Online Resource 5. Male-to-female suicide mortality ratio and the gender paradox

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 examines the male-to-female (M/F) suicide mortality ratio in Andalusia over the period 2000–2024, a key indicator of the so-called "gender paradox" in suicidology—the well-documented pattern whereby men die by suicide at higher rates despite women reporting more attempts. The resource is structured around four sections: (1) the overall M/F ratio and its temporal trend, (2) the age-specific pattern, (3) the temporal evolution of age-specific ratios across quinquennia, and (4) a heatmap summary integrating both dimensions.

1. Overall M/F ratio and temporal trend

Over the 25-year study period, the mean M/F ratio for suicide mortality in Andalusia was 3.54 (SD = 0.36), indicating that men died by suicide at approximately 3.5 times the rate of women. This value exceeds the WHO global reference of 2.3 and the Western European average of approximately 3.0. Prais–Winsten regression yielded a non-significant declining trend (EAPC = –0.44%, 95% CI –1.00 to +0.12, p = 0.139; R^2 = 0.093), confirmed by a non-significant Mann–Kendall test (Z = –1.378, p = 0.168).

Sub-period analysis revealed heterogeneous dynamics: a significant decline during the pre-crisis period (EAPC = –2.77%, p = 0.022), followed by non-significant changes during the recession (–1.73%, p = 0.395), recovery (–4.22%, p = 0.201), and pandemic/post-pandemic period (+4.27%, p = 0.360). By historical period, mean M/F ratios were: pre-crisis 3.55, recession 3.76 (the highest), recovery 3.41, and pandemic/post-pandemic 3.40 (the lowest). Table S6 presents the complete annual series.

Table S6. Annual male-to-female suicide mortality ratio, Andalusia, 2000–2024

Year	Male rate	Female rate	Male deaths	Female deaths	M/F ratio	95% CI
2000	15.17	4.24	544	157	3.57	2.99–4.27
2001	14.42	3.69	520	137	3.91	3.24–4.72
2002	14.61	3.71	532	139	3.94	3.27–4.75
2003	15.84	4.11	585	156	3.86	3.23–4.60
2004	14.27	4.18	535	161	3.41	2.86–4.07
2005	13.87	4.27	530	167	3.24	2.73–3.86
2006	14.19	4.38	553	174	3.24	2.73–3.84
2007	13.62	4.22	539	170	3.23	2.72–3.84
2008	16.35	4.03	658	165	4.06	3.42–4.81
2009	14.31	4.03	583	167	3.55	2.99–4.21
2010	13.09	3.55	537	148	3.69	3.08–4.43
2011	12.61	3.09	521	130	4.08	3.36–4.94
2012	14.86	3.88	617	164	3.83	3.22–4.55
2013	14.93	4.44	620	188	3.36	2.86–3.96
2014	14.98	3.85	621	163	3.89	3.27–4.62
2015	12.66	3.70	525	157	3.42	2.86–4.09
2016	12.73	3.30	528	140	3.86	3.20–4.65
2017	12.20	4.38	506	186	2.79	2.35–3.30
2018	12.18	3.48	505	148	3.50	2.91–4.20
2019	11.52	3.80	478	162	3.03	2.53–3.62
2020	13.80	5.06	576	217	2.73	2.33–3.19
2021	15.80	4.37	661	188	3.62	3.08–4.25
2022	15.51	4.15	651	179	3.74	3.17–4.41
2023	14.92	4.23	631	184	3.53	3.00–4.16
2024	15.30	4.50	650	197	3.40	2.90–3.99
Mean	—	—	—	—	**3.54**	SD = 0.36

Rates per 100,000 population (crude). M/F ratio = male rate / female rate. 95% CI computed by the delta method. Pink-shaded rows indicate the pandemic/post-pandemic period (2020–2024). Source: INE. Authors' calculations.

