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Irritable Bowel Syndrome and Mood Disorders

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ABSTRACT

This case study describes the use of SAS technology in streamlining cross-sectional and retrospective case-control studies in the exploration of comorbidity of depression and gastrointestinal disorders. Various studies in Europe and America have documented associations between irritable bowel syndrome and psychological conditions such as depression and anxiety disorders; however, these were observational studies. Because it is impossible to randomize symptoms, it is difficult to isolate patients with these co-morbidities for randomized trials. Therefore, studies will continue to use observational data. In this study, all steps are conducted electronically in a rapid development environment provided by SAS technology. In addition, it examines the potential rate of health-care utilization particularly for GI disorders among individuals with depressive symptoms and anxiety disorders. We find that the proportion of patients with gastrointestinal problems and psychological disorders is typically higher than the proportion of patients with only gastrointestinal problems.

INTRODUCTION

It has been previously reported that depressive symptoms are highly prevalent in the inpatient population with current gastrointestinal symptoms and vice versa. Inadomi et al (2003) reports that in the United States and Europe, one of the major reasons to visit a gastroenterologist is irritable bowel syndrome. Moreover, Drossman D. et al (2002) report that between fifty and sixty percent of IBS patients in gastroenterology clinics suffer from psychiatric disorders which exacerbate the patients' poor quality of life, causing them to seek more medical help. This has led to theories that patients with depressive symptoms have an increased use of health care services and work absenteeism because of abdominal complaints. According to Hillilä et al (2008), symptoms of depression are common in the general population and are associated with symptoms in the gastrointestinal system; in turn, these cause an increase in the use of the health care system.

Other theories indicate that patients with severe irritable bowel syndrome may increase their health-related quality of life by following psychological treatments. Jackson R. et al (2000) review of data concludes that patients with irritable bowel syndrome found that symptoms improved with the use of antidepressants as much as four times more compared to the use of a placebo. Similarly, Creed F. et al (2005) supports the idea that IBS patients, even those without psychological disorders, that do not respond positively to the usual treatment may find improvement from psychological treatment. Another hypothesis in the matter is that of irritable bowel syndrome being induced by stress (Whitehead W, 1994). A study conducted by Blanchard et al (2008) measured a significant correlation between some gastrointestinal symptoms, such as IBS and dyspepsia. They found that some life stressors exist over an extended period of time. They concluded that the data support a reciprocal relation between stress and gastrointestinal symptoms rather than a relation of cause and effect. These results concur with those of an earlier study by Levy R. (1997). A great deal of literature supports the important associations between psychiatric illness and chronic medical conditions in a clinical setting.

INPATIENT DATA OUTCOMES

The data set for the year 2005 was obtained from the Nationwide Inpatient Sample (NIS), the largest all-payer inpatient care database in the United States. A ten percent sample was obtained with a sampling module from SAS Enterprise Miner. It contains data on 7,995,048 hospital stays from approximately one-thousand hospitals. From it, a random ten per cent sample from the data set for the year 2005 was obtained.

First, this set was filtered to contain the records of patients having a digestive condition as the primary reason for being in a hospital. The dataset was created by filtering on the field, DRG, diagnosis resource group, on the basis of DRG values related to non-infectious conditions on the digestive systems such as irritable bowel disease, chronic diarrhea, peptic ulcers, chronic constipation, and so on. For a more complete list of the relevant codes, see table 1. A second subset was defined for those individuals experiencing psychological disorders as the main reason for visiting a hospital. Similarly, the original set was filtered based on DRG values related to psychological conditions such as anxiety disorders, several types of depression, and so on. For a more complete list of the relevant codes, see table 2. From these two subsets, we obtained a frequency count for hospital visits related to non-infectious digestive diseases and for hospital visits related to the psychological conditions described above.

