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Original Article

Flu and other Acute Respiratory Infections in the Working Population. The Impact of Influenza A (H1N1) Epidemic

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ABSTRACT

Introduction: This study aims to asses the impact of influenza and other acute respiratory infectious diseases (ARI) on the Catalan working population between January 2007 and December 2009, including the period of the influenza virus A (H1N1) pandemic in our region.
Methods: All certified sickness absence episodes (sick-leave) due to influenza and other ARI amongst the working population of Catalonia, Spain, were analyzed from January 2007 to December 2009. Monthly and weekly incidence was calculated, as well as an influenza sick-leave threshold, in order to identify the epidemic season in the working population.
Results: Registered annual sick-leave incidence for influenza-like illnesses (ILI) per 100 000 workers was 1260.6 in 2007, 915.2 in 2008 and 2377.2 in 2009. Epidemic curves show monthly peaks in January-February each year, plus a second peak in November 2009 corresponding to the influenza virus A (H1N1) pandemic in our region. In 2009 sick-leave incidence for ILI and other ARI was higher in workers from the Health-Social Services sector than in the other workers ($P<.001$).
Conclusion: This study contributes to understanding the impact of influenza and other ARI on the general workforce, during a period of time including the outbreak of influenza virus A (H1N1).

Gripe y otras infecciones respiratorias agudas en la población trabajadora. Impacto del brote de gripe A (H1N1)

Palabras clave:
Gripe
Infección respiratoria aguda
Incapacidad temporal
Salud laboral

RESUMEN

Introducción: El objetivo de este estudio fue evaluar el impacto que tuvieron la gripe y el resto de infecciones respiratorias agudas (IRA) en la población trabajadora catalana entre enero de 2007 y diciembre de 2009, periodo de tiempo que incluyó el brote de gripe por virus A (H1N1) en nuestro medio.
Métodos: Se analizaron todos los procesos de incapacidad temporal (IT) diagnosticados como gripe o como otras IRA en la población trabajadora de Cataluña, España, entre enero de 2007 y diciembre de 2009. Se calcularon la incidencia semanal y mensual y un umbral epidémico de IT por gripe a partir del cual poder definir el brote epidémico en la población trabajadora.
Resultados: La incidencia acumulada anual de IT por gripe por 100.000 trabajadores fue de 1.260,6 en 2007, 915,2 en 2008 y 2.377,2 en 2009. Las curvas de incidencia indican brotes epidémicos en los meses de enero o febrero de cada año, además de un segundo brote en el mes de noviembre de 2009, coincidiendo con la pandemia de virus A (H1N1) en nuestro país. En 2009 la incidencia de gripe y de otras IRA fue más alta en los trabajadores de los sectores salud-servicios sociales que en el resto de los trabajadores ($p < 0,001$).
Conclusión: Este estudio contribuye a conocer las consecuencias de la gripe y las otras IRA sobre la población trabajadora, durante un periodo de tiempo que incluyó el brote por virus A (H1N1).

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Introduction

Influenza and other acute respiratory infections (ARI) are important causes of morbidity in the general population both in Western Europe and the rest of the world. Seasonal mortality can be studied using epidemiological surveillance systems that are coordinated by health departments in local governments.[1-6] Some authors also propose specific surveillance systems for absenteeism (sick days) in order to estimate the impact of influenza and other ARI in the school-age population.[7] However, very few surveillance systems evaluate the impact that these diseases have on the working population.[8,9]

The recent pandemic of influenza A (H1N1) was cause for alarm for health authorities and the general public in several countries.[10-12] Multiple contingency plans and measures were put into place in order to reduce the severity of cases and increase the capacity of health care systems.[13-15] A major increase in workers on sick leave due to influenza could have contributed to the socioeconomic impact of the pandemic, especially due to the losses in key productive sectors such as health and social services and education.[12] The objective of this study was to describe the consequences in terms of sick-leave (SL) that influenza and other ARI had on the working population of Catalonia between January 2007 and December 2009, a time period that included the outbreak of Influenza A (H1N1) in our area.

Methods

Study Population

The public health system is universal in Spain. SL starts from the first day of work missed on doctor's recommendation and ends when the doctor considers that the patient can return to work. We analyzed data corresponding to all SL registered in Catalonia between January 2007 and December 2009.

