

# Trends in Occupational Diseases in Italian Industry and Services From 2006 To 2019

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**KEYWORDS:** Occupational Diseases; Incidence Rate Ratios; Italy; Time Trend

## ABSTRACT

**Background:** *There is a paucity of data on occupational disease incidence in Italy, and we analyzed the trend on time as an incidence rate ratio (IRR). Methods:* Occupational diseases reported to the Italian National Insurance for Occupational Diseases (INAIL) in industrial and services sectors from 2006 to 2019 were considered and analyzed. Annual case counts were analyzed using a Poisson regression model to estimate incidence trends. **Results:** *The incidence of occupational diseases in the industrial and services sectors in 2019 was 261 cases for 100,000 workers, with musculoskeletal disorders (MSDs) representing 65% of the total cases, their incidence being 169.5 cases per 100,000 workers. The incidence of ear diseases (ED) decreased to 20.8 cases for 100,000 workers. The annual change in incidence (IRR) was 1.08 (CI 95% 1.07–1.11) for MSDs, 1.08 (CI 95% 1.06–1.10) for cancers, and 1.04 (CI 95% 1.03–1.06) for respiratory diseases. The trend was significantly negative for ear diseases, 0.96 (CI 95% 0.96–0.97), and skin diseases 0.93 (CI 95% 0.92–0.93). No changes were found for asbestos and mental disorders. Conclusions:* *During the study period, occupational diseases increased in Italy, mainly for MSDs, due to a change-over in eligibility criteria from 2008. However, the overall incidence was lower than in other EU Countries. More efforts are needed to harmonize the legislation for joint action in preventing and recognizing occupational diseases.*

## 1. INTRODUCTION

Studying incidence trends in occupational diseases (ODs) is important to prioritize and evaluate preventive measures to reduce their occurrence. Despite the importance of such an analysis, only some data are available in the literature. [1] Stocks et al. [1] reported trend analyses in contact dermatitis, occupational asthma, noise-induced hearing loss, carpal tunnel syndrome (CTS), and upper limb musculoskeletal disorders in ten EU countries from

2000 to 2012. They demonstrated a general decrease in ODs with few exceptions. Noise-induced hearing loss was reported to increase only in some EU Countries (Belgium, Spain, Switzerland, and the Netherlands). CTS and upper limb musculoskeletal disorder trends are completely different in different EU Countries, mainly due to different reporting systems [1]. EUROSTAT [2] collects data from EU Countries on ODs. Still, differences are wide due to different reporting classification systems' aims, namely compensation or prevention, and

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comprehensive data on ODs is available for a limited list of ODs in Europe.

More recently, van der Molen et al. [3] reported the trend in the incidence of ODs in Italian agricultural sectors, finding a significant increase in musculoskeletal disorders (MSDs) from 2008 due to a changeover of recognizing system applied by the Italian Insurance against occupational diseases (INAIL – Istituto Nazionale per l'Assicurazione contro gli Infortuni sul Lavoro). [4] To enhance this study, we now report the incidence of ODs in another major economic sector, i.e., the industrial sector, in Italy from 2004 to 2019.

The present study aimed to determine the incidence and trend of reported ODs incidence rate (IRR) in Italy's industrial and services sectors from 2006 to 2019.

## 2. METHODS

### 2.1. Study Design and Procedures

ODs notified to INAIL in the national industrial and services sectors from 2006 to 2019 were considered. ODs in Italy are compulsorily reported by a physician in case of "suspected occupational origin". The disease has to be acknowledged, i.e., a cause-effect link has to be ascertained, for the worker to be compensated. OD is defined when a disease is caused by work-related factors and is listed in the Italian List of Occupational Diseases, updated in 2008. [4] Incidence of ODs was determined for six groups of diseases present in the Italian list: Cancers: C00-D48; ear diseases: H60-H95, mainly noise-induced hearing loss: H83.3; musculoskeletal and connective tissue diseases: M00-M99 (mostly added in 2008); respiratory diseases: J00-J99; skin diseases: L00-L99; psychiatric disorders F00-F99 (not included in the official list of occupational diseases in Italy).

The data for this study were taken from two databases: i) the number of reported ODs for industrial and services sectors was taken from the INAIL website [5] for the last five years and from INAIL reports available online for the previous years; ii) the number of total workers in the Industrial and services sectors was taken from a database provided by the Italian National Institute of Statistics (ISTAT) [6].

### 2.2. Statistics

The annual incidence of occupational diseases was calculated by dividing the number of reported ODs per year (provided by INAIL) [5] by the total number of workers occupied in industrial and services sectors that year (supplied by ISTAT). [6] To estimate incidence trends, the annual case numbers were analyzed using a Poisson regression model using the time (year) as a continuous variable and the estimate of the yearly population of occupied workers in industry and services sectors. Statistical analyses were performed with StataCorp V.15. Texas, USA.

