

# Online Resource 1. Annual crude and age-standardised suicide mortality rates by sex, Andalusia, 2000–2024

**Article:** Age–period–cohort effects on suicide mortality in Andalusia, Spain (2000–2024): demographic masking and sustained pandemic excess

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This Online Resource provides the complete annual series of suicide deaths, crude rates, and age-standardised rates (ASR) for the autonomous community of Andalusia during the 25-year study period (2000–2024). Age standardisation was performed by the direct method using the 2013 European Standard Population (ESP2013) as reference. These data underpin the demographic masking analysis, joinpoint regression, and trend estimates presented in the main text.

## 1. Overall burden and descriptive summary

Over the study period, 18,350 suicide deaths were recorded (14,206 men, 77.4%; 4,144 women, 22.6%). The mean annual number of deaths was 734 (range: 640 in 2019 to 849 in 2021). The Andalusian population grew by 18.5%, from 7.29 million in 2000 to 8.63 million in 2024.

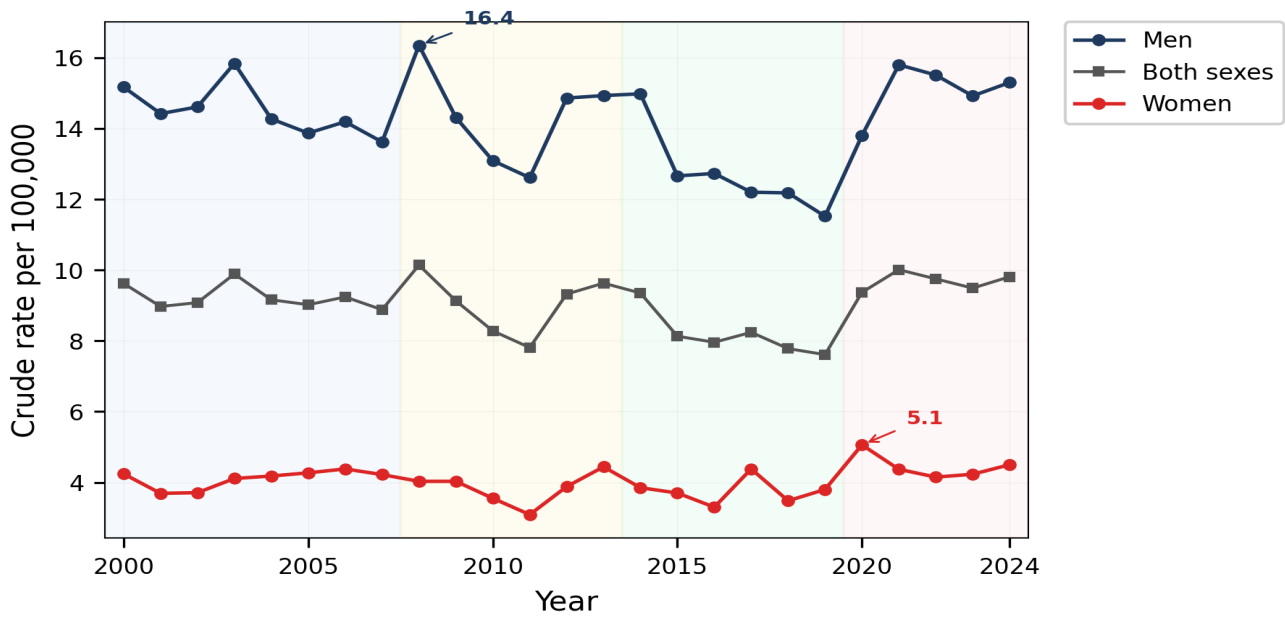
The mean crude rate for both sexes was 9.03 per 100,000 (SD 0.75); for men, 14.15 (SD 1.29); for women, 4.03 (SD 0.43). Crude rates ranged between 7.61 (2019) and 10.14 (2008) for both sexes. The mean ASR was 9.28 per 100,000 (SD 1.02) for both sexes, 15.35 (SD 2.07) for men, and 4.07 (SD 0.46) for women, ranging between 7.42 (2019) and 11.25 (2000). Table S1 summarises these overall and period-specific indicators.

**Table S1. Descriptive characteristics of suicide mortality in Andalusia, 2000–2024**

	Deaths (n)	Mean pop.	Crude rate	ASR <sup>a</sup>	EAPC (95% CI)	EAPC-PW <sup>b</sup>	p
<b>Total</b>	18,350	8,136,573	9.03	9.28	−0.12% (−0.59 to +0.35)	−0.08%	0.615
Men	14,206	4,020,355	14.15	15.35	−0.22% (−0.73 to +0.29)	−0.17%	0.400
Women	4,144	4,116,218	4.03	4.07	+0.22% (−0.38 to +0.82)	+0.22%	0.478
<b>By period (both sexes)</b>							
Overall (2000–2024)	18,350	8,136,573	9.03	—	−0.12% (−0.59 to +0.35)	—	0.615
Pre-crisis (2000–2007)	5,599	7,583,859	9.23	—	−0.61% (−1.71 to +0.51)	—	0.326
Econ. recession (2008–2013)	4,498	8,284,243	9.05	—	−0.71% (−5.60 to +4.42)	—	0.794
Recovery (2014–2019)	4,119	8,394,164	8.18	—	−3.18% (−5.23 to −1.09)	—	0.041
Pandemic/post (2020–2024)	4,134	8,534,604	9.69	—	+0.39% (−1.42 to +2.24)	—	0.702

Rates expressed per 100,000 population. <sup>a</sup> ASR: age-standardised rate (2013 European Standard Population, ESP2013). <sup>b</sup> EAPC-PW: estimated annual percentage change from Prais–Winsten regression with AR(1) autocorrelation correction. EAPC: estimated annual percentage change from log-linear regression; 95% CI: 95% confidence interval. Period-specific EAPCs estimated by log-linear regression restricted to each sub-period. Source: INE. Authors' calculations.

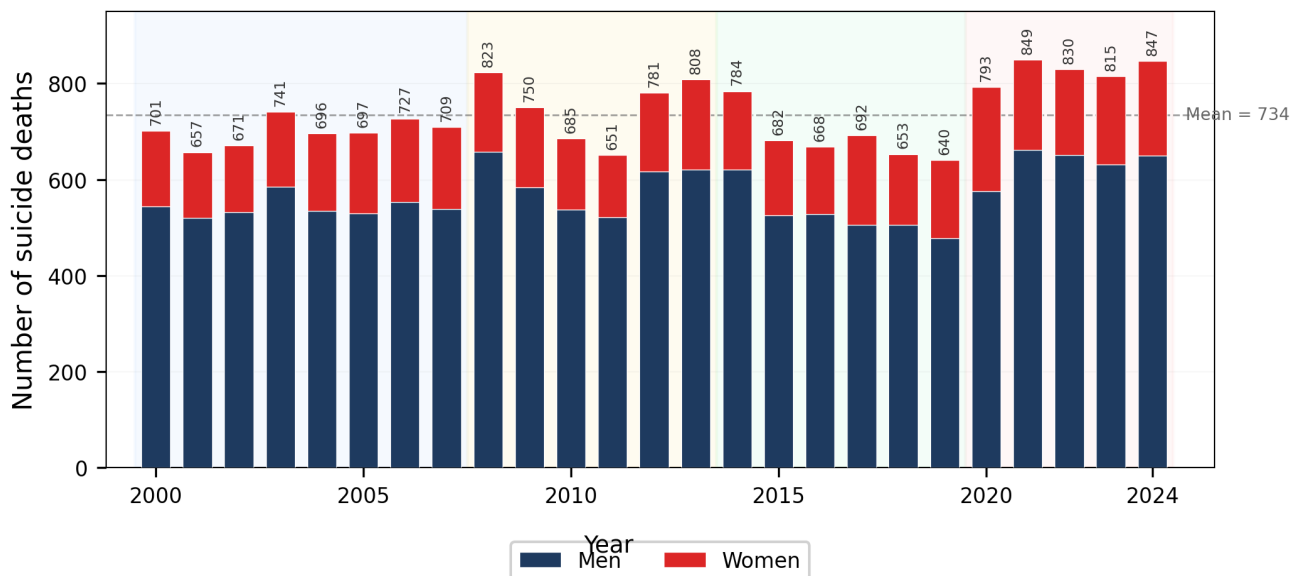
By historical period, mean crude rates were 9.23 (pre-crisis, 2000–2007; 5,599 deaths), 9.05 (economic recession, 2008–2013; 4,498 deaths), 8.18 (recovery, 2014–2019; 4,119 deaths), and 9.69 (pandemic/post-pandemic, 2020–2024; 4,134 deaths), the latter being the highest period-level value across the entire series. Mann–Whitney comparisons between adjacent periods showed that the increase from the recovery to the pandemic period was statistically significant for both sexes ( $p = 0.004$ ), men ( $p = 0.017$ ), and women ( $p = 0.030$ ). The corresponding mean ASRs were 10.19, 9.42, 8.07, and 9.14 by period. In men, the ASR decline was particularly pronounced: from 17.28 (pre-crisis) to 13.06 (recovery), with a rebound to 14.65 in the pandemic period. Figure S1 depicts the annual crude rate trajectories by sex.



**Figure S1.** Crude suicide mortality rates by sex, Andalusia, 2000–2024. Annual rates per 100,000 population for men (dark blue circles), both sexes (grey squares), and women (red circles). Background colour bands delimit the four *a priori* historical periods: pre-crisis (2000–2007), economic recession (2008–2013), recovery (2014–2019), and pandemic/post-pandemic (2020–2024). Peak values are indicated for men (16.4 per 100,000 in 2008) and women (5.1 per 100,000 in 2020). The male–female gap is approximately 3.5-fold throughout the series. Source: INE; authors’ calculations.

## 2. Absolute burden and sex distribution

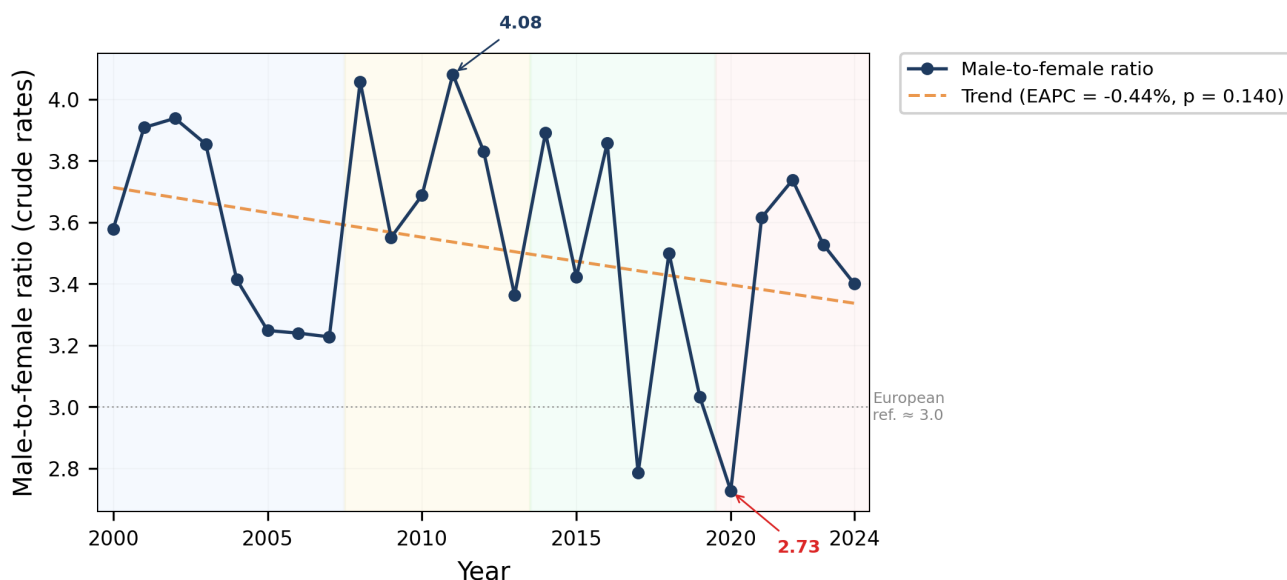
Figure S2 presents the absolute number of suicide deaths by sex across the entire study period. The stacked bar chart reveals a consistent male predominance (77.4% of all deaths), with the five pandemic/post-pandemic years (2020–2024) all exceeding the period mean of 734 deaths/year. The series minimum was recorded in 2019 (640 deaths), immediately followed by the sharp increase to 793 deaths in the first pandemic year. The 2021 maximum (849 deaths) represents a 32.7% increase over the 2019 nadir.



**Figure S2.** Annual suicide deaths by sex, Andalusia, 2000–2024. Stacked bars: men (dark blue) and women (red). Horizontal dashed line: period mean (734 deaths/year). Total counts annotated above each bar. Background colour bands delimit the four historical periods. Source: INE; authors’ calculations.

### 3. Male-to-female ratio

The male-to-female ratio of crude suicide rates is presented in Figure S3. The ratio ranged between 2.73 (2020) and 4.08 (2011), with a mean of 3.54 (SD = 0.36), consistently exceeding the approximate Western European average ( $\approx 3.0$ ). The log-linear trend was not statistically significant (EAPC =  $-0.44\%$ ; 95% CI:  $-1.00$  to  $+0.12$ ;  $p = 0.140$ ), indicating no systematic convergence or divergence of male and female rates over the period. The minimum ratio coincided with the first pandemic year (2020), driven by the disproportionate increase in female suicide deaths ( $+34.0\%$  relative to 2019 vs  $+20.5\%$  in men), whilst the maximum occurred during the economic recession (2011), a year in which male rates peaked while female rates fell.



**Figure S3.** Trends in the male-to-female ratio of suicide mortality rates, Andalusia, 2000–2024. Solid dark blue line: annual ratio of male to female crude rates. Dashed orange line: log-linear trend (EAPC =  $-0.44\%$ ; 95% CI:  $-1.00$  to  $+0.12$ ;  $p = 0.140$ ). Dotted line: Western European reference ( $\approx 3.0$ ). Peak (4.08, 2011) and trough (2.73, 2020) annotated. Source: INE; authors’ calculations.

### 4. Complete annual time series

Table S2 provides the full annual time series of deaths, mid-year populations, crude rates, and age-standardised rates by sex. Pandemic/post-pandemic years (2020–2024) are shaded for ease of reference. These data serve as the input for the joinpoint regression, Prais–Winsten trend estimation, and age–period–cohort decomposition described in the main text.

**Table S2. Complete time series of suicide mortality by sex, Andalusia, 2000–2024**

Year	Both sexes				Men				Women			
	Deaths	Pop.	CR	ASR	Deaths	Pop.	CR	ASR	Deaths	Pop.	CR	ASR
2000	701	7,285,993	9.62	11.25	544	3,587,107	15.17	19.39	157	3,698,886	4.24	4.83
2001	657	7,323,031	8.97	10.47	520	3,605,582	14.42	18.66	137	3,717,450	3.69	4.13
2002	671	7,391,401	9.08	10.00	532	3,641,925	14.61	17.37	139	3,749,477	3.71	3.95
2003	741	7,490,857	9.89	10.70	585	3,693,713	15.84	18.62	156	3,797,144	4.11	4.35
2004	696	7,596,512	9.16	9.92	535	3,748,929	14.27	16.24	161	3,847,583	4.18	4.54
2005	697	7,730,705	9.02	9.76	530	3,822,474	13.87	15.87	167	3,908,233	4.27	4.61
2006	727	7,865,774	9.24	9.87	553	3,896,219	14.19	16.20	174	3,969,557	4.38	4.63
2007	709	7,986,596	8.88	9.51	539	3,957,069	13.62	15.87	170	4,029,529	4.22	4.39
2008	823	8,118,574	10.14	10.72	658	4,025,027	16.35	18.10	165	4,093,547	4.03	4.24
2009	750	8,212,986	9.13	9.68	583	4,073,370	14.31	15.86	167	4,139,615	4.03	4.20
2010	685	8,276,017	8.28	8.59	537	4,103,593	13.09	14.44	148	4,172,423	3.55	3.57
2011	651	8,332,087	7.81	8.08	521	4,131,059	12.61	13.76	130	4,201,029	3.09	3.17
2012	781	8,377,810	9.32	9.58	617	4,152,488	14.86	15.94	164	4,225,321	3.88	3.92
2013	808	8,387,986	9.63	9.85	620	4,153,357	14.93	15.90	188	4,234,629	4.44	4.50
2014	784	8,381,239	9.35	9.39	621	4,146,169	14.98	15.78	163	4,235,070	3.85	3.82
2015	682	8,388,994	8.13	8.12	525	4,147,731	12.66	13.30	157	4,241,263	3.70	3.63
2016	668	8,392,046	7.96	7.96	528	4,148,415	12.73	13.34	140	4,243,631	3.30	3.20
2017	692	8,394,017	8.24	8.02	506	4,147,238	12.20	12.36	186	4,246,779	4.38	4.24
2018	653	8,396,464	7.78	7.49	505	4,145,478	12.18	12.10	148	4,250,986	3.48	3.34
2019	640	8,412,222	7.61	7.42	478	4,150,733	11.52	11.50	162	4,261,489	3.80	3.70
2020	793	8,461,039	9.37	8.96	576	4,172,773	13.80	13.73	217	4,288,266	5.06	4.73
2021	849	8,484,804	10.01	9.55	661	4,182,620	15.80	15.63	188	4,302,184	4.37	4.15

Year	Both sexes				Men				Women			
	Deaths	Pop.	CR	ASR	Deaths	Pop.	CR	ASR	Deaths	Pop.	CR	ASR
2022	830	8,511,167	9.75	9.16	651	4,196,620	15.51	14.98	179	4,314,547	4.15	3.88
2023	815	8,584,147	9.49	8.90	631	4,229,831	14.92	14.34	184	4,354,316	4.23	3.98
2024	847	8,631,862	9.81	9.11	650	4,249,355	15.30	14.56	197	4,382,507	4.50	4.17

Deaths: suicide deaths (ICD-10 codes X60–X84, Y87.0). Pop.: mid-year population (1 July). CR: crude rate per 100,000 population. ASR: age-standardised rate per 100,000 (ESP2013). Shaded rows: pandemic/post-pandemic period (2020–2024). Source: INE. Authors' calculations.

## Summary

Suicide mortality in Andalusia over 2000–2024 was characterised by apparent stability in crude rates (EAPC =  $-0.12\%$ ,  $p = 0.615$ ) masking a significant decline in age-standardised rates (see Online Resource 3). The male-to-female ratio remained stable at approximately 3.5:1. The pandemic/post-pandemic quinquennium (2020–2024) recorded the highest period-level crude rate (9.69 per 100,000) and all five years exceeded the 25-year mean. The disproportionate female increase in 2020 (+34.0%) produced the lowest male-to-female ratio of the series (2.73). These descriptive findings motivate the formal age–period–cohort decomposition and counterfactual excess mortality analysis presented in the main text.