Sick-Leave Data

The data for SL due to common illness, together with the clinical diagnoses, are registered by the family doctor in the primary health care database. These data are then transferred to the centralized information system of the Instituo Catalán de Evaluaciones Médicas (Catalan Institute of Medical Assessment) (ICAM) for the management and analysis of SL in Catalonia. Acute respiratory infections were classified into influenza and other ARI according to the SL diagnosis registered by the family doctor. The classification was based on the guidelines from the International Classification of Diseases, Ninth Revision, for influenza (487-488) and other ARI (460-466 and 480-486) as well as the equivalent sections from the Tenth Revision.

Given that the pandemic of the influenza A H1N1 took place during a time that was unusual for seasonal influenza outbreaks, we chose to present the results not just from flu seasons but from the entire year. The incidences during the weeks without influenza were used to calculate a threshold value for SL due to influenza. The indicators for accumulated incidence and days of SL per active worker with a Social Security number were calculated per calendar year in order to be able to compare these results with those from other diseases that also cause SL. However, the results from Figure 4 are presented in conventional epidemiological weeks, as presented by epidemiological surveillance programs for influenza in the general population, in order to facilitate comparison by flu season.

Sick-Leave Indicators

In order to study the seasonal patterns of SL due to influenza and other ARI, we calculated the monthly percentage of these diseases from the total SL due to any cause. For each calendar year, we calculated accumulated incidence of SL, mean age at the start of SL, mean duration of the causal condition of the SL, and number of days of SL per active worker with a Social Security number per year. This last index depended on both the number of cases and their duration, and reflected the mean loss in productivity per SL due to the disease per active worker with a Social Security number. We also specifically analyzed the weekly incidence of SL due to influenza and other ARI for the sectors of health and social services and education during 2009.

We established a weekly epidemic threshold for SL due to influenza in the working population as the mean weekly incidence of SL in non-flu weeks plus two standard deviations.[6] We considered non-flu weeks to be those in which the percentage of positive cases of influenza obtained through the epidemiological surveillance system in the general population was less than 10%, and the population incidence was less than 100 cases per 100 000 inhabitants (weeks 9 to 53 of 2007, weeks 6 to 50 in 2008, and weeks 9 to 38 in 2009).[1,16]

Statistical Analysis

The accumulated incidence was calculated using the sum of new cases of SL due to influenza divided by the mean number of active workers with a Social Security number during the corresponding time period. The mean active population with a Social Security number was 3.4 million workers in 2007/2008 and 3.2 million in 2009.[17] The mean total population in Catalonia for the study period was 7.3 million.[18]

The number of SL days per worker per year was calculated using sick leave data. The total number of days spent at home on SL within the study period were added up and divided by the mean number of active workers with a Social Security number during the corresponding period.

We used SPSS statistical software version 18 for the data processing and descriptive analyses. The comparison of weekly incidences of SL due to influenza and other ARI between different sectors of economic activity during 2009 was performed using the Student's t-test. Values of $P<.05$ were considered to be statistically significant.

Results

The seasonal pattern for SL due to influenza and other ARI varied greatly between 2007-2008 and 2009 (Fig. 1). As usual, seasonal flu was at maximum peaks of incidence between January and February in 2007 and 2008. However, during 2009, a second peak was produced in November due to the new Influenza A (H1N1) pandemic. During this month, influenza and other ARI represented 22% and 20.2% of all new SL cases, respectively. During the week in which the maximum weekly peak was reached for the influenza A (H1N1), these percentages changed to 26.6% for SL due to influenza and 19.7% for SL due to other ARI.

The accumulated incidence of SL due to influenza out of 100 000 active workers with a Social Security number was 1260.6 (2007), 915.2 (2008), and 2377.2 (2009). For other ARI, the annual accumulated incidence of SL per 100 000 workers with a Social Security number was 5932.9 (2007), 6071.1 (2008) and 5917.6 (2009).