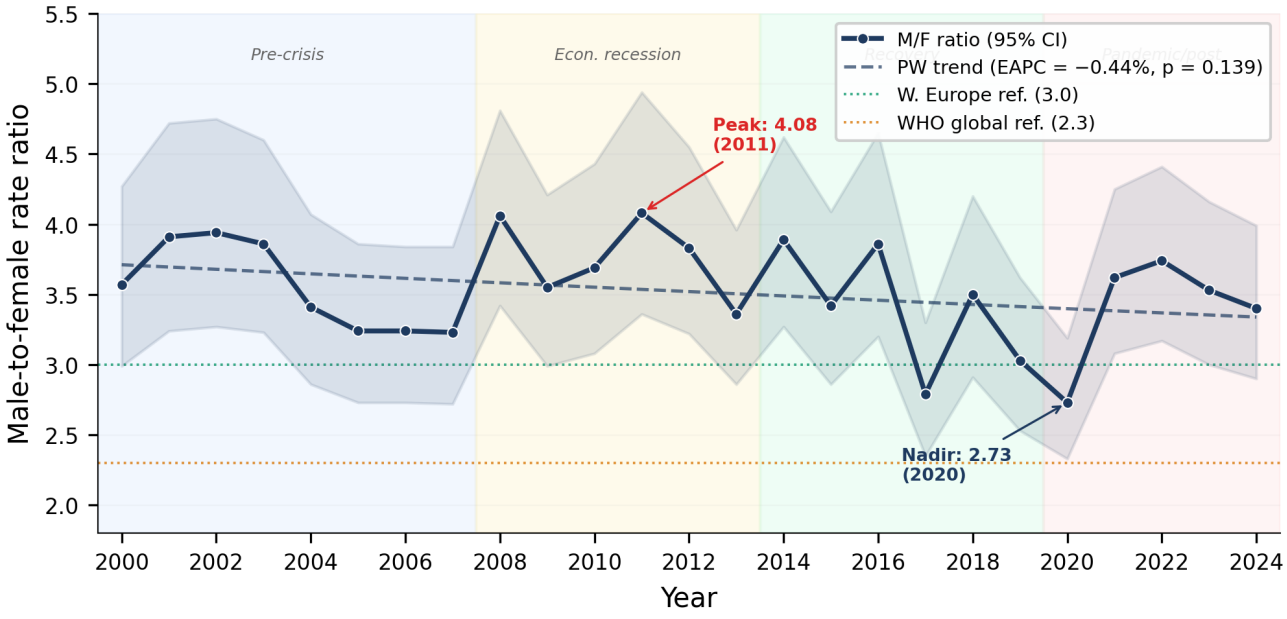

Figure S10. Time series of the male-to-female suicide mortality ratio, Andalusia, 2000–2024. Solid line with 95% confidence interval (shaded band, delta method). Dashed line: Prais–Winsten linear trend (EAPC = –0.44%, p = 0.139). Background bands indicate historical periods: pre-crisis (blue), economic recession (amber), recovery (green), and pandemic/post-pandemic (pink). Horizontal reference lines: Western European average (3.0, green dotted) and WHO global average (2.3, amber dotted). The ratio peaked at 4.08 in 2011 and reached its nadir at 2.73 in 2020. Source: INE. Authors' calculations.

2. Age-specific pattern of the M/F ratio

The M/F ratio exhibited a pronounced age gradient. The lowest mean ratios were observed in the ≤14 age group (2.15), followed by 65–69 (2.77) and 55–59 (2.80)—all below the Western European reference of 3.0. In working-age adults (15–64), the ratio fluctuated between 2.80 and 4.15, with the highest value in the 15–29 group (4.15). A dramatic escalation occurred in the elderly: 75–79 (5.30), 80–84 (6.32), and ≥85 (9.47). This steep gradient in older ages reflects the near-absence of recorded female suicides in the oldest cohorts, amplifying the M/F disparity. Figure S11 illustrates this age-specific pattern.

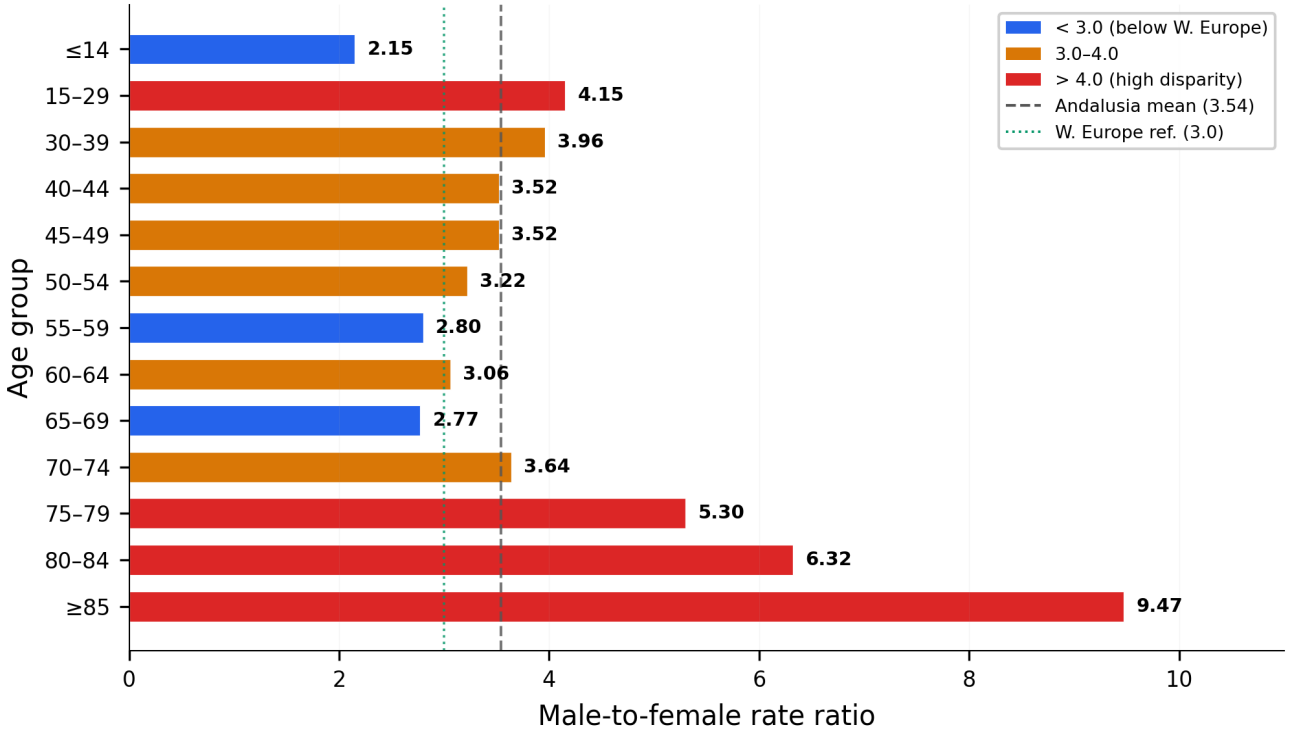

Figure S11. Mean male-to-female suicide mortality ratio by age group, Andalusia, 2000–2024. Horizontal bar chart displaying the period mean M/F ratio for each of 13 age groups. Colour coding: blue = below Western European reference (<3.0), amber = 3.0–4.0, red = above 4.0 (high gender disparity). Dashed vertical line: Andalusia overall mean (3.54). Dotted green line: Western European reference (3.0). The ratio escalated sharply in the elderly, reaching 9.47 in the ≥85 group. Source: INE. Authors' calculations.

3. Temporal evolution of the M/F ratio by age group

The temporal evolution of age-specific M/F ratios revealed two opposing trends of particular epidemiological significance. In the 15–29 age group, a marked convergence was observed: the M/F ratio declined from 5.31 in 2000–04 to 3.05 in 2020–24, a reduction of 42.6%. This convergence was driven primarily by rising female suicide rates in young adults, consistent with international evidence of increasing suicidal behaviour among young women.

In contrast, the ≥85 age group showed a striking divergence: the M/F ratio increased from 9.55 in 2000–04 to 11.15 in 2020–24, a rise of 16.9%. This widening of the gender gap in the oldest cohort reflects the persistence of high male suicide rates in elderly men alongside relatively stable or declining female rates. Other notable patterns include the decline in the 70–74 group (from 4.96 to 3.23, –34.9%) and the relative stability in the 40–49 range. Figure S12 displays these trajectories for all age groups across the five quinquennia.

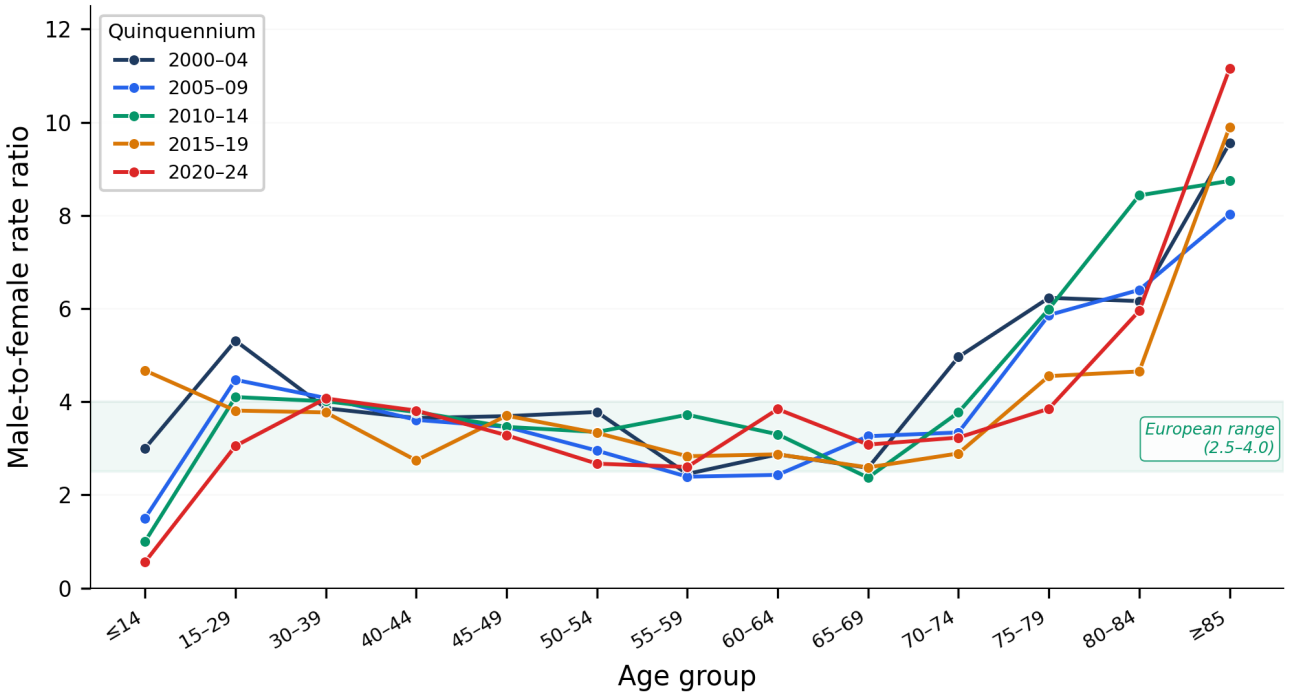

Figure S12. Male-to-female suicide mortality ratio by age group and quinquennium, Andalusia, 2000–2024. Line plot with five colour-coded quinquennia. Shaded band: European reference range (2.5–4.0). The most notable temporal changes include the convergence in the 15–29 group (from 5.31 to 3.05, –42.6%) and the divergence in the ≥85 group (from 9.55 to 11.15, +16.9%). The steep upward gradient in elderly age groups is consistent across all quinquennia. Source: INE. Authors' calculations.

4. Heatmap summary: age × period interaction

Figure S13 synthesises the age-by-period interaction in a single heatmap, with darker tones indicating higher M/F ratios. The bottom-right corner (≥85, 2020–24) represents the maximum observed value (11.15), while the top-right corner (≤14, 2020–24) represents the minimum (0.56). The heatmap visually confirms the two key findings: (a) a consistent elderly gradient across all periods, and (b) the progressive convergence in younger groups alongside progressive divergence in the oldest age band.

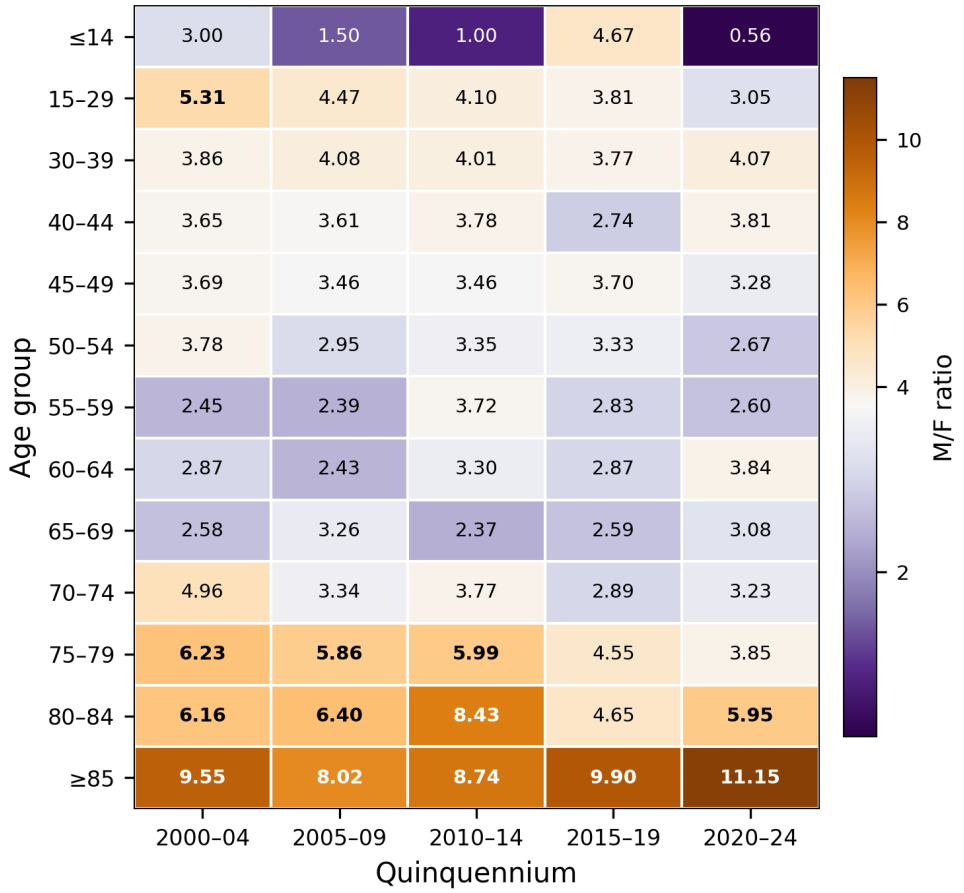

Figure S13. Heatmap of the male-to-female suicide mortality ratio by age group and quinquennium, Andalusia, 2000–2024. Colour scale: purple (low M/F ratio) through white (~3.5) to brown/orange (high M/F ratio). Numerical values annotated within each cell; bold values indicate ratios above 5.0. The ≥85 age group consistently shows the highest ratios (8.02–11.15) across all quinquennia, with a progressive increase over time. In contrast, younger groups (15–29) show a progressive decline from 5.31 to 3.05. Source: INE. Authors' calculations.

Summary

The male-to-female suicide mortality ratio in Andalusia (mean 3.54) consistently exceeds both the WHO global (2.3) and Western European (3.0) references, confirming a pronounced gender paradox. While the overall trend was non-significant (EAPC = –0.44%, p = 0.139), the pandemic/post-pandemic period was associated with a marked convergence: the nadir of 2.73 was reached in 2020, driven primarily by a disproportionate increase in female suicide rates. Age-stratified analysis reveals two contrasting dynamics: progressive convergence in young adults (15–29: –42.6%) and progressive divergence in the very elderly (≥85: +16.9%). The steep gradient in elderly M/F ratios (reaching 9.47 in ≥85) reflects the near-absence of recorded female suicides in the oldest cohorts. These findings support the main text's emphasis on demographic masking: aggregate M/F ratios conceal fundamentally different age-specific dynamics that carry distinct implications for sex-targeted prevention strategies.