examined the associations between gastrointestinal symptoms and BMI in a population sample who were then investigated for an upper gastrointestinal tract structural explanation by oesophagogastrroduodenoscopy. We found that reflux symptoms were linked to obesity and specifically, the presence of GORS was linked to reflux oesophagitis in the population. We also observed independent associations of the presence of GORS was linked to reflux oesophagitis in the multiple logistic regression models evaluated.

Obesity was not associated with constipation in this study; others have reported concordant observations. The finding of a link between obesity and diarrhoea, however, has now been confirmed in three population-based studies, although these were all in uninvestigated subjects. Crowell et al also observed more frequent lower gastrointestinal symptoms in obesity rather than, as might be expected in this generally more sedentary population, constipation? We hypothesise that excess intake of poorly absorbed products causing osmotic diarrhoea could explain the increased lower gastrointestinal symptoms in obesity. For example, there has been a very substantial increase in the use of corn syrup containing fructose in the USA, and excess ingestion of this could induce fructose malabsorption.

We have confirmed the findings of other population based studies that showed an association between obesity and GORS, although we did see an association between calcium channel blockers and the symptom of a burning feeling rising in the chest. Importantly, intake of medications did not substantially alter the association between BMI and GORS or BMI and oesophagitis in the multiple logistic regression models evaluated.

Other mechanisms that might explain the increased bowel frequency associated with increased BMI include abnormal bile salt turnover because of rapid small intestinal transit or rapid gastric emptying, which has been reported in some groups of obese patients. Obesity was also associated with symptoms consistent with IBS in the present study. However, whether obesity is truly linked to IBS remains unclear; we did not apply the Rome II criteria for IBS as the questionnaire would not apply the Rome II criteria for IBS as the questionnaire.
was not designed to assess these specifically. Others have observed a trend for more IBS symptoms in obesity but this has yet to be confirmed, and severe obesity has not been studied.45

Mechanisms that control food intake and energy expenditure may be dysregulated in obesity. A number of hormonal satiation factors, including cholecystokinin, enterostatin, and peptide YY from the gut, may contribute to meal termination, and thus may influence meal size.46 47 Whether a decreased satiation response to food intake plays a role in the development of obesity is uncertain.48 49 Early satiation, defined as an inability to finish a normal size meal, has been linked to impaired fundic accommodation in some studies although not all studies agree and the association is controversial.50 51 For this reason, we investigated the association between obesity and the symptom early satiation; we speculated there would be more people with this symptom in those who were normal weight and less in the obese group. However, we did not observe increased reporting of early satiety in normal weight persons. This is contrary to previous observations in uninvestigated subjects with obesity.52 53 whether this reflects population or measurement differences is unknown.

Obesity is now considered to be a major health problem worldwide. Data from the National Centre for Health Statistics show that 31% of the US population aged 20 years or above is clinically obese (BMI $\geq$ 30 kg/m$^2$).54 The prevalence of obesity in Northern Sweden was less (16%) but still substantial; moreover, the rates of obesity in this cohort were only modestly higher than those reported across Sweden as a whole (10%).55 The present study had a number of other strengths. The ASQ is a reliable and adequately validated measure.56 57 The study was performed in the northern part of Sweden, but the population studied appears to be representative of the Swedish population in terms of most sociodemographic factors, and the response rates were excellent. The proportion with higher education was slightly lower in these communities and a low education was associated with a higher BMI, but education was controlled for in the analyses. Hospitalisation and death from gastrointestinal disorders in the northern part of Sweden is similar to the rest of Sweden and the Western world.58 On the other hand, the impact of these gastrointestinal symptoms on quality of life in obese versus non-obese was not assessed in this study. However, we did ask only about troublesome symptoms, implying that the complaints reported were of importance to the community subjects.

In conclusion, in this population based study, reflux symptoms were independently associated with BMI. Importantly, the association was explained by increased upper endoscopy findings in obesity.

ACKNOWLEDGEMENTS

This study was supported in part by the Swedish Research Council, the Swedish Society of Medicine, Maj-tarm sjukas förbund, Norrbotten County Council, Sweden, and AstraZeneca R&D, Sweden.

REFERENCES

Clinical presentation
An elderly male presented with acute upper abdominal pain and tenderness with dyspnoea. On examination he had tachypnoea, tachycardia, hepatomegaly, and tenderness in the right upper quadrant and epigastrium. He also appeared jaundiced and had peripheral oedema of the lower limbs. Laboratory findings were: aspartate transaminase 118 IU/l (normal range 60–240); and bilirubin 40 µmol/l (normal range 0–32); alkaline phosphatase 430 IU/l (normal range 30–110); and amylase 112 IU/l (normal range 10–120).

Chest radiograph performed at presentation suggested a mediastinal mass. Multidetector row computed tomography of the thorax and abdomen was performed for further assessment (fig 1A, B).

Question
What is the diagnosis?
See page 1390 for answer

This case is submitted by:

R Sinha
Department of Radiology, Glenfield Hospital, Leicester, UK

D Clarke
Department of Radiology, Derby City General Hospital, Derby, UK

Correspondence to: Dr R Sinha, Department of Radiology, Glenfield Hospital, Leicester LE3 9QP, UK; rakesh.sinha@uhl-tr.nhs.uk
doi: 10.1136/gut.2005.066134

Figure 1 (A) Large lobulated mass involving the pericardium causing luminal compromise of the atria. (B) Coronal reformatted image along the plane of the right atrium and inferior vena cava shows large mass (arrow) with near total obliteration of the right atrial chamber.
Body mass index and chronic unexplained gastrointestinal symptoms: an adult endoscopic population based study

P Aro, J Ronkainen, N J Talley, T Storskrubb, E Bolling-Sternevald and L Agréus

Gut 2005 54: 1377-1383 originally published online May 25, 2005
doi: 10.1136/gut.2004.057497

Updated information and services can be found at:
http://gut.bmj.com/content/54/10/1377

These include:

Supplementary Material
Supplementary material can be found at:
http://gut.bmj.com/content/suppl/2005/09/09/gut.2004.057497.DC1

References
This article cites 50 articles, 8 of which you can access for free at:
http://gut.bmj.com/content/54/10/1377#BIBL

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections
Articles on similar topics can be found in the following collections

- Ulcer (484)
- Diarrhoea (663)
- Gastro-oesophageal reflux (351)

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/