DRG	Description
179	INFLAMMATORY BOWEL DISEASE
180	GASTROINTESTINAL OBSTRUCTION WITH COMPLICATIONS
181	GASTROINTESTINAL OBSTRUCTION WITHOUT COMPLICATIONS
182	ESOPHAGITIS, GASTROENTERITIS, & MISCELLANEOUS DIGESTIVE DISORDERS WITHOUT COMPLICATIONS
183	ESOPHAGITIS, GASTROENTERITIS, & MISCELLANEOUS DIGESTIVE DISORDERS WITH COMPLICATIONS
184	MISCELLANEOUS DIGESTIVE

Table 1. DRG's related to IBS

From these frequencies, we obtained the proportion of hospital visits due to such digestive disorders and due to such psychological ailments respectively.
The second phase of the preprocessing involved determining conditional proportions with the previously built subsets. To do this, the first subset was filtered for the presence of psychological conditions. The D*X* variables were used; these contain ICD9 codes for diagnosis 1 through 15. Using SQL statement from SAS, the observations were filtered for those containing an ICD9 coded related to psychological affections, such as various kinds of depressions and anxiety disorders within any of the D*X* fields. A binary variable, DIGESTIVE, was computed to mark these records (Figure 1).

DRG	Description
426	DEPRESSIVE NEUROSES
428	DISORDERS OF PERSONALITY & IMPULSE CONTROL

Table 2. DRG's related to Depression

Likewise using a SAS SQL code module, the second subset was filtered for the presence of ailments of the digestive system on the D*X* fields on ICD9 values that correspond to digestive systems conditions such as irritable bowel disease, chronic diarrhea, peptic ulcers, and chronic constipation. Within this

query/filter, a binary variable, PSYCHOLGICAL, was created to identify these records. Subsequently, the *SAS merge* procedure was used to merge these subsets to its *parent* sets respectively. At this point, those records from the *parent* sets that did not make it into the queries had blank values in the computed fields DIGESTIVE and PSYCHOLGICAL. These blank values were replaced with values of 0. At this point, the *one-way frequency* method from *SAS* was used on each of the *parent sets* to determine the wanted conditional probabilities.

Moreover, these subsets were merged using SAS code to obtain summary statistics and analytic graphs. SAS Enterprise Guide was also used to build a relative frequency bar chart based on the subset of those patients visiting a hospital for a digestive condition. It identifies the patients having a psychological condition, namely condition 2. Finally, the SAS Kernel Density function was used to compute the distribution of *Length of Stay* and *Total Charges* by the presence of psychological conditions given a digestive condition was the reason to visit a hospital.

First, the proportion of patients attending a hospital for digestive conditions is rather high – about eighty per cent; while, the proportion of people looking for assistance in a hospital for psychological disorders is about twenty-five per cent (Figure 1). The proportion of patients with a psychological condition given that digestive condition was first diagnosed is twenty per cent (Figure 2). The proportion of patients with a digestive condition given that psychological disorder was first diagnosed is ten per cent. Similarly, the proportion of patients having both conditions is ten percent. We also found that that distribution of Length of Stay are different if a psychological condition was present (Figure 3). These differences may indicate that a relationship between some gastrointestinal disorders and some psychological conditions may exist.

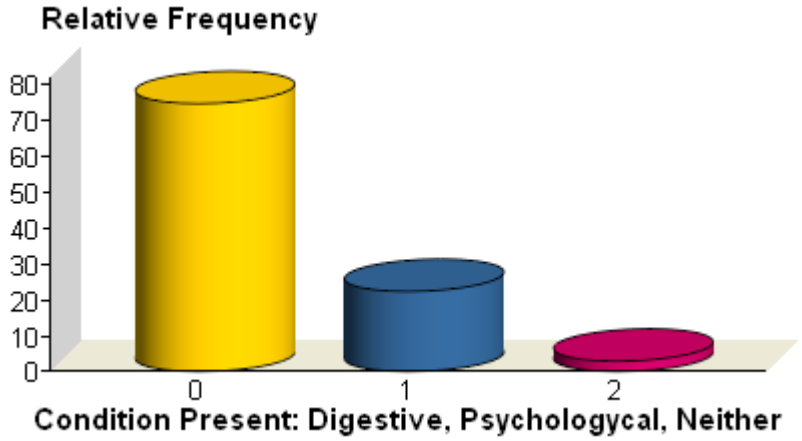

Figure 1.