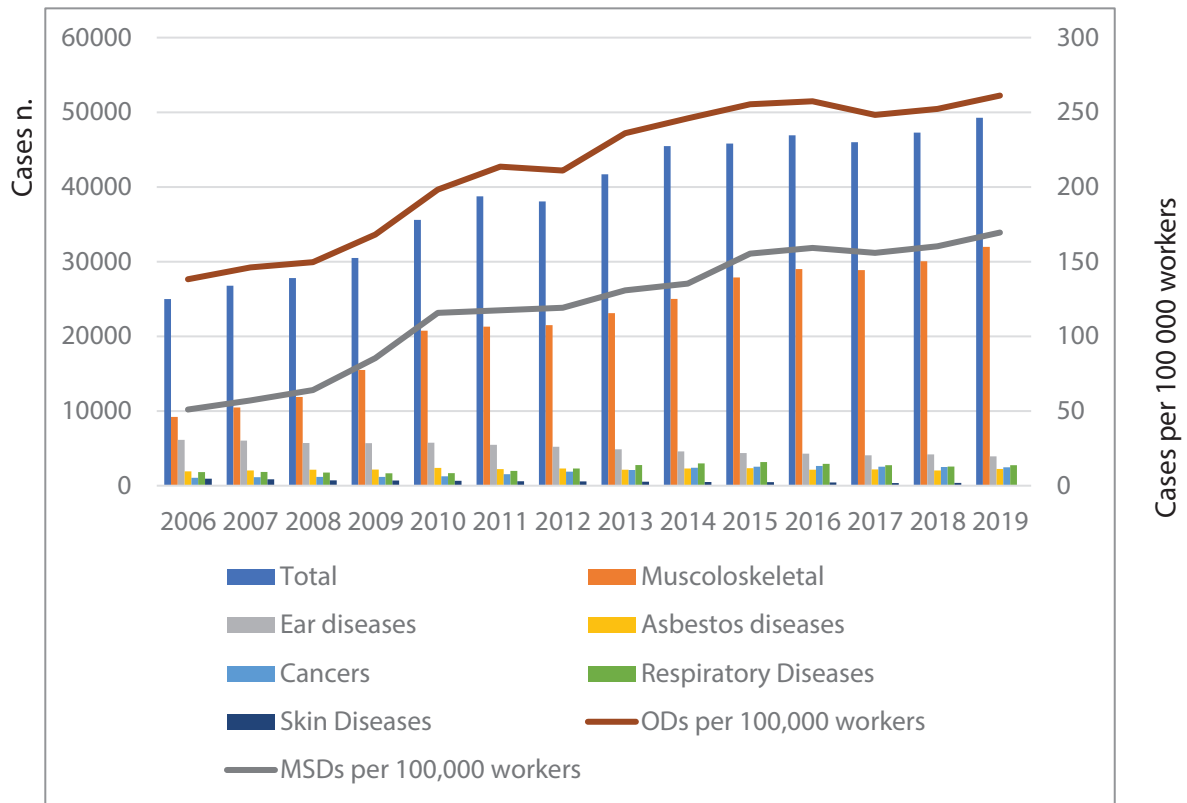
## 3. RESULTS

In total, 544,924 ODs among Italian industrial workers over 14 years were notified (Figure 1), and occupied workers in industry and services sectors varied from 18,073,000 in 2006 and 18,863,438 in 2019.

Figure 1 shows the incidence trend for total and musculoskeletal occupational diseases in the period considered. In 2006, the number of all the diseases considered was 24,984, and the incidence was 138.2 cases per 100,000 workers. Musculoskeletal disorders were the most frequent ODs, with 51.0 cases per 100,000 workers, followed by ear diseases, with 34 cases per 100,000 workers. In 2008-2009, the rise of ODs started, mainly corresponding with the increase in musculoskeletal diseases, with an incidence of 64.0 and 85.4 cases per 100,000 workers in 2008 and 2009, respectively.

In 2010, the total number of diseases considered raised to 35,587, with an incidence of 198.2 cases per 100,000 workers mainly due to musculoskeletal disorders (n= 20,766 cases representing 58.3% of all ODs).

In 2019, 49,271 cases of ODs were reported, with an incidence of 261.2 cases for 100,000 workers; musculoskeletal disorders represented 65% of the total cases (n=31,973) with 169.5 cases per 100,000 workers. The incidence of ear diseases decreased to 20.8 cases for 100,000 workers. Similarly, a decrease in incidence during the timeframe considered was observed for skin diseases (from 5.14 to 1.82 cases per 100,000 in 2006 and 2019, respectively), while cancers increased from 5.8 to 13.1 cases per 100,000 workers and respiratory diseases increased



**Figure 1.** Absolute number (N) and Incidence cases per 100,000 workers of total and specific OD in the industrial and services sectors from 2004 to 2019. Ear diseases (mainly noise-induced hearing loss).

from 10.1 to 14.5 cases per 100,000 workers in 2006 and 2019, respectively. To better visualize the trend in ODs over time figure 2 reported occupational diseases (ODs) in the Italian industrial and services sectors from 2004 to 2019, considering 2004 as the reference year. Ear diseases (mainly noise-induced hearing loss) also include other ears' diseases. Decreasing in ear and skin diseases are clearly shown as well as the increasing in MSDs, cancers and respiratory diseases

Table 1 shows the absolute number of ODs in 2019 and the trend over the 14 years evaluated using the Poisson regression. Over this period, the annual change in incidence (IRR) was 1.08 (CI 95% 1.07-1.11) for MSDs, 1.08 (CI 95% 1.06-1.10) for cancers, and 1.04 (CI 95% 1.03-1.06) for respiratory diseases. The trend was significantly negative for ear diseases [0.96 (CI 95% 0.96-0.97)] and skin diseases [0.93 (CI 95% 0.92-0.93)]. No changes were found for asbestos and mental diseases.

#### 4. DISCUSSION

Our study investigated the trends in the incidence of ODs in the large Italian industrial sectors and services from 2006 to 2019 and found a significant increase in MSDs, cancers, and respiratory diseases and a decrease in ear and skin diseases (Figure 2).

The large increase in MSDs is due to the change in Italian legislation in 2008 and the reduction of underreporting for diseases that were not considered work-related in the past. This effect was already shown in the investigation done by van Der Molen et al. in 2020 [3], analyzing ODs in the Italian agriculture sector. However, we did not observe a sharp increase in MSDs after 2008 shown in agriculture. In agriculture and industry/services, MSDs were the most common ODs (74% and 53% of overall diagnoses, respectively). While the industrial and services sectors have seen a significant decrease in noise-induced hearing loss throughout the years, the

**Table 1.** Incidence of occupational diseases in the Italian industrial and services sectors. IRR is the annual change in incidence from 2006 to 2019, assuming a linear trend. ICD-10, International Classification of Diseases; OD, Occupational Disease; IRR, incidence rate ratio. In bold are reported significant values.

Diagnosis (ICD-10)	Absolute N in 2019	Trends over time, 2006-2019		
		ODs	IRR	95% CI
Total	49 271	544 924	<b>1.05</b>	<b>1.04 to 1.06</b>
MSDs	31 973	306 547	<b>1.08</b>	<b>1.07 to 1.11</b>
Ear diseases	3 930	70 404	<b>0.96</b>	<b>0.96 to 0.97</b>
Respiratory diseases	2743	32 995	<b>1.04</b>	<b>1.05 to 1.06</b>
Cancers	2466	26 471	<b>1.08</b>	<b>1.06 to 1.10</b>
Asbestos diseases	2234	30 558	1.00	0.99 to 1.01
Mental diseases	477	6 474	1.00	0.99 to 1.02
Skin diseases	345	8 089	<b>0.93</b>	<b>0.92 to 0.93</b>

incidence in agriculture has risen after 2008. This is probably due to the increased awareness of the possibility of receiving compensation for noise-induced hearing loss in agriculture.

In contrast, noise-induced hearing loss in the industrial sector was the principal OD, and the decrease could be explained by better prevention linked to Italian Laws 626/99 and 81/2008. The differences between the agriculture, industry, and services sectors are linked to the workforce characteristics in the two sectors. The former comprises familiar small enterprises, while bigger enterprises with higher union presence characterize the second. The overall incidence of occupational diseases was higher in agriculture [3], with 1,285 *vs* 248.3 cases per 100,000 workers in 2017 in agriculture and industry, respectively. Similar differences were found for musculoskeletal disorders (961 *vs.* 155.9 cases per 100,000 workers), while cancer incidence was higher in the industry and services sectors (11 *vs* 13.8 cases per 100,000 workers, respectively).

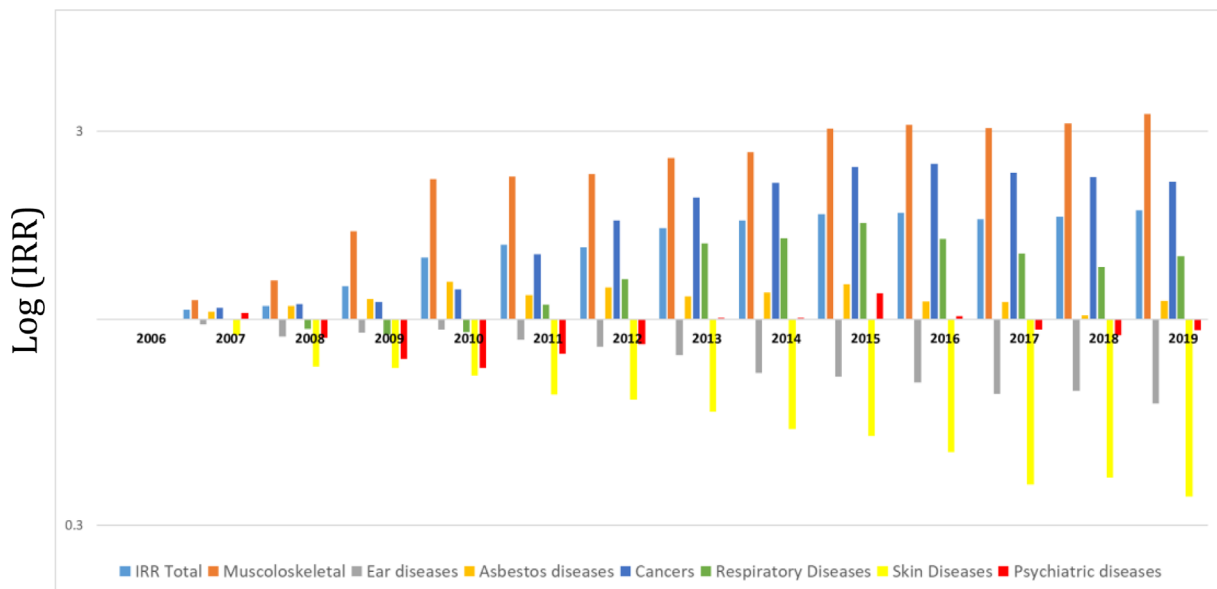
During the analyzed period, we found a significant increase in cancers and respiratory diseases reported, possibly due to the increased knowledge of their potential occupational causation and the improvement of medical surveillance for workers linked to the Italian Law 81/2008.

The incidence of skin diseases decreased in the considered period with lower incidences than international data [7, 8]. Indeed, skin diseases in Italy are less reported, and incidence data are probably

underestimated. [9] Moreover, Mediterranean skin, frequently exposed to the sun, presented a lower prevalence of atopic eczema, one of the most important risk factors for contact dermatitis. [9] The decreasing trend for occupational skin diseases aligns with a European registry study [1] and EUROSTAT data. [2] No differences were found for asbestos-related illnesses, for which Italian law makes the relationship with exposure clear and stable over time.

In the Netherlands [10] and Scotland [11], the most reported ODs were mental diseases followed by MSDs, while in Italy in 2009, mental diseases accounted only for 1.9% of all ODs. Mental disorders are not included in the list of occupational diseases for which the Italian insurance system recognizes the relationship with some exposures. This example further demonstrates how the incidence of occupational diseases is biased by criteria used in compensation, largely affected by the context, *i.e.*, by the societal acceptability of detrimental effects of work on workers' health.

The creation of the EU COST ACTION MODERNET (Monitoring trends in Occupational Diseases and tracing new and Emerging Risks in a NETWORK) tried to analyze data to compare them between countries [12]. However, the comparisons of incidence are problematic, considering the differences between OD surveillance systems in each EU country. [1, 13-15] Our study demonstrated increased occupational diseases reported in Italy due to the changeover in legislation. To better act



**Figure 2.** Incidence rate ratio of reported occupational diseases (ODs) in the Italian industrial and services sectors from 2004 to 2019, considering 2004 as the reference year. Ear diseases (mainly noise-induced hearing loss) also include other ears' diseases.

in the prevention of occupational diseases EU needs common legislation: differences in the incidence of occupational diseases trend in Italy seems to be mainly due to legislation and criteria applied by the insurance institution than to an actual increase in disease incidence. More efforts are needed for common legislation in the EU to recognize occupational diseases and for a common frame to promote prevention and fair compensation if justified.

## 5. CONCLUSION

Our study reported the incidence of ODs in Italian industrial and services sectors from 2004 to 2019, showing an increasing trend due mainly to MSDs and, to less extent, to cancers and respiratory diseases. Incidence data on occupational skin diseases and ear diseases showed declining trends. No differences were found for asbestos and mental-related illnesses. More efforts are needed to harmonize ODs legislation in the EU for better prevention and fair compensation.

**DECLARATION OF INTERESTS:** The Authors declare no conflict of interests.

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