The mean duration of SL and number of days of SL per worker with a Social Security number per year, both for influenza and other ARI, and separated by sex and age group, is presented in the Table. For influenza, the mean duration of SL over the 3-year study period was 6.8 (12.4) days. The number of days of SL per worker per year due to influenza was 0.1 in 2007–2008 and 0.2 in 2009. In the age class of 15 to 44 years old, the number of days of SL per worker per year due to influenza went from 0.1 in 2007-2008 to 0.2 in 2009. For other ARI, the mean duration of SL during the 3-year period was 7.6

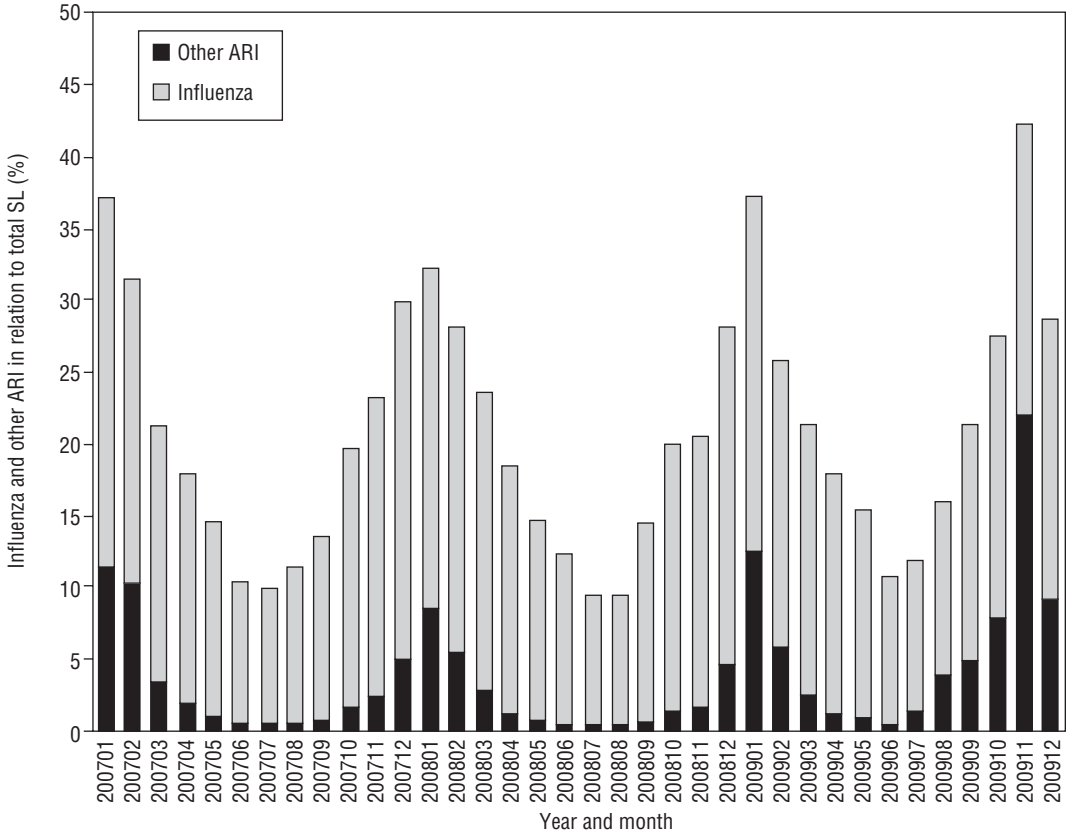

Figure 1. Seasonal pattern of sick-leave due to influenza and other acute respiratory infections between January 2007 and December 2009. ARI indicates acute respiratory infections; SL, sick-leave.Results expressed as monthly percentage of SL due to influenza and other ARI with respect to the total number of SL.

Table
Duration of SL episodes due to influenza and other ARI. Days of SL per active worker with a social security number per year, separated by cause (influenza or other ARI)

	Duration of the SL			Days of SL per active worker with a social security number per year		
	2007	2008	2009	2007	2008	2009
Influenza No.	**42 426**	**30 271**	**74 437**	**42 426**	**30 271**	**74 437**
Sex						
Men	6.7 (14.4)	6.6 (14.2)	6.3 (8.4)	0.1	0.1	0.1
Women	7.5 (14.7)	7.7 (18.7)	6.8 (9)	0.1	0.1	0.2
Total	**7 (14.6)**	**7.1 (16.4)**	**6.6 (8.7)**	**0.1**	**0.1**	**0.2**
Age						
16-24 years	5.8 (10)	5.9 (16)	5.8 (6.4)	0.1	0.1	0.2
25-34 years	6.5 (16.9)	6.1 (13.9)	5.9 (7.3)	0.1	0.1	0.2
35-44 years	6.8 (10.4)	7.2 (17.6)	6.5 (8.8)	0.1	0.1	0.2
45-54 years	8.1 (14.8)	8.3 (15.4)	7.5 (10.8)	0.1	0.1	0.1
≥55 years	10.7 (20.2)	10.2 (22.8)	9 (11.7)	0.1	0.1	0.1
Other ARI, No.	**202 138**	**202 845**	**187 134**	**202 138**	**202 845**	**187 134**
Sex						
Men	7.9 (20.5)	7.3 (19)	7.2 (19.3)	0.4	0.4	0.3
Women	8.4 (20.3)	7.7 (18.2)	7.2 (16.8)	0.6	0.5	0.5
Total	**8.2 (20.4)**	**7.5 (18.6)**	**7.2 (18)**	**0.5**	**0.4**	**0.4**
Age						
16-24 years	6 (14)	5.3 (11.6)	5.1 (10.7)	0.7	0.6	0.7
25-34 years	6.7 (15.7)	5.9 (12.6)	5.8 (13.2)	0.5	0.4	0.4
35-44 years	8.2 (19.2)	7.5 (17.2)	7 (16.4)	0.4	0.4	0.4
45-54 years	10.9 (26.4)	10.2 (25.4)	9.2 (22.6)	0.4	0.4	0.4
≥55 years	16.2 (38.9)	15.3 (36)	14.5 (34.4)	0.6	0.5	0.5

Abbreviations: ARI, acute respiratory infections; SL, sick-leave. The duration of SL is expressed in days as mean (SD).

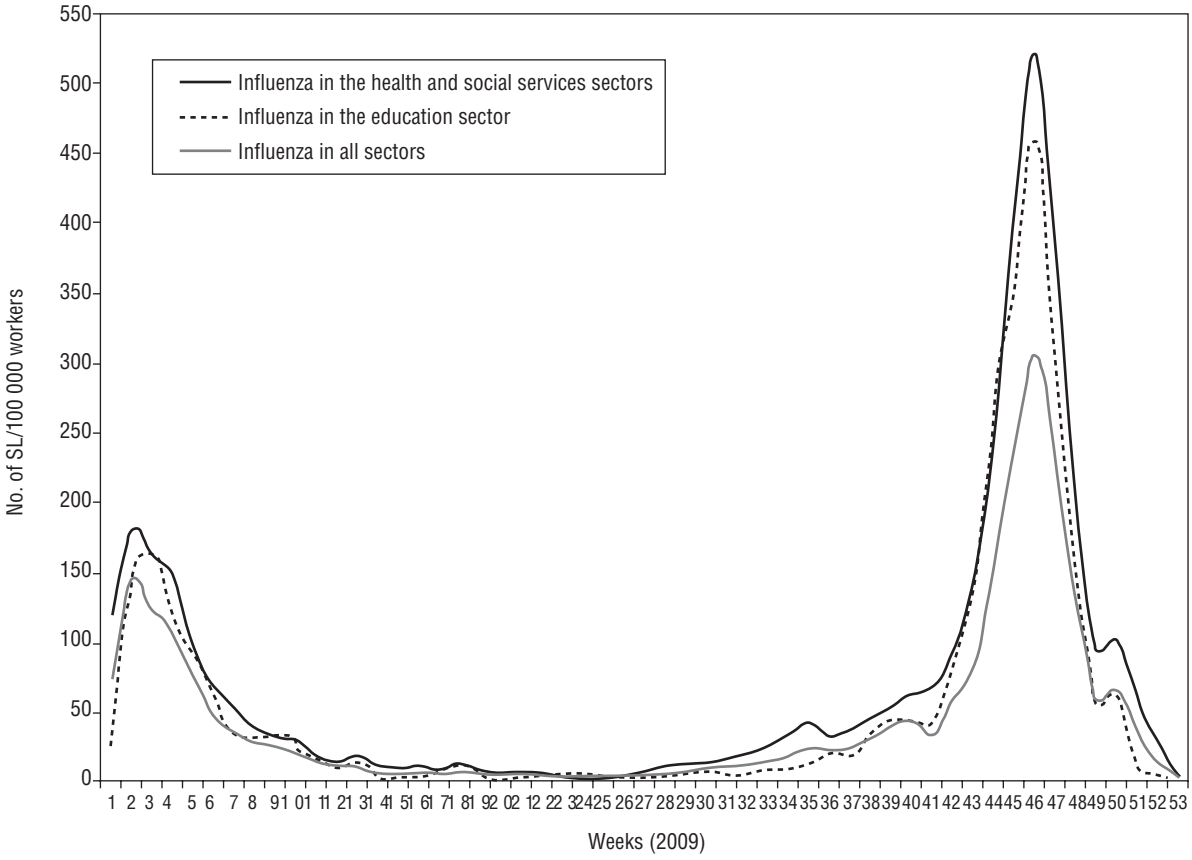

Figure 2. Weekly incidence of SL due to influenza during 2009 among workers in the health and social services, educational, and all other sectors. SL indicates sick-leave.

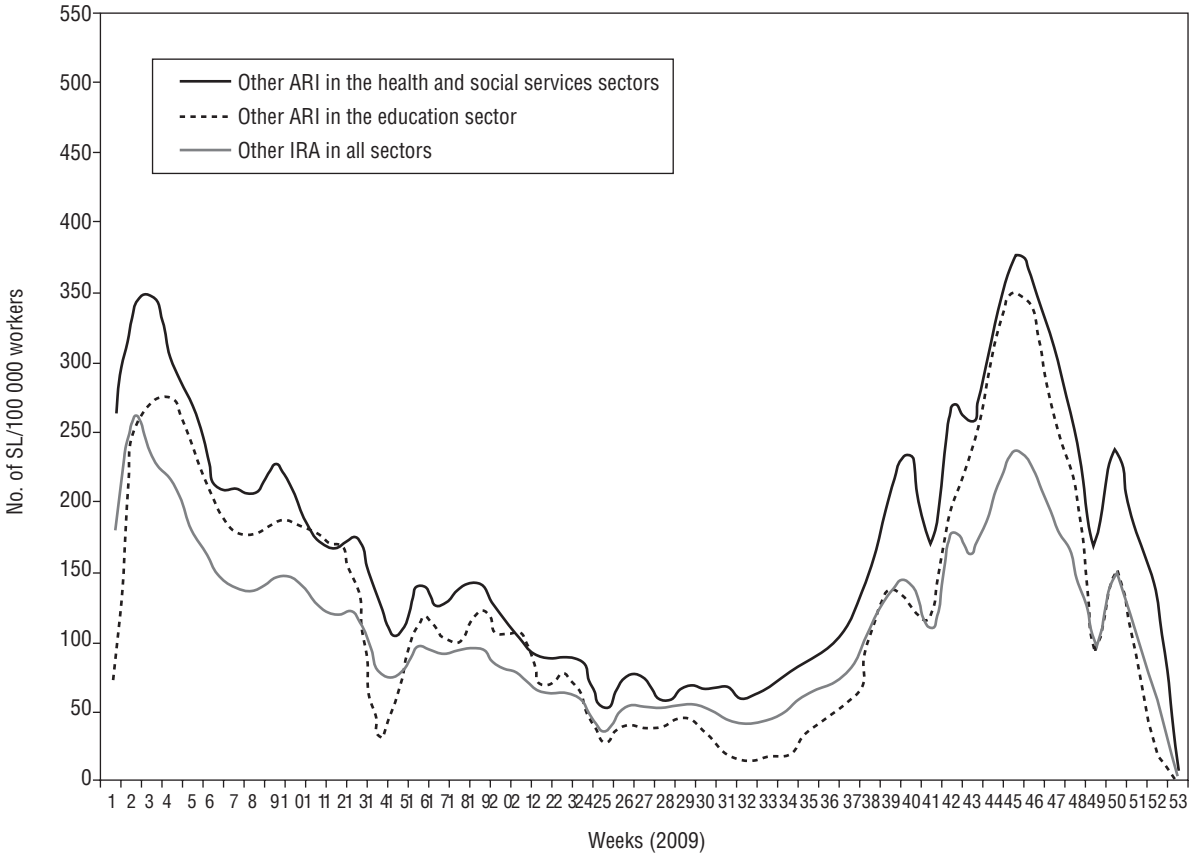

Figure 3. Weekly incidence of SL due to other ARI during 2009 among workers in health and social services, educational, and all sectors. ARI indicates acute respiratory infections; SL. sick-leave.

(19.0) days. The number of days of SL per worker per year for other ARI went from 0.5 in 2007 to 0.4 in 2008–2009.

The estimated weekly incidences of SL for health and social services and education in the year 2009 are shown in Figure 2 (referring to influenza) and Figure 3 (referring to other ARI). For 2009, the overall incidence of SL due to influenza and other ARI was greater for the health and social services sector than for all workers (P<.001). However, this difference was not significant for the educational sector with respect to all workers. The weekly incidence of SL due to influenza rose abruptly in week 46 of 2009, coinciding with the peak of the influenza A virus (H1N1) pandemic in the general population. During this week, the incidence of SL due to influenza in health and social services and educational sectors was 60% greater than the sum of all of the other production sectors.

Figure 4 shows the weekly incidence of SL due to influenza between January 2007 and December 2009 organized by flu season (between the 40th week of one year and the 39th week of the next).

The epidemic threshold for SL due to influenza in the working population was established at 30 new cases per 100 000 workers per week.

Discussion

Our study provides information on the processes of SL due to influenza and other ARI in Catalonia during the last 3 years, including the period of the influenza A (H1N1) pandemic. The monthly incidence of SL due to influenza shows a clear seasonal distribution, with higher values at the beginning of each year. This seasonal pattern coincides with what is normally found for influenza in the general population, both in Spain and in other European countries.[2,3] The abrupt increase in the incidence of SL due to influenza in November 2009 corresponded to an increase in influenza incidence in the general population and the influenza A (H1N1) epidemic in our area.[19]

The generally short mean duration of SL due to influenza and other ARI explains the relatively low cost of these pathologies on productivity in terms of days on SL per worker per year. However, due to the increase in SL incidence for influenza in 2009, this indicator doubled in the age group between 16 and 44 years. This differential impact on younger workers is consistent with the data of influenza in the general population during the influenza A (H1N1) pandemic, both in our country,[19] and in other countries.[3,20] The greater incidence of SL due to influenza in younger people could be due to the fact that older workers have greater protection than younger workers, due to previous exposure or greater vaccination rates.

During 2009, the incidence of SL due to influenza was significantly higher for workers in the health and social services sector than for all workers. In Norway, other authors also described a greater risk of SL due to influenza and other ARI in nursing staff.[21] Furthermore, during the maximum weekly peak of the influenza A (H1N1) pandemic, the incidence of SL due to influenza was 60% higher in the health and social services and education sectors than in all the other sectors. Possibly, the workers in these sectors were more exposed to contact with the disease, given the direct interaction that these jobs have with the general population. Although it will be necessary to continue studying the incidences of SL due to influenza according to various professional sectors in years to come, our study would indicate that in similar situations in the future, the most highly affected sectors will probably be those of the health and social services and education. They will therefore require greater prevention efforts. Our study establishes a weekly epidemic threshold for SL due to influenza in