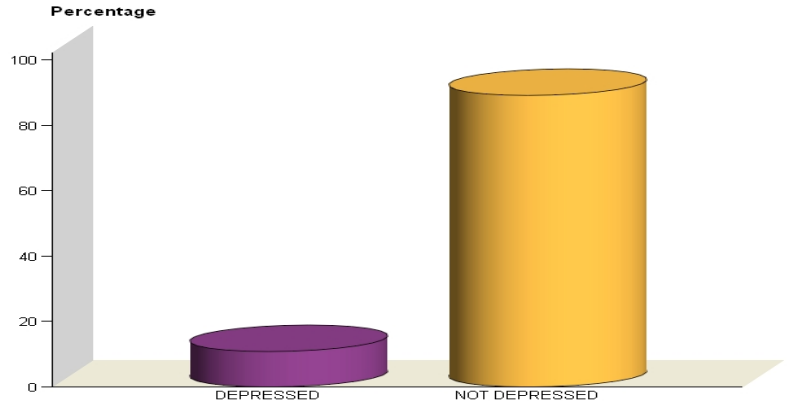

Figure 2. Prevalence of depression

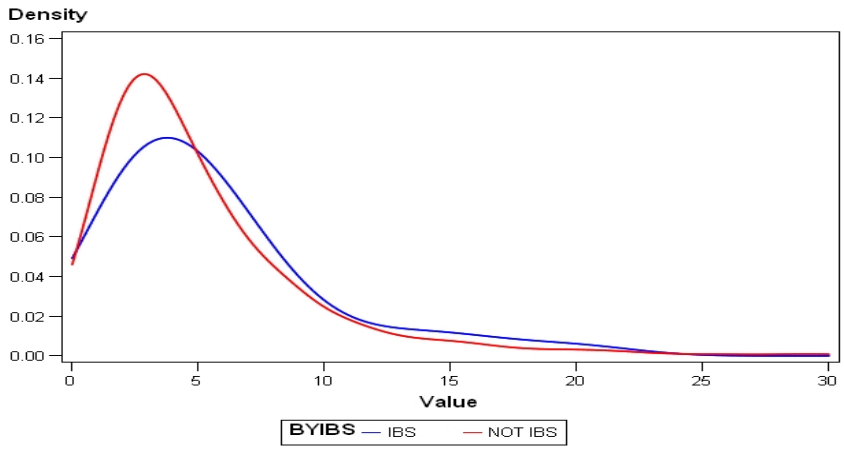

Figure 3. KDE for Length of Stay

In addition, cluster analysis was implemented in SAS Enterprise Miner (figure 4). This analysis resulted in eight clusters. To visualize how different they are, kernel density estimation was implemented with SAS PROC KDE. The results are a natural hierarchy of the clusters (figure 5).

Cluster	Percent	Description
1	8	Ulcer and Anemia
2	13	Anxiety and Acid Reflux
3	12	Gastritis and Dehydration
4	17	Stomach Disorders and Depression
5	4	Astma, Lung Cancer, and Acid Reflux
6	23	Heart Disease and Anemia
7	17	Esophagitis and Dehydration
8	6	General Digestive Symptoms and Acid Reflux

Table 2. Cluster Analysis

CONCLUSION

There is a moderate association between IBS and mood disorders related to depression.
Several characterizations of the data support the same conclusion: chi-square test, risk ratio, kernel density, and clustering. The association seems to be more of reciprocal relation rather than causal.
SAS Enterprise Guide and Enterprise Miner are powerful tools that facilitate Statistical Analysis.

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