

ORIGINAL ARTICLE

Sickness absence due to gastroesophageal reflux diagnoses: a nationwide Swedish population-based study

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Abstract

Objective. Gastroesophageal reflux disease (GERD) is a major public health problem in the Western world. No previous population-based nationwide study has, however, examined the occurrence of sickness absence due to GERD diagnoses, that is, the aim of this study. **Material and methods.** Nationwide population-based study based on Swedish registers including all 4,764,843 individuals registered as living in Sweden in 31 December 2004 and 31 December 2005, aged 20–64 years, not on disability or old age pension. Reimbursed sickness absence due to reflux diagnoses (ICD-10), that is, GERD (K21), esophagitis (K20), and heartburn (R12), was studied separately and combined. In analyses stratified by sociodemographic factors, inpatient/specialized outpatient care, antireflux surgery, and prescribed reflux medications those sickness absent in 2005 due to reflux diagnoses were compared to those sickness absent due to non-reflux diagnoses and to those with no sickness benefits 2005. **Results.** In total, 627 individuals had at least one prevalent sick-leave spell due to reflux diagnoses in 2005, of which GERD was the most common diagnosis. Of these, almost half (45%) was absent for ≥ 28 reimbursed sick-leave days due to reflux diagnoses. The proportions of low socioeconomic status (SES), inpatient and outpatient care due to tumors, mental disorders, circulatory disorders, GERD, antireflux surgery, and reflux medications were higher among those sickness absent due to reflux diagnoses compared to those with no sickness benefits. **Conclusions.** In this nationwide population-based study a high proportion of those sickness absent due to reflux diagnoses was on long-term sick leave, a finding that warrants attention.

Key Words: *heartburn, nationwide, population-based, sick leave*

Introduction

Gastroesophageal reflux disease (GERD) is, according to the Montreal definition, a chronic condition that develops when reflux of gastric contents into the esophagus causes troublesome symptoms or complications [1]. Heartburn and acid regurgitation are defined as the characteristic symptoms of this disease [1–3]. GERD is one of the most common health problems among adults in the Western world with an estimated, and increasing [4], prevalence of about 10–20% [5–7]. In a study among 3000 adults in northern Sweden, as many as 14% reported having reflux symptoms at least once a week [8], and in a population-based study in the Norwegian county Nord-Trøndelag, the prevalence of GERD had

increased substantially between 1995–1997 and 2006–2009, that is, from 11.6% to 17.1% [9]. GERD is prevalent among both men and women and in all ages, although it seems to be most common in the middle ages [9,10]. High body mass index (BMI) [7,11–13], tobacco smoking [7,14–16] and heredity [17,18] are established risk factors for GERD, while low SES [19], anxiety and depression [20], and sleep problems [21] are strongly associated with GERD. Current management of GERD includes lifestyle modifications or self-medication with over-the-counter drugs if minor symptoms, while more troublesome and relapsing reflux symptoms are treated in primary care or by specialists if long-term management by acid suppressant therapy or antireflux surgery is required [22].

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Severe complications of GERD include esophagitis [1,23] and esophageal adenocarcinoma [24,25]. Moreover, GERD has an adverse impact on health-related quality of life [8,26] and several studies have shown that GERD is associated with impaired work capacity and reduced work productivity [27–39]. Thus, GERD produces substantial costs to patients, employers, and society at large, mainly through decreased work productivity [36] and costs for the often lifelong medical treatment [26]. The need for large studies, including data on individual levels, of work absenteeism in relation to GERD has been stressed [30,38]. No prior nationwide population-based study, based on individual diagnosis-specific sickness absence data, has examined the occurrence of sickness absence due to reflux diagnoses, that is, the aim of this study.

