

*Full Length Research Paper*

# A descriptive study of behavioural patterns associated with gastrointestinal illness in the general Swedish population

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A nation-wide survey was conducted in 2009 to collect information about behavioural patterns possibly associated with gastrointestinal illness (GI) in the general Swedish population. One-third of the respondents used various internet and/or telephone resources to find information about GI. Nearly eighty percent said that they buy and consume certain food products or beverages, and one-third of the respondents claimed that they buy over-the-counter pharmaceutical products for treatment of GI. In the present study, information retrieval behaviour on the internet and telephone calls to health care advice services appear to be the most relevant indicators of GI in Sweden.

**Key words:** Beverages, consumption patterns, foods, drugs, incidence of foodborne and waterborne gastrointestinal illness, health indicators, information retrieval, outbreak detection, over-the-counter drugs (OTC drugs), surveillance.

## INTRODUCTION

Research on behavioural patterns during gastrointestinal illness (GI) is sparse. However, knowledge in this area could have great public health implications. An earlier detection of food- or waterborne outbreaks increases the chances of identifying the source of infection. As a complement to traditional surveillance, syndrome surveillance based on various signals and health indicators in the community may be used for earlier detection of outbreaks (Hogan et al., 2003; Edge et al., 2006). Such signals may include behavioural patterns among those who are ill, for example, information retrieval, seeking of healthcare advice, and purchasing of drugs.

This study presents a nation-wide, population based survey of behavioural patterns of GI in Sweden. The primary aim was to obtain knowledge about behavioural patterns in Sweden that may serve as indicators for detecting outbreaks of GI in the general population. A secondary aim was to estimate the incidence of food- and waterborne illnesses in the population.

## METHODOLOGY

Respondents, 16 to 85 years of age, were selected from Statens personadressregister (SPAR, 2009), which includes all individuals who are registered as resident in Sweden. Background information was collected about each respondent, including sex, age, place of residence, education, occupation, household size, number and age of children living in the household. Respondents were also asked whether they had experienced GI (vomiting and/or diarrhoea, chronic illness excepted) in the last five years, whether they had experienced GI in the last 12 months allegedly due to intake of food or drinking water, and whether the alleged food or drink had been consumed whilst being in Sweden or abroad. Respondents were also asked to provide information on information- and treatment seeking behaviour about GI on the internet and via the telephone, consumption of specific food products and pharmaceuticals for self-treatment of GI, and willingness to report foodborne illness. Behavioural data were analysed using logistic regression in Minitab version 15 (Minitab Inc.).

## RESULTS AND DISCUSSION

Table 1 presents the main results of 1,000 completed computer assisted telephone interviews performed by professional interviewers in November 2009. The response rate of the survey was 55%. The estimated

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**Table 1.** Frequency of gastrointestinal illness (GI) and information retrieval and consumption behaviour associated with GI in the general Swedish population.

Question	Response	No. respondents (%)
Gastrointestinal illness (GI)		
	Yes	476 (48)
Had GI in the past 5 years	No	507 (51)
	Unsure	17 (2)
	Yes	92 (9)
Had GI in the past 12 months due to intake of food or water	No	364 (37)
	Unsure	20 (2)
	Yes	68 (7)
Had GI in the past 12 months due to intake of food or water in Sweden	No	23 (2)
	Unsure	1 (0)
Information retrieval		
	Yes	278 (28)
Seeks information on the internet	No	680 (68)
	Unsure	42 (4)
	www.google.com	149 (15)
Most commonly used websites	www.vardguiden.se (a regional healthcare advice service, mainly Stockholm area)	73 (7)
	www.1177.se (a national healthcare advice service)	70 (7)
	Yes	386 (39)
Seeks information via the telephone	No	586 (59)
	Unsure	28 (3)
	1177 Sjukvårdsrådgivningen (a national healthcare advice service)	227 (23)
Most commonly used telephone health advice service	Outpatients' clinic	140 (14)
Consumption		
	Yes	775 (78)
Buys certain foods or beverages	No	204 (20)
	Unsure	20 (2)
	Blueberry soup	247 (25)
Most commonly purchased food products	Cola-type sodas	189 (19)
	Probiotics	62 (6)
	Rusks	59 (6)
	Soured milk	59 (6)
	Rose-hip soup	43 (4)
	Yes	342 (34)
Buys pharmaceuticals (prescription or over-the-counter)	No	589 (59)
	Unsure	68 (7)
Most commonly purchased pharmaceuticals	Electrolyte replacements	61 (6)

**Table 1.** Contd.

	Anti-diarrhoeal loperamide-based products	57 (6)
	Activated charcoal	23 (2)
Buys natural remedies	Yes	127 (13)
	No	819 (82)
	Unsure/no response	53 (5)

incidence of GI (all causes, 5-year recall) corresponded to 0.095 illnesses per person and year. The estimated incidence of food- and waterborne GI (12-month recall) was 0.092 illnesses per person and year and the corresponding incidence for GI believed to have been contracted in Sweden was 0.068 (Table 1). The estimated number of food- and waterborne illnesses contracted in Sweden was 506,739; 95% CI 390,535 to 622,942. A z-test was carried out and the proportion of food- and waterborne illnesses in 2009 was not significantly different from 1994 ( $p > 0.05$ ) (Norling, 1994).

Gastrointestinal illness was significantly more common among younger respondents ( $p < 0.05$ ), and respondents aged 20 to 39 were over-represented among those who had experienced GI. This is consistent with the reported foodborne illnesses in Sweden (Lindblad et al., 2009). A previous survey showed that young adults living in the cities twice as often contract foodborne GI compared with the average population and that the risk significantly increases for those who dine out rather than at home (Norling, 1994). Gastrointestinal illness was also more common among respondents in families with small children under the age of five, compared with respondents in families with older children or no children. The present estimates of GI incidence are likely to be underestimations since it was not possible for respondents to state the total number of illnesses (if applicable) experienced during the time period in question. In addition, recall bias may also lead to an underestimation of the incidence. This explains why the 5-year recall of total GI resulted in an estimated incidence that was very close to the 12-month recall of foodborne GI in the present study.

Many Swedes use the telephone or the internet to obtain information or advice about GI. One-third of the respondents used either the internet or the telephone to obtain information about GI when they, or a member of their family, fall ill from GI (Table 1). The most commonly used channels for this type of information were the telephone-based national healthcare advice service (<http://www.1177.se>) and the internet-based Google search engine. Using the internet for information retrieval about GI was significantly associated with respondents younger than the median age (52 years), with university education, living with another adult, and who had experienced GI due to food or drinking water in the past

12 months. Using the telephone for seeking information was significantly related to whether the respondent lived in a household with at least one child under the age of five years. The use of specific search terms in search engines or health care websites may provide information useful for syndrome surveillance. For example, Google Flu Trends (<http://www.google.org/flutrends>) use search terms as indicators of seasonal influenza (Ginsberg et al., 2009), and the Swedish Institute for Communicable Disease Control successfully use web queries as an additional surveillance system for monitoring seasonal norovirus infections (Hulth et al., 2010). It is however important to keep in mind that web queries are not direct measures of illness activity. Web queries rather reflect the current interest among internet users for the topic in question, which may be influenced by a range of factors.

Sales statistics on certain food products or drugs may possibly be used as public health indicators. Seventy-eight percent bought specific food products when they or a member of their family fell ill from GI (Table 1). Buying food products was significantly associated with respondents who were female, had children living at home, and had experienced GI in the past five years. The most frequently bought products were blueberry soup, cola-type sodas and probiotics. To the best of our knowledge, sales frequencies of food products have not been used for monitoring infectious disease in the general population. However, this may not be surprising since any association of such data to disease incidence is inherently difficult to analyse. This is due to high baseline consumption in the community and because factors other than GI more strongly correlate with consumption patterns of these food products.

One-third of the respondents bought pharmaceutical products or natural remedies (Table 1). Buying pharmaceuticals was significantly related to respondents younger than the median age, who lived in households consisting of at least two adults, and who had experienced GI due to food or drinking water in the past 12 months. The use of over-the-counter (OTC) drug sale statistics as indicators of illness has been evaluated in other studies. Edge et al. (2006) found that OTC sales of drugs against diarrhoea and nausea were good predictors of norovirus infections in the community. Hogan et al. (2003) concluded that increased sales of electrolyte products usually preceded hospital diagnoses

of respiratory and diarrheal diseases in children, and may therefore facilitate an earlier detection of outbreaks.

Forty-eight percent of the respondents claimed that they would report to their municipal health and environment department if they believed themselves, or a member of their family, to have become ill due to food poisoning. Most respondents prefer the internet as a means of reporting food poisonings. Seventy-six percent of the respondents said that they would like to be able to report to the National Food Agency (NFA) directly, preferably by using the internet. Willingness to report to NFA was significantly associated with respondents younger than the median age of the survey. There was no significant relationship between willingness to report and having experienced food- or drinking water-related GI in the past 12 months.

This study adds novel findings on how Swedes behave when encountering a GI event. The knowledge might be used in developing an efficient surveillance of foodborne illnesses that is necessary for timely intervention during outbreaks and for preventing new and/or severe cases of illness. Public health surveillance and early detection of food- and waterborne outbreaks in Sweden may be strengthened by: new options for the general public to report foodborne illnesses via the internet; a more efficient use of the currently available reporting system; and the use of information retrieval behaviour on the internet and via telephone calls to health care advice services; and, possibly, consumption patterns of certain foods and pharmaceuticals.

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