Evaluation of the effectiveness of occupational injury prevention programs at the company level

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Introduction

Goya, El albañil herido, 1786

- Occupational injuries remain a priority for public health in developed countries, although incidence rate trends have been declining in recent years.

- Occupational injury is a problem with a substantial cost: in Australia the economic cost of occupational injuries between 2004 and 2005 was estimated to be 5% of GDP.

Introduction

- **The Prevention of Occupational Risks Law** of 1995 in Spain (Ley 31/1995), from the European "Framework Directive" 83/391, stands out among the measures implemented in Spain to reduce occupational injuries.

- After a serious accident occurred in 1997 that resulted in the death of 18 workers, a preventive program was implemented by regional labor authorities: **Preferential Action Plans** (PAPs).

- PAPs promote preventive measures to control occupational injuries in those companies with high incidence rates of occupational injuries.

- All companies with occupational injury incidence rates two standard deviations higher than the average incidence rate of its economic activity branch met the inclusion criteria for participation in the PAP program.

- Inclusion in a PAP program was decided by the region labor authority according to this criteria in the previous year.

Introduction

- PAPs incorporated activities like:
  - Sending of warning letters to those companies with a high number of occupational injuries.
  - Official visits to companies.
  - Evaluation of whether those companies carry out legal rules concerning preventive measures
  - Offering solutions and establishing deadlines to solve detected faults
  - Sanctions for those companies which, after receiving a visit and recommendations, do nothing or practically nothing to reduce the number of occupational injuries.

Introduction

- Evaluation of the effectiveness of health interventions is an essential requirement for informing public policy.

- Previous studies have evaluated the effectiveness of PAPs comparing by region time trends changes before and after the PAP's application.

- They concluded that PAPs were not exclusively related to the decline in incidence rates of occupational injuries (the declined occurred in all regions, regardless of the PAP's quality and even in those without a PAP)

    - In the regional comparison analyses, both companies with PAPs and without them were included.

Objective

- Evaluate the effectiveness of PAPs in a sample of companies in a Spanish region (Valencia), by comparing those companies that have adopted a PAP with other companies that have not adopted these plans.

Material & methods

- We studied 1,189 companies in the **industrial, construction and services sectors** between 1999 and 2007 in the Valencia region (Spain).

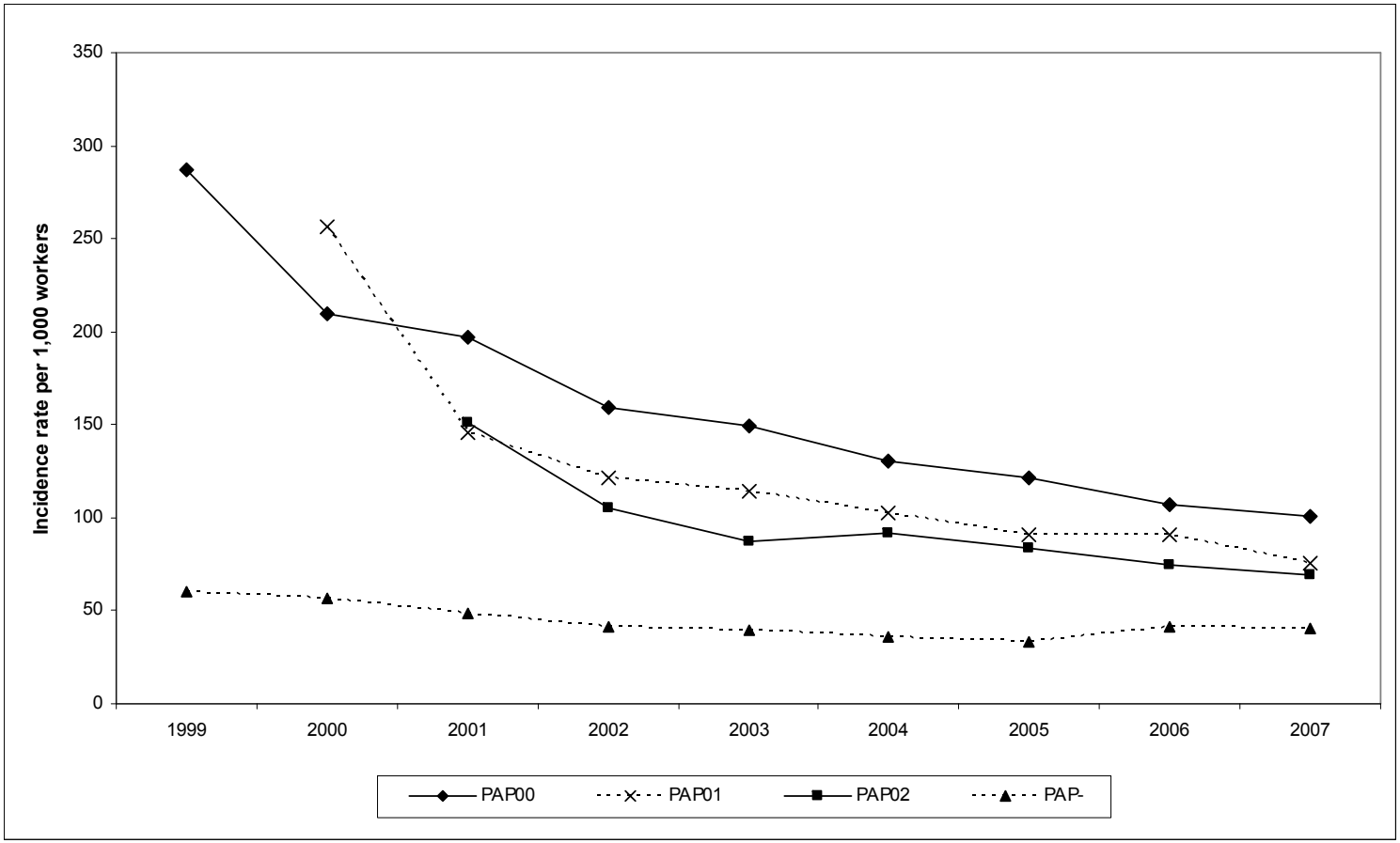
- Our sample included **507,262** workers, among whom **44,250** non-fatal occupational injuries with at least a work-day lost were registered.

- Companies were divided into two groups:
  - **PAP-**: Not included in the PAP program in any years of study (comparison group)
  - **PAP+**: Included in the PAP programs. 3 interventions groups, in accordance with the first year of inclusion: in 2000 (**PAP00**), in 2001 (**PAP01**) and in 2002 (**PAP02**).

  (All companies included in the different groups were in the same group during the whole period, so each company belongs only to one group)

Material & methods

- Evaluation of the effectiveness of the PAPs was performed by **comparing time trends** of incidence rates of occupational injuries among companies included in the PAP program with those not included.



Material & methods

- **Annual change percentage** (ACP) and its 95% confidence interval (95% CI) of PAP+ and PAP- trends was estimated assuming a **negative binomial distribution** on yt, the number of occupational injuries studied in year t, with the following log-linear mean:

$$\log\left(E[y_t]\right) = \beta_0 + \beta_1 t + \beta_2 P + \beta_3 t \times P + \log\left(N_t\right)$$

Where,

t → years of study according to the PAP+ group,

P → 0 for the PAP-, 1 for the PAP+

txP → interaction between t and P variables

Nt → worker-year in t.

- we obtained the **p-value associated with β3**, which gives an assessment of whether there are statistically significant differences between the time trends for each intervention group and the comparison group.

Material & methods

- We stratified the analysis by:
  - **Company economic activity sector** (industrial, construction and service)
  - **Company size** (<10 workers, 10-50 workers and >50 workers)
  - **Length of sick leave** (≤15 days, >15 days)
  - **Type of injury** (mechanical, non-mechanical and over-exertion).

Results

Annual change percentage and 95% confidence intervals, in non-fatal occupational injuries at work with at least a work-day lost, trends in the industrial sector, construction and services sector companies, in different company groups: intervention groups (PAP00 started in 2000, PAP01 started in 2001 and PAP02 started in 2002) and comparison group (PAP-). Valencia region, Spain 1999-2007.

	1999-2007			2000-2007			2001-2007		
	PAP00	PAP-	p-value[1]	PAP01	PAP-	p-value[1]	PAP02	PAP-	p-value[1]
Company size									
< 10 workers	-15.0 (-19.7 ; -9.9)	-4.7 (-8.7 ; -0.5)	0.002	-21.8 (-28.8 ; -14.1)	-3.8 (-9.4 ; 2.1)	< 0.001	-26.8 (-37.5 -14.2)	-2.8 (-12.8 ; 8.4)	0.004
10-50 workers	-11.2 (-13.6 ; -8.8)	-4.0 (-6.7 ; -1.3)	< 0.001	-13.9 (-17.5 ; -10.2)	-3.1 (-7.0 ; 1.1)	< 0.001	-13.0 (-18.0 ; -7.7)	-0.8 (-6.4 ; 5.1)	0.002
> 50 workers	-11.6 (-13.6 ; -9.5)	-6.0 (-8.2 ; -3.8)	< 0.001	-11.8 (-15.2 ; -8.4)	-5.1 (-8.3 ; -1.7)	0.005	-9.5 (-12.2 ; -6.7)	-3.1 (-6.3 ; 0.1)	0.003
Company economic activity sector									
Industrial	-11.6 (-14.1 ; -9.0)	-5.4 (-8.1 ; -2.7)	0.001	-13.8 (-17.9 ; -9.6)	-4.3 (-8.6 ; 0.2)	0.002	-10.2 (-14.1 ; -6.1)	-2.0 (-6.3 ; 2.5)	0.006
Construction	-12.5 (-13.7 ; -11.2)	-4.6 (-6.6 ; -2.6)	< 0.001	-17.5 (-21.0 ; -13.8)	-3.6 (-7.0 ; -0.1)	< 0.001	-13.3 (-16.8 ; -9.7)	-2.7 (-6.5 ; 1.4)	< 0.001
Services	-9.5 (-13.0 ; -5.9)	-5.6 (-9.1 ; -2.0)	0.132	-11.3 (-14.8 ; -7.7)	-5.0 (-8.5 ; -1.3)	0.015	-10.2 (-13.2 ; -7.2)	-3.1 (-6.7 ; 0.7)	0.003
Length of sick leave									
≤ 15 days	-13.2 (-15.2 ; -11.0)	-7.5 (-9.8 ; -5.2)	< 0.001	-15.9 (-19.4 ; -12.2)	-6.8 (-10.5 ; -2.8)	< 0.001	-12.8 (-15.8 ; -9.7)	-4.5 (-7.9 ; -1.0)	< 0.001
> 15 days	-8.4 (-10.3 ; -6.5)	-2.0 (-4.1 ; 0.2)	< 0.001	-9.2 (-12.7 ; -5.7)	-0.8 (-4.2 ; 2.8)	< 0.001	-6.8 (-10.1 ; -3.3)	0.3 (-3.4 ; 4.2)	0.007
Type of injury									
Mechanical	-15.4 (-17.8 ; -12.9)	-10.3 (-12.9 ; -7.6)	0.006	-18.5 (-22.1 ; -14.7)	-9.6 (-13.4 ; -5.6)	0.001	-14.0 (-18.5 ; -9.3)	-8.1 (-12.9 ; -3.0)	0.082
Non-mechanical	-0.8 (-8.1 ; 7.0)	1.2 (-6.6 ; 9.7)	0.726	-2.5 (-13.2 ; 9.6)	1.7 (-9.2 ; 13.9)	0.613	0.0 (-8.1 ; 8.8)	6.0 (-3.4 ; 16.2)	0.371
Over-exertion	-6.4 (-8.4 ; -4.3)	1.2 (-1.1 ; 3.6)	< 0.001	-8.2 (-12.0 ; -4.3)	2.3 (-1.7 ; 6.5)	< 0.001	-6.2 (-8.9 ; -3.4)	4.8 (1.6 ; 8.1)	< 0.001
TOTAL	-11.7 (-13.7 ; -9.6)	-5.4 (-7.6 ; -3.2)	< 0.001	-13.6 (-17.0 ; -10.0)	-4.5 (-8.2 ; -0.7)	< 0.001	-10.6 (-13.7 ; -7.3)	-2.7 (-6.1 ; 0.9)	0.001

1. This p-value, associated with β_3, gives an assessment of whether there are statistically significant differences between the time trends for PAP+ and PAP-.

Conclusions

- The PAP program have been effective in the prevention of occupational injuries.
  - Although all of the companies studied have reduced the incidence rates of occupational injury, in companies included in the PAP the incidence rates have reduced significantly more quickly.

- Benefits from the PAP program seem to be clear, the reduction presumably attributable to the PAP program each year of occupational injuries, per 1,000 workers is:
  - 168 in PAP00
  - 165 in PAP01
  - 74 in PAP02

33,500 non-fatal occupational injuries at work with at least a work-day lost were prevented

Conclusions

- The PAP program was more effective for:
  - Companies with fewer than ten workers
  - Construction companies
  - Mechanical injuries
  - Injuries with less than 16 days sick leave.

- Although it is difficult to say whether a PAP program can be effective outside of Spain, the PAP program represents an important opportunity for the sharing of good practices in prevention of occupational injuries.

Thanks!!!

Gracias!!!