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# Educational inequalities in euthanasia use in Spain during the first three years after legalisation: a population-based study

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**ABSTRACT:**

**Background**: In Spain, euthanasia has been legally recognised as a healthcare right since 2021. However, little is known about its socioeