SUMMARY. Objective. Suicide rate in police officers is higher than in the general population worldwide. This paper assesses and analyzes the trends in suicide rates of Italian police officers from 1995 to 2017, comparing these with the trends of Italian general population.

Methods. We reviewed all cases of active Italian police officers who died by suicide from 1995 through 2017 (N=271). We calculated age- and gender-specific suicide rates among police officers and the Italian general population. We carried out descriptive chi-squared analyses for categorical variables, and one-way ANOVA for continuous variables, performing a joinpoint regression to analyze suicide trends. Results. The mean police suicide rate was 11.78 per 100,000 individuals per year (95% CI=11.18-12.06). Joinpoint regression analyses of the period 1995-2017 showed that suicide rates of Italian police officers significantly decreased from 1995 to 2007 (annual percent change [APC]: -5.75%), followed by a period of a non-significant increase (APC: 3.9%). The period as a whole showed a non-significant decrease (APC: -1.7%). During 1995-2014, suicide rates were significantly higher among police officers vs. the age-adjusted general population (p<0.001), in male police vs. Italian male residents younger than 65 (p<0.001), and in female police vs. the female age-adjusted general population (p<0.05).

Conclusions. Suicide rates among Italian police officers were significantly higher than those of the national resident population younger than 65 years. Annual suicide rate trends among Police showed a significant reduction in the period 1995-2007 followed by a stable trend until 2017. The entire period 1995-2017 showed a non-significant decreasing trend.

KEY WORDS: suicide, suicide rates, suicide trends, Italian State Police, law enforcement.


PAROLE CHIAVE: suicidio, tassi di suicidio, tendenze del suicidio, Polizia di Stato, Forze dell’Ordine.
Suicide among Italian police officers from 1995 to 2017

INTRODUCTION

The rate of suicide in police forces worldwide is higher than that of the general population. Research has explored suicidal behavior in police officers with variables such as divorce, age 40+, job dissatisfaction, somatic complaints, anxiety, depression, and burnout. Suicide risk in police officers worldwide is related to several factors, including the easy availability of lethal means for suicide (firearms and cars), the presence of suicidal ideation, a diagnosis of major depressive disorder or other mood disorder, post-traumatic stress disorder, alcohol use disorder (particularly in young officers), family conflicts, marital problems, psychological distress, stigma for mental illness, and being suspended from service.

Other studies have identified several protective factors for suicide among police officers, including camaraderie, perception of a positive sense of professional and life purpose, family and social support, organizational support, adequate officer selection, medical and psychological services provided for officers, and periodic medical and psychological examinations. These kinds of protective factors are in line with current theoretical models of suicide risk which emphasize the importance of being socially integrated.

For the law enforcement officers in Italy, suicide is considered an occupational hazard. Police officers are believed to manifest higher suicidality than ordinary people, but no studies have systematically investigated this to date. To address this issue, the present paper focuses on police suicide rates during the 23-year period from 1995 to 2017, comparing suicide rates among Italian police with the suicide rates of the general population.

METHODS

The Italian Police Department provided names, dates and locations for the death of all officers who died during the study period, along with the annual numbers of active police officers, stratified by age, gender, and ethnic group. Death certificates from the certifying jurisdictions were reviewed. Only deaths certified as suicide (ICD codes 950-959) were used to calculate suicide rates. The Italian National Institute of Statistics (ISTAT) provided the annual numbers of general population residents who committed suicide, stratified demographically (http://www.istat.it/it/archivio/suicidi). Annual crude suicide rates of suicide were calculated as the annual number of residents who died by suicide, divided by the national resident population per 100,000 persons per year. We calculated the annual suicide rates for the national resident population corrected by age (<65 years old).

Statistical analysis

We used the SPSS Statistics V24.0 software (IBM Corporation, Armonk, New York, 2016) for descriptive analyses and analysis of variance. The annual suicide rate for police officers was calculated as the number of suicides per year, divided by the number of active police officers as of July 1 each year per 100,000 persons per year. Suicide rate among national residents was adjusted to the demographic characteristics of the sample. We calculate 95% confidence intervals (95% CIs) for each rate. Differences by age and for other continuous variables between men and women, and between police and the general population were analyzed through one-way analysis of variance (one-way ANOVA). We used the chi-squared test to analyze differences for the categorical variable "gender."

We analyzed temporal trends in suicide rate using log-linear jointpoint segmented regression models, which identify points corresponding to statistically significant changes over time in the linear slope of the occurring trend. We used annual suicide rates as the independent variable, assuming constant variance (homoscedasticity) and without log transformation. We applied a grid search method to fit regression functions with unknown jointpoints assuming a Poisson distribution and uncorrelated errors. We set the minimum/maximum jointpoint number from 0 to 4, and used a permutation test with overall significance level set at p<0.05 and the number of randomly permuted data sets of 4,499 to select the best fit. In the final model, each jointpoint indicates a significant change in trend. We reported estimated annual percent change (APC) for the segmented analysis. To summarize and analyze trends, we calculated the estimated average annual percent change (AAPC) for the entire period (1995-2017), and for the periods 1995-2007 and 2007-2017. AAPC is a summary measure that is computed, over a fixed interval, as a weighted average of the slope coefficients of the jointpoint regression with the weights equal to the length of each detected segment over the interval. Jointpoint analyses were performed using the Jointpoint Regression Program, version 3.5, from the US National Cancer Institute (https://surveillance.cancer.gov/joinpoint/).

RESULTS

Descriptive statistics

Among the deaths of police officers from 1995 to 2017, 271 were certified as suicide. The mean age of the suicides was 38.97 years (SD=8.77, range=20-55). The annual number of suicides ranged from 3 in 2007 to 19 in 1999 (mean=11.78, CI=11.35-12.21). The mean police suicide rate in the period 1995-2017 was 11.78 per 100,000 individuals per year (95% CI=11.18-12.06). The mean male police suicide rate between 1995 and 2014 was 12.67 per 100,000 individuals per year (95% CI=12.14-13.2), and the mean female police suicide rate for the same period was 5.61 per 100,000 individuals per year (95% CI=1.87-9.35).

Suicide was committed using a police duty weapon (81.92%), a private weapon (5.54%), hanging (7.01%), drowning (0.37%), jumping (2.21%), cutting (0.74%), throwing oneself under a truck (1.11%), and poisoning with drugs (0.74%). Overall, firearms were used in 237 of these (87.45%). Suicide motives, reported by the Police Departments of those who died by suicide, consisted mainly of emotional issues (39.11%) (resulting from personal and family problems, mourning, and divorce), economic difficulties (6.27%), psychiatric disorders (11.81%), honor-related issues (5.17%), physical illness (2.21%), occupational problems (1.48%), and unknown reasons (33.95%).

Jointpoint regression analyses for the period 1995-2017 showed that suicide rate for Italian police officers significantly decreased from 1995 to 2007 with an APC of -5.75% (95% CI=-10.1, -1.2; t=-2.6; p<0.05), followed by a period without a statistically significant change with an APC of 3.9% (95% CI=-2.4, +10.6; t=1.3; n.s.) (Table 1). The whole
period 1995-2017 showed a non-significant decrease, with 
A PC of -1.7 (95% CI=-4.2, +0.9; t=-1.3; n.s.). The A A PC 
for the whole study period was not significant (A A PC=-1.5; 95% 
CI=-4.9, +2.1; t=-0.8; p=0.4), and was significant only for the 
period 1995-2007 (p<0.05), but not for the period 2007-2017 
(p=0.2) (Table 1). 

In summary, two periods can be identified: the first be-
 tween 1995 and 2007 during which the suicide rate among 
Italian police decreased, and another from 2007 to 2017 
which showed a stable trend (with no statistically significant 
change) (Figures 1 and 2).

**Comparison with general population rates (1995-2014)**

Comparing the general population suicide rates for the period 
1995-2014 with the police suicide rates for the same 
period, the overall suicide rate among police officers was 
11.62 per 100,000 per-year (95% CI=11.18-12.06), compared 
with the adjusted suicide rate (age<65) for the Italian pop-
ulation during the same period of 4.67 (95% CI=4.667-4.673).

For the period 1995-2014, the suicide rate for male police 
officers was 12.67 (95% CI=12.13-13.19) which was higher 
than that of men of comparable age in the national popu-
lation (7.44, 95% CI=7.43-7.45). The suicide rate for female 
officers was 5.61 (95% CI=5.187-9.35) which was higher 
than that of females of comparable age in the national pop-
ulation (3.27, 95% CI=3.26-3.28).

One-way ANOVA indicated significant differences in an-
nual suicide rates during 1995-2014 between police officers 
and the general population, corrected for age (F=65.36; 
p<0.001); male police officers and male general population 
corrected for age (F=32.87; p<0.001), and female police offi-
cers and female general population corrected for age 
(F=5.96; p=0.019).

Comparing police suicide rates with the crude suicide 
rates of the general population, not corrected for age, one-
way ANOVA showed significant differences in the annual 
rates of suicide for the period 1995-2014 in both genders con-
jointly (F=26.78; p<0.001), but not individually (Policemen vs. 
ne new general population (F=2.23; p=0.143) and Police-
women vs. female general population (F=2.62; p=0.114).

**DISCUSSION**

Although most studies report that police officer suicide 
rates are higher than those of the general population11-14,
other studies have not documented this difference15-21, possi-
bly a result of the fact that many police officer suicides are 
labelled as “undetermined”22,23, thereby causing the actual 
suicide rate to be underestimated. Since police recruits in 
most countries undergo psychological screening for job fit-
ness, it might be argued that police suicide rates should be 
lower than they are since potentially suicidal police officer 
applicants should be rejected during the screening pro-
cess1,24. For the period 1995-2014, suicide among Italian 
police officers was influenced by gender, with a mean 
male/female ratio of 2.26. In the same period the mean age-
corrected male/female ratio in the general population was 
roughly the same (2.28).

We found that the suicide rate among Italian male police 
officers was about 1.7-times greater than the age-adjusted sui-
cide rate of the national male population. For Italian female 
police officers, the suicide rate was 2.7-times higher than the 
suicide rate of females under 65 years old in the general pop-
ulation. The overall suicide rate of police officers did not rise 
significantly during the period of observation. For the period 
1995 and 2007 the suicide rate among Italian Police de-
creased, while from 2007 to 2017 there was a stable rate.

There are probably multiple determinants of suicide in 
police. Job-related stress may often relate to the officer’s ex-
posure to trauma and death at the hands of others. In some 
countries, such as the USA, irregular work shifts and assign-
ments, as well as public stigma resulting from mistrust among 
the general population and lack of institutional support, may 
also contribute to the suicide risk21,26. The majority of the po-
lice suicides in Italy were committed with firearms, in partic-
ular with duty weapons, and the easy access to and familiar-
ity of officers with handguns may contribute to their suicide 
rate21,27. Marital problems, alcoholism, and job suspensions 
were the most noteworthy individual characteristics associat-
ed with police suicides28. Age, ethnicity, years of service, and 
rank have not been found to be associated with this risk2,29.

Italian Police suicide rates in our sample were lower than 
those in other European countries, the USA, and Africa, but 
they were higher than those in Asian and Caribbean coun-
tries3. The reasons for these variations are not be readily ap-
parent, but differences in police officer selection and public 
attitudes toward the police may play a role.

We found a decrease in police officer suicide rates during 
the years 1995-2007 followed by a plateau. Whether this rep-
resents a result of better selection and improved educational 
programs that reached a peak in 2007 is unclear, but such 
programs do indeed reduce suicide rates among police offi-
cers in other countries30. Data on effects of educational pro-
grams aimed at reducing suicide in the police are few, but 
there is evidence that police officers do increase their knowl-
edge about suicide in other people when participating in 
such programs, with improvements in terms of stigmatizing 
attitudes, knowledge and confidence31.

Police departments, with their tight organizational struc-
tures, offer both opportunities and challenges for suicide-
prevention programs. The Italian police have sponsored 
counseling programs for officers, but, barriers for police offi-
cers seeking psychiatric care remain formidable, since offi-
cers often worry that a psychiatric evaluation can result in 
job sanctions, reassignment, restriction of firearm privileges, 
missed promotions, and stigmatization. Stigma in the military 
has been related to several elements, including feeling em-
barrassed, relationship problems within their own group, and 
fear of being discriminated against by superiors. Military per-
sonnel often experience difficulty in gaining access to help 
and treatment, as well as assurance of confidentiality32. In-
terventions may be effective if started early during training 
and delivered regularly throughout an officer’s career in or-
der to keep the rate of suicide among police officers as low 
as possible. We recently reported that Italian police officers 
were aware of suicidality-related issues affecting their or-
ganization after having received training on the well-being of 
the staff33. Considering that suicide is an infrequent event 
and can be unpredictable34, there is evidence that effective 
prevention strategies can be implemented successfully35,37.
Table 1. Model estimates (upper panel [A]) and trends (lower panel [B]) of suicide rates in Italian State Police.

### A. MODEL STATISTICS

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Number of Joinpoints</th>
<th>Number of observations</th>
<th>Number of parameters</th>
<th>Degrees of Freedom</th>
<th>Sum of Squared Errors</th>
<th>Mean Squared Error</th>
<th>Autocorrelation parameter</th>
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</thead>
<tbody>
<tr>
<td>All – 1 Joinpoint</td>
<td>1</td>
<td>23</td>
<td>4</td>
<td>19</td>
<td>2.70057</td>
<td>0.14214</td>
<td>Uncorrelated</td>
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</tbody>
</table>

### ESTIMATED JOINPOINTS

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Joinpoint</th>
<th>Estimate</th>
<th>Lower C.I.</th>
<th>Upper C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All – 1 Joinpoint</td>
<td>1</td>
<td>2007</td>
<td>1997</td>
<td>2015</td>
</tr>
</tbody>
</table>

### ESTIMATION REGRESSION COEFFICIENTS (BETA)

#### Standard parameterization

| Cohort       | Joinpoint | Parameter | Parameter Estimate | Standard Error | Test Statistic (t) | Prob. > |t| |
|--------------|-----------|-----------|--------------------|----------------|--------------------|---------|---|
| All – 1 Joinpoint | Intercept 1 | 120.854340 | 45.207564 | 2.673321 | 0.015505 |
| All – 1 Joinpoint | Slope 1   | -0.059172 | 0.022598 | -2.618452 | 0.017410 |
| All – 1 Joinpoint | Slope 2 – Slope 1 | 0.097731 | 0.037361 | 2.615847 | 0.017506 |

#### General Parameterization

| Cohort       | Parameter | Parameter Estimate | Standard Error | Test Statistic (t) | Prob. > |t| |
|--------------|-----------|--------------------|----------------|--------------------|---------|---|
| All – 1 Joinpoint | Intercept 1 | 120.854330 | 45.207464 | 2.673321 | 0.015505 |
| All – 1 Joinpoint | Intercept 2 | -75.290950 | 59.875518 | -1.257458 | 0.224658 |
| All – 1 Joinpoint | Slope 1   | 0.059172   | 0.022598  | -2.618452 | 0.017410 |
| All – 1 Joinpoint | Slope 2   | 0.038559   | 0.029752  | 1.296008  | 0.211345 |

### B. ESTIMATED JOINPOINTS

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Joinpoint</th>
<th>Estimate</th>
<th>Lower C.I.</th>
<th>Upper C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All – 1 Joinpoint</td>
<td>1</td>
<td>2007</td>
<td>1997</td>
<td>2015</td>
</tr>
</tbody>
</table>

### ANNUAL PERCENT CHANGE (APC)

| Cohort       | Segment | Lower Endpoint | Upper Endpoint | APC     | Lower C.I. | Upper C.I. | Test Statistic (t) | Prob. > |t| |
|--------------|---------|----------------|----------------|--------|------------|------------|--------------------|---------|---|
| All – 1 Joinpoint | 1       | 1995           | 2007           | -5.7^   | -10.1      | -1.2       | -2.6               | 0.0     |
| All – 1 Joinpoint | 2       | 2007           | 2017           | 3.9     | -2.4      | 10.6       | 1.3                | 0.2     |

^ Indicates that the APC is significantly different from 0 at the $\alpha = 0.05$ level.

### AVERAGE ANNUAL PERCENT CHANGE (AACP)

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Range</th>
<th>Lower Endpoint</th>
<th>Upper Endpoint</th>
<th>AACP</th>
<th>Lower C.I.</th>
<th>Upper C.I.</th>
<th>Test Statistic*</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>All – 1 Joinpoint</td>
<td>Full Range</td>
<td>1995</td>
<td>2017</td>
<td>-1.5</td>
<td>-4.9</td>
<td>2.1</td>
<td>-0.8</td>
<td>0.4</td>
</tr>
<tr>
<td>All – 1 Joinpoint</td>
<td>1995-2007</td>
<td>1995</td>
<td>2007</td>
<td>-5.7^</td>
<td>-10.1</td>
<td>-1.2</td>
<td>-2.6</td>
<td>0.0</td>
</tr>
<tr>
<td>All – 1 Joinpoint</td>
<td>2007-2017</td>
<td>2007</td>
<td>2017</td>
<td>3.9</td>
<td>-2.4</td>
<td>10.6</td>
<td>1.3</td>
<td>0.2</td>
</tr>
</tbody>
</table>

^ Indicates that the AACP is significantly different from 0 at the $\alpha = 0.05$ level. Parametric method used to calculate confidence intervals (CIs).

* If the AACP is within one segment, the $t$-distribution is used. Otherwise, the normal (z) distribution is used.

Figure 2. Trends of suicide rates among Italian police officers - whole study period (1995-2017).

*All - 0 Joinpoints 1995.0-2007.0 APC = 5.75* 2007.0-2017.0 APC = 3.85*

*All - 0 Joinpoints 1995.0-2017.0 APC = -1.65*
CONCLUSIONS

The suicide rates of Italian police officers were significantly higher than those of the national resident population younger than 65 years. The annual suicide rate trends among police officers indicated a significant reduction over the period 1995-2007, followed by a stable trend until 2017.

Conflicts of interests: the authors declare no conflicts in the subject matter of this article.

Acknowledgments: we gratefully acknowledge the support of the chief of the Italian State Police, dr. Franco Gabrielli; the head of the Central Directorate of Health, dr. Fabrizio Ciprani; the members of the Department of Public Security, the General and Legal Affairs Office, Central Directorate for Human Resources, Department of Public Security, Ministry of the Interior, Rome, Italy.

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