Methods

Study design, study population, data collection, and register linkages

This population-based study includes all 5,277,713 individuals who were registered as living in Sweden in 31 December 2004 and 31 December 2005, respectively, and in 31 December 2005 were 20–64 years old. We obtained data from nationwide population-based registers that were linked by using the Personal Identity Number (PIN, a unique ten-digit number assigned to all Swedish residents); from the *Longitudinal Integration Database for Health Insurance and Labor Market Studies* (LISA) of Statistics Sweden for data regarding definition of the cohort, sociodemographic factors, and old age pension; from the *Micro Data for Analysis of the Social Insurance database* (MiDAS) of the Swedish Social Insurance Agency for data regarding diagnosis-specific sickness absence and disability pension; and from the *National Patient Register*, *Swedish Prescribed Drug Register*, and *Causes of Death Register* of the National Board of Health and Welfare for data regarding inpatient and specialized outpatient care, antireflux surgery, reflux medications, and mortality, respectively. The study was approved by the Regional Ethical Review Board in Stockholm, Sweden.

Exclusions of non-eligible study participants

We excluded 34 individuals who were erroneously registered as alive in 2005, 24,876 individuals with early old age pension starting before 2005 (as old age pension is mostly granted at 65 years in Sweden), and 487,960 individuals with ongoing disability pension in 2004 and 2005, respectively. After these

exclusions, 4,764,843 individuals were included in the statistical analyses.

Sickness absence due to reflux diagnoses

The Swedish social insurance system includes sickness benefits covering up to 80% of lost income when sickness absent due to disease or injury among all adult residents with income from work or unemployment benefits. The first sick-leave day is a qualifying day with no benefits. After the seventh sick-leave day, a sickness certificate issued by a physician is required. Sick pay is provided from the employer for the first 14 days of a sick-leave spell, and thereafter the Swedish Social Insurance Agency pays sickness benefits. There are no strict time limitations regarding duration of a sick-leave spell. In this study, data regarding sickness absence due to reflux diagnoses was based on MiDAS and defined as having sickness benefits for at least one day. Nationwide diagnosis-specific sick-leave data is available since 2005, and the main sick-leave diagnosis for each sick-leave spell is registered. Sick-leave diagnoses are classified according to *The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* (ICD-10, 3 digits). Reflux diagnoses were defined as GERD (K21), esophagitis (K20), and heartburn (R12). Several different measures of sickness absence due to reflux diagnoses, studied separately and combined, were used. First, we constructed eight different variables regarding prevalent sickness absence due to reflux diagnoses in 2005 (i.e., including both ongoing sick-leave spells even if starting before 2005 and new sick-leave spells starting in 2005) and incident sickness absence in 2005 (i.e., including only new sick-leave spells starting 2005) categorized as: i) individuals having no sickness benefits in 2005, ii) individuals having no sick-leave spell due to reflux diagnoses, but at least one sick-leave spell due to non-reflux (or missing) diagnoses in 2005, iii) individuals having no sick-leave spell due to GERD diagnoses, but at least one sick-leave spell due to esophagitis or heartburn diagnoses in 2005, and iv) individuals having at least one sick-leave spell due to GERD diagnoses in 2005. For the other variables, GERD diagnoses were replaced by esophagitis or heartburn diagnoses, respectively, and when studying reflux diagnoses categories (iii) and (iv) were merged. Secondly, we studied number of prevalent and incident sick-leave spells among those sickness absent due to reflux diagnoses in 2005. Finally, we studied the summarized number of reimbursed sick-leave days within sick-leave spells due to reflux diagnoses, among those sickness absent

due to reflux diagnoses in 2005, and categorized as: i) 1–27 sick-leave days, ii) 28–179 sick-leave days, iii) 180–365 sick-leave days, and iv) 366+ sick-leave days. We calculated the number of sick-leave days due to reflux diagnoses within both prevalent sick-leave spells (i.e., starting both before and during 2005) and incident sick-leave spells (i.e., starting only during 2005). All available data were used (i.e., until 2010) and we calculated the number of sick-leave days within the sick-leave spells until they ended (i.e., end dates for both prevalent and incident sick-leave spells may have been after 31 December 2005 until 31 December 2010).

Statistical analyses

We performed descriptive analyses, that is, frequencies, proportions, means and medians, of the different measures of sickness absence due to reflux diagnoses using SAS 9.2 (SAS Institute Inc. Cary, NC). The analyses of prevalent sickness absence due to reflux diagnoses were stratified by the following variables: *Sociodemographic factors*, that is, age, sex, SES based on education/educational level, family situation, region of residence, and country of birth. *Hospitalization, that is, inpatient data, and specialized care, that is, outpatient data*, due to the following ICD-10 diagnoses: malignant and benign tumors (C00–C97, D00–D48), mental and behavioral disorders (F00–F99), diseases of the circulatory system (I00–I99), and reflux diagnoses (studied separately and combined), that is, GERD (K21), esophagitis (K20), and heartburn (R12). *Antireflux surgery*, classified according to the Swedish version of Classification of Surgical Procedures using the following surgical codes (studied separately and

combined); transabdominal operations for rupture or local lesion of diaphragm (JBA), operations for diaphragmatic hernia (JBB), operations for GERD (JBC), other transabdominal operations on diaphragm, and operations for gastroesophageal reflux (JBW). *Medical treatment for reflux*, that is, prescribed and collected drugs for peptic ulcer and GERD classified according to the following Anatomical Therapeutic Chemical (ATC) codes (studied separately and combined): H2-receptor antagonists (A02BA), proton pump inhibitors (A02BC), and other drugs for peptic ulcer and GERD (A02BX). For detailed descriptions of the above-mentioned variables see Tables IV and V.

Sickness absence due to reflux diagnoses in 2010

In addition, to study sickness absence due to reflux diagnoses in 2010, we used all available data, that is, for the year 2010. Thus, after similar exclusions as described above, 4,936,790 individuals registered as living in Sweden in 31 December 2009 and 31 December 2010, respectively, who in 31 December 2010 were 20–64 years old were included in these analyses. Similar variables as described above for prevalent and incident sickness absence and number of incident and prevalent sick-leave spells in 2010 were constructed.

Results

Prevalent and incident sickness absence due to reflux diagnoses

Table Ia presents the distribution of those sickness absent due to the three reflux diagnoses compared to

Table Ia. Sickness absence due to reflux diagnoses, separately and combined, among the study participants registered as living in Sweden December 31, 2004/2005, aged 20–64 years¹.

	No. of participants (%)	
	Prevalent sickness absence	Incident sickness absence
No sickness benefits 2005	4,103,347 (86.12)	4,319,483 (90.65)
No sick-leave spell due to reflux diagnoses, but at least one other sick-leave spell	660,869 (13.87)	444,850 (9.34)
GERD		
No sick-leave spell due to GERD, but at least one due to esophagitis/heartburn	43 (0.00)	37 (0.00)
At least one sick-leave spell due to GERD diagnoses 2005	584 (0.01)	473 (0.01)
Esophagitis		
No sick-leave spell due to esophagitis, but at least one due to GERD/heartburn	594 (0.01)	481 (0.01)
At least one sick-leave spell due to esophagitis diagnoses 2005	33 (0.00)	29 (0.00)
Heartburn		
No sick-leave spell due to heartburn, but at least one due to GERD/esophagitis	617 (0.01)	502 (0.01)
At least one sick-leave spell due to heartburn diagnoses 2005	10 (0.00)	8 (0.00)
Reflux diagnoses combined		
At least one sick-leave spell due to reflux diagnoses 2005	627 (0.01)	510 (0.01)
Total	4,764,843 (100)	4,764,843 (100)

¹No missing observations.

Table Ib. Sickness absence due to reflux diagnoses, separately and combined, among the study participants registered as living in Sweden in 31 December 2009/2010, aged 20–64 years¹.

	No. of participants (%)	
	Prevalent sickness absence	Incident sickness absence
No sickness benefits 2010	4,514,707 (91.45)	4,592,802 (93.03)
No sick-leave spell due to reflux diagnoses, but at least one other sick-leave spell	421,846 (8.54)	343,785 (6.96)
GERD		
No sick-leave spell due to GERD, but at least one due to esophagitis/heartburn	13 (0.00)	10 (0.00)
At least one sick-leave spell due to GERD diagnoses 2010	224 (0.00)	193 (0.00)
Esophagitis		
No sick-leave spell due to esophagitis, but at least one due to GERD/heartburn	230 (0.00)	197 (0.00)
At least one sick-leave spell due to esophagitis diagnoses 2010	7 (0.00)	6 (0.00)
Heartburn		
No sick-leave spell due to heartburn, but at least one due to GERD/esophagitis	231 (0.00)	199 (0.00)
At least one sick-leave spell due to heartburn diagnoses 2010	6 (0.00)	4 (0.00)
Reflux diagnoses combined		
At least one sick-leave spell due to reflux diagnoses 2010	237 (0.00)	203 (0.00)
Total	4,936,790(100)	4,936,790 (100)