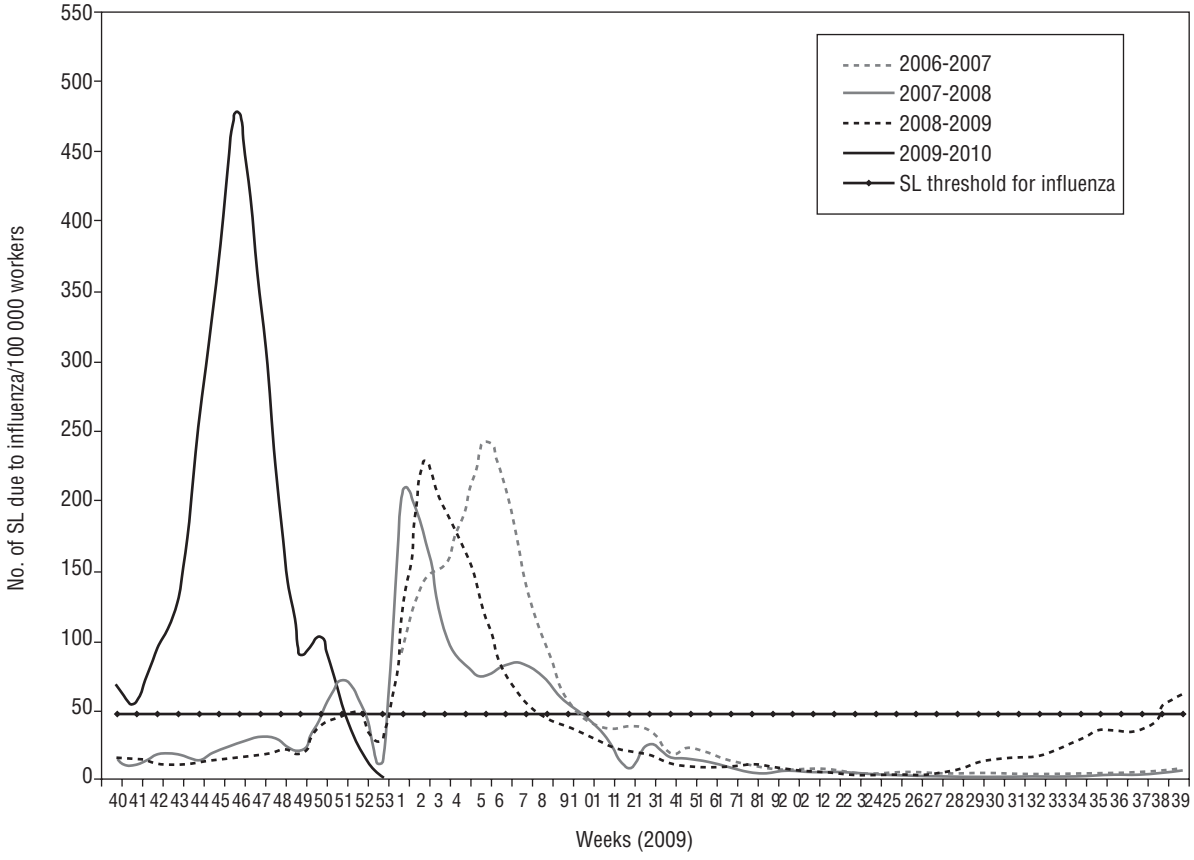

Figure 4. Weekly incidence of SL due to influenza between January 2007 and December 2009, by flu season. SL indicates sick-leave.

the working population at 30 cases per 100 000 active workers with a Social Security number. Logically, this threshold is lower than the threshold for an influenza epidemic in the general population (100 cases per 100 000 inhabitants), which is estimated using data from visits to the family doctor using the influenza epidemiological surveillance programme.[19] The epidemic threshold for SL due to influenza calculated in this study could be useful for monitoring outbreaks of SL due to influenza in the working population, indicating the start of the outbreak, the predictable increase in losses in productivity due to SL, and the possibility of organizational problems in activity sectors with a higher incidence of SL due to influenza.

One limitation of this study is that the data are based on the diagnosis of clinical suspicion, without a biological confirmation made during primary care. It is possible that during the pandemic, a greater sensitivity of the general population and health professionals to the condition could have caused over-diagnosis of influenza in cases with non-specific symptoms. However, the surveillance data for influenza in the general population published by the influenza epidemiological surveillance programme in Catalonia indicate that during the influenza A (H1N1) pandemic, not only was there an increase in cases diagnosed due to clinical criteria, but also that these were biologically confirmed at a greater rate than in normal seasonal flu periods.[19] Therefore, we believe that the criteria for clinical detection of influenza during the pandemic were applied in a similar manner to previous flu seasons by family doctors.

Despite consisting of short episodes, influenza and other ARI represent a high percentage of SL during the weeks of flu epidemics. This percentage can be even greater during pandemics such as that of the influenza A virus (H1N1). Organizational measures are necessary in different sectors in order to minimize the consequences of influenza, especially in the younger population and some key sectors such as health and social services and education.

Conflict of Interest

The authors affirm that they have no conflicts of interest.

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