¹No missing observations.

those sickness absent due to non-reflux (or missing) diagnoses (i.e., all non-reflux diagnoses included in the 22 ICD-10 chapters) and to those with no sickness benefits. The majority (4,103,347 persons, 86%) of the study participants had no prevalent sick-leave spell in 2005, whereas 14% had at least one prevalent sick-leave spell due to non-reflux diagnoses and less than 1% had at least one prevalent sick-leave spell due to reflux diagnoses (Table Ia). GERD was by far the most common diagnosis, while very few were sickness absent due to an esophagitis or heartburn diagnosis. The numbers regarding incident sickness absence due to reflux diagnoses were slightly lower (Table Ia). The number of sick-leave spells due to both non-reflux and reflux diagnoses, respectively, was lower among those registered as living in Sweden in 2009/2010 (Table Ib).

Number of sick-leave spells due to reflux diagnoses

The majority of those sickness absent due to reflux diagnoses in 2005 had one prevalent or incident sick-leave spell and no one had more than two prevalent or incident sick-leave spells due to reflux diagnoses in 2005 (Table IIa). Similarly, the majority among those sickness absent due to reflux diagnoses in 2010 had only one prevalent or incident sick-leave spell (Table IIb).

Summarized number of reimbursed sick-leave days due to reflux diagnoses

The majority (55%) among those having at least one prevalent sick-leave spell due to reflux diagnoses in 2005 were absent for 1–27 summarized reimbursed sick-leave days due to reflux diagnoses, 25% had 28–179 sick-leave days, 4% had 180–365 sick-leave

Table IIa. Number of prevalent and incident sick-leave spells due to reflux diagnoses, separately and combined, among those sickness absent due to reflux diagnoses in 2005¹.

	No. of participants (%)	
	Prevalent sick-leave spells	Incident sick-leave spells
GERD		
One sick-leave spell due to GERD diagnoses	567 (97)	462 (98)
Two sick-leave spells due to GERD diagnoses	17 (3)	11 (2)
Esophagitis		
One sick-leave spell due to esophagitis diagnoses	33 (100)	29 (100)
Heartburn		
One sick-leave spell due to heartburn diagnoses	9 (90)	7 (86)
Two sick-leave spells due to heartburn diagnoses	1 (10)	1 (12)
Reflux diagnoses combined		
One sick-leave spell due to reflux diagnoses	609 (97)	498 (98)
Two sick-leave spells due to reflux diagnoses	18 (3)	12 (2)

¹No missing observations.

Table IIb. Number of prevalent and incident sick-leave spells due to reflux diagnoses, separately and combined, among those sickness absent due to reflux diagnoses in 2010¹.

	No. of participants (%)	
	Prevalent sick-leave spells	Incident sick-leave spells
GERD		
One sick-leave spell due to GERD diagnoses	213 (95)	184 (95)
Two sick-leave spells due to GERD diagnoses	9 (4)	7 (4)
Three sick-leave spells due to GERD diagnoses	2 (0.9)	2 (1)
Esophagitis		
One sick-leave spell due to esophagitis diagnoses	7 (100)	6 (100)
Heartburn		
One sick-leave spell due to heartburn diagnoses	6 (100)	4 (100)
Reflux diagnoses combined		
One sick-leave spell due to reflux diagnoses	226 (95)	194 (96)
Two sick-leave spells due to reflux diagnoses	9 (4)	7 (3)
Three sick-leave spells due to GERD diagnoses	2 (0.8)	2 (1)

¹No missing observations.

days, while as many as 17% were sickness absent due to reflux diagnoses for more than 366 days. The corresponding numbers of sick-leave days among those having at least one incident sick-leave spell due to reflux diagnoses in 2005 were 64%, 26%, 3%, and 7%, respectively (Table III). The distribution of the number of sick-leave days was very skewed. Thus, the mean number of sick-leave days due to reflux diagnoses within prevalent sick-leave spells was 191 (standard deviation [SD] = 388), while the median

was 22, and the mean number of sick-leave days due to reflux diagnoses within incident sick-leave spells was 87 (SD = 227), while the median was 17.

Prevalent sickness absence due to reflux diagnoses stratified by sociodemographic factors

Individuals who were sickness absent due to both non-reflux and reflux diagnoses were somewhat older

Table III. Summarized number of reimbursed sick-leave days due to reflux diagnoses,¹ separately and combined, among those sickness absent due to reflux diagnoses in 2005².

	No. of participants (%)	
	Prevalent sick-leave spells	Incident sick-leave spells
GERD		
1–27 summarized sick-leave days	323 (55)	307 (65)
28–179 summarized sick-leave days	142 (24)	120 (25)
180–365 summarized sick-leave days	22 (4)	15 (3)
366+ summarized sick-leave days	97 (16)	31 (7)
Esophagitis		
1–27 summarized sick-leave days	17 (52)	17 (59)
28–179 summarized sick-leave days	11 (33)	10 (34)
180–365 summarized sick-leave days	-	-
366+ summarized sick-leave days	5 (15)	2 (7)
Heartburn		
1–27 summarized sick-leave days	3 (30)	3 (38)
28–179 summarized sick-leave days	4 (40)	4 (50)
180–365 summarized sick-leave days	1 (10)	-
366+ summarized sick-leave days	2 (20)	1 (13)
Reflux diagnoses combined		
1–27 summarized sick-leave days	343 (55)	327 (64)
28–179 summarized sick-leave days	157 (25)	134 (26)
180–365 summarized sick-leave days	23 (4)	15 (3)
366+ summarized sick-leave days	104 (17)	34 (7)

¹Prevalent/ongoing reimbursed sick-leave spells in 2005 started before or during 2005, incident/new sick-leave spells started during 2005, that is, between 1 January 2005 and 31 December 2005. End dates for both prevalent and incident sick-leave spells might have been after 31 December 2005 until, at the latest, 31 December 2010. However, the majority of the sick-leave spells ended in 2005, and only one sick-leave spell ended in 2010, that is, 1 January 2010.

²No missing observations.

(35–64 years) and had lower educational levels (0–9 years) compared to those with no sickness benefits in 2005. The proportion of women among those sickness absent due to reflux diagnoses was lower (50%) compared to the proportion of women (61%) among those sickness absent due to non-reflux diagnoses. The distributions regarding family situation, region of residence, and country of birth were fairly similar between those who were sickness absent and not sickness absent (Table IV).

Prevalent sickness absence due to reflux diagnoses stratified by inpatient and outpatient care due to tumors, mental disorders, and circulatory diseases

Comorbidity, that is, having inpatient or specialized outpatient care during 2005 due to tumors, mental disorders, or circulatory diseases, was somewhat more common among those sickness absent due to both non-reflux and reflux diagnoses compared to those who were not sickness absent (data not shown).

Prevalent sickness absence due to reflux diagnoses stratified by inpatient and outpatient care due to reflux diagnoses, antireflux surgery, and reflux medications

Very few among those with no sickness benefits or those sickness absent due to non-reflux diagnoses had inpatient or specialized outpatient care due to reflux diagnoses or antireflux surgery in 2005. In contrast, 3% among those with no sickness benefits and 10% among those sickness absent due to non-reflux diagnoses had at least one record of prescribed and collected reflux/peptic ulcer medications during July–December 2005. Among those on sick leave due to reflux diagnoses, 235 individuals (37%) had at least one admission due to reflux diagnoses, 225 (36%) had at least one specialist visit due to reflux diagnoses, 218 (35%) had at least one record of antireflux surgery, and 329 (52%) had at least one collection of reflux medications (Table V) of which most inpatient/outpatient care due to reflux diagnoses was due to a GERD diagnosis, most antireflux surgery were operations for GERD, and most reflux/peptic ulcer medications were proton pump inhibitors (data not shown).

Summarized number of reimbursed sick-leave days due to reflux diagnoses stratified by antireflux surgery and reflux medications

Figure 1 presents analyses of summarized number of reimbursed sick-leave days among those sickness absent due to reflux diagnoses combined stratified by both antireflux surgery and reflux medications.

Within all sick-leave days categories, it was most common to have been prescribed reflux medications, while having no record of antireflux surgery, while a fairly high proportion of individuals with long-term sickness absence due to reflux diagnoses had no record of either reflux medications or antireflux surgery (Figure 1).

Discussion

To our knowledge, this is the first nationwide population-based study of occurrence of sickness absence due to reflux diagnoses. Within the whole Swedish population of working ages only 627 individuals had at least one reimbursed sick-leave spell due to reflux diagnoses in 2005, although a high proportion among those sickness absent due to reflux diagnoses had long-term or very long-term sick-leave spells.

Major strengths of this study are the population-based nationwide design, including the whole Swedish population in working ages, entailing very high statistical power and excluding selection bias, the availability of comprehensive register (i.e., not self-reported) data regarding diagnosis-specific reimbursed sickness absence, sociodemographic factors, inpatient and outpatient care, antireflux surgery, and reflux medications. The population-based study design is complete with no or very few missing observations due to the high quality and nationwide coverage of the Swedish population-based registers used [40,41]. Moreover, we used several different measures of sickness absence to study both the occurrence and duration of the sick-leave spells [42]. It is, however, important to consider that for the employed majority sick-leave spells shorter than 15 days are not included as the employer provides sick pay during this period, that is, the majority of short-term sick-leave spells (i.e., 1–14 days) are not included in our study. Moreover, there is, to our knowledge, only one study of the validity of sick-leave diagnoses, but here the validity of sick-leave diagnoses in medical records was high when compared to diagnoses in registers [43].

While no previous nationwide population-based study has investigated the occurrence of reimbursed sickness absence due to reflux diagnoses, there are several, predominantly US and Western European, studies of direct and indirect costs due to GERD, including the influence of GERD on work productivity and work absence [27–39]. In these studies GERD was associated with substantial both direct (e.g. medications) and indirect costs, that is, reduced ability to work efficiently while at work due to GERD [32,34]. This GERD-related sickness presenteeism resulted in reduced work productivity, that is, a

Table IV. Prevalent sickness absence due to reflux diagnoses combined stratified by sociodemographic factors among the study participants.

Characteristic: 31 December 2005	No. of participants (%)		
	No sickness benefits in 2005	Sick-leave non-reflux diagnoses	Sick-leave reflux diagnoses
Age groups (year)			
20–34	1,458,964 (36)	157,407 (24)	124 (20)
35–44	1,024,275 (25)	173,076 (26)	176 (28)
45–54	866,063 (21)	166,170 (25)	169 (27)
55–64	754,045 (18)	164,216 (25)	158 (25)
Sex			
Men	2,210,543 (54)	256,884 (39)	316 (50)
Women	1,892,804 (46)	403,985 (61)	311 (50)
SES based on education ¹			
High educational level (more than 12 years)	1,520,555 (37)	177,629 (27)	161 (26)
Medium educational level (10–12 years)	1,973,656 (49)	361,074 (55)	343 (55)
Low educational level (0–9 years)	573,378 (14)	120,775 (18)	121 (19)
Missing	35,758	1,391	2
Family situation ²			
Living with partner without children living at home	590,577 (14)	115,812 (18)	107 (17)
Living with partner with children living at home	1,564,714 (38)	264,406 (40)	248 (40)
Living without a partner without children living at home	1,628,235 (40)	208,497 (32)	216 (34)
Living without a partner with children living at home	253,485 (6)	70,454 (11)	55 (9)
Living with parent(s) (aged 20 years)	66,320 (2)	1,669 (0.3)	1 (0.2)
Missing	16	1	-
Region of residence ³			
Larger cities	1,582,243 (39)	227,471 (34)	272 (43)
Medium-sized cities	1,468,096 (36)	238,605 (36)	193 (31)
Smaller places	1,053,008 (26)	194,793 (29)	162 (26)
Country of birth			
Sweden	3,509,261 (86)	562,299 (85)	536 (86)
Other Nordic countries	120,275 (3)	25,363 (4)	27 (4)
Other European Union countries	90,038 (2)	13,673 (2)	15 (2)
Rest of the world	383,494 (9)	59,515 (9)	49 (8)
Missing	279	19	-
Total	4,103,347 (100)	660,689 (100)	627 (100)

¹Statistics Sweden derives the attained “highest education” based on information regarding education according to the Swedish Standard Classification of Education. We classified SES based on education into three often used categories.

²We categorized family situation into five categories. Cohabitants without children in common are classified as singles in the nationwide registers. Individuals living with parents who were older than 20 years were categorized as living without a partner without children living at home.

³“Region of residence” is based on “H-regions,” that is, homogenous regions regarding the population base, a categorization by Statistics Sweden based on municipalities according to the local and regional population bases following the scale urban – rural. We categorized these regions into three categories.

significant burden for employers, while work absence/sick leave due to GERD was rare [32,34]. These prior studies were, however, often based on smaller, not population-based samples and included only self-reported data on sickness absence. In recent studies, based on larger sample sizes, work absence was more common among GERD patients compared to those without GERD [36,37]. Considering the high prevalence of GERD in the middle ages [9,10], the findings in our study indicate that sickness absence due to reflux diagnoses is rare and that most GERD patients are not on long-term sick leave and probably only have shorter sick-leave spells or no sickness absence at all. Moreover, this finding is in accordance with the Swedish National Board of Health and Welfare’s recently established sickness certification guidelines

regarding sickness absence due to GERD diagnoses [44,45]. These guidelines recommend, in the normal case, no sickness absence or sickness absence up to 10 days if work capacity is reduced due to pain or nausea.

Our finding of a high proportion of individuals on long-term sick leave due to reflux diagnoses warrants attention. Potential explanations for long-term sick leave due to GERD diagnoses might be severe symptoms and sleep disruption caused by nocturnal heartburn, which is associated with reduced work capacity and work productivity [29]. Moreover, a recent review showed that the number of hours absent from work was highest among individuals with disruptive GERD, that is, having severe and frequent GERD symptoms [46]. GERD symptoms may affect many

Table V. Prevalent sickness absence due to reflux diagnoses combined stratified by inpatient/outpatient care due to reflux diagnoses, antireflux surgery, and reflux medications among the study participants.

Nationwide register data 2005	No. of participants (%)		
	No sickness benefits in 2005	Sick-leave non-reflux diagnoses	Sick-leave reflux diagnoses
Inpatient care due to reflux diagnoses combined			
No inpatient care due to reflux diagnoses	4,102,604 (99.98)	660,239 (99.90)	392 (62.52)
At least one admission due to reflux diagnoses	743 (0.02)	630 (0.10)	235 (37.48)
Specialized outpatient care due to reflux diagnoses combined			
No outpatient care due to reflux diagnoses	4,096,500 (99.83)	657,902 (99.55)	402 (64.11)
At least one specialist visit due to reflux diagnoses	6,847 (0.17)	2,967 (0.45)	225 (35.89)
Antireflux surgery combined			
No antireflux surgery	4,103,164 (100.00)	660,553 (100.00)	409 (65.23)
At least one record of antireflux surgery	183 (0.00)	216 (0.00)	218 (34.77)
Reflux medications combined ¹			
No prescribed reflux medications	3,980,679 (97.01)	597,684 (90.44)	298 (47.53)
At least one collection of prescribed reflux medications	122,668 (2.99)	63,185 (9.56)	329 (52.47)
Total	4,103,347 (100)	660,689 (100)	627 (100)

¹At least one purchase/collection/registered reflux/peptic ulcer medication prescribed by a physician during July–December 2005, that is, nationwide data is available since July 2005. The Swedish Prescribed Drug Register contains data on drugs (ATC codes), but lacks information on indication of treatment, which prohibits identification of specific disease groups and it is not possible to link drugs bought over-the-counter to individual persons.

aspects of patients' lives, causing sleep problems, anxiety, and physical inactivity as well as reduced concentration, psychosocial well-being, and health-related quality of life [35]. Although many individuals with GERD do not consult a physician, particularly if they have mild GERD symptoms, studies have shown that comorbidity, high utilization of health care resources, and high rates of prescribed prescriptions are common among GERD patients, which may lead to missed hours from work [35]. This is consistent

with the findings in our study of a higher prevalence of inpatient and specialized outpatient care and prescribed reflux medications among those sickness absent due to reflux diagnoses compared to those with no sickness benefits, suggesting that those sickness absent probably have severe GERD symptoms. Thus, long-term sick leave due to GERD diagnoses might be more common among patients with complicated and severe GERD. Among those living in Sweden in 2009/2010, the number of sick-leave spells

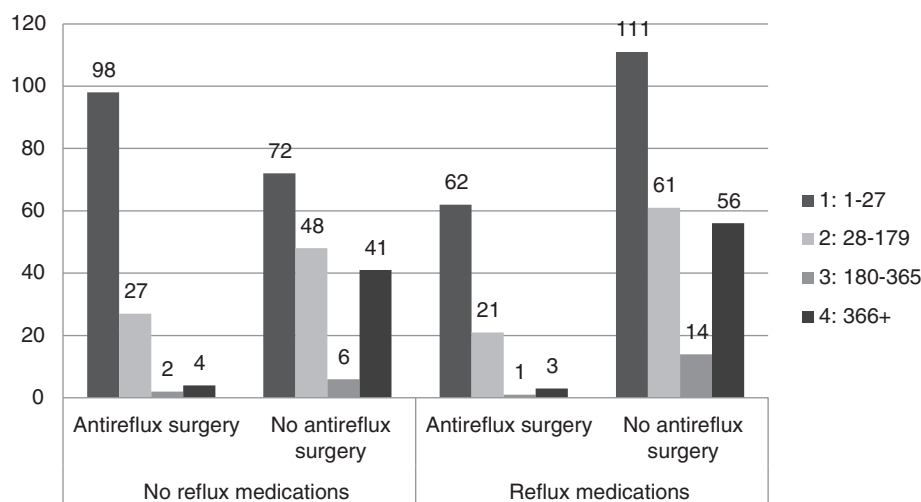


Figure 1. Number of study participants with at least one prevalent sick-leave spell due to reflux diagnoses combined ($n = 627$) in four categories (1: 1–27 summarized sick-leave days due to reflux diagnoses, 2: 28–179 summarized sick-leave days due to reflux diagnoses, 3: 180–365 summarized sick-leave days due to reflux diagnoses, 4: 366+ summarized sick-leave days due to reflux diagnoses) stratified by antireflux surgery (yes/no) and reflux medications (yes/no).

due to both non-reflux and reflux diagnoses was lower, which might be explained by decreasing sickness absence rates in Sweden since 2002, reaching an all-time low in 2010, and the introduction of sick-listing guidelines and stricter eligibility rules in 2008 [47].

Women have an increased risk of sickness absence in general compared to men [48,] and in this study, more women than men were sickness absent due to non-reflux diagnoses while, in contrast, there were no sex differences among those sickness absent due to GERD diagnoses. However, this is consistent with GERD being highly prevalent among both women and men [9]. Having a low educational level was more common among those sickness absent due to reflux diagnoses compared to those with no sickness benefits, which is consistent with observed associations between low SES and increased risks of both GERD and sickness absence, respectively [19,49,50]. Prescribed reflux medications were common within all duration categories of sickness absence due to reflux diagnoses, although several individuals with long-term sickness absence had neither reflux medications nor antireflux surgery and may not have received optimal treatment. Thus, it is important to pay attention to and treat GERD patients adequately to enhance their health-related quality of life and prevent long-term sick leave and exclusion from the labor market.

In conclusion, this nationwide Swedish population-based study reveals that reimbursed sickness absence due to reflux diagnoses is not very common. However, a high proportion of those sickness absent due to reflux diagnoses were long-term sickness absent, a finding that warrants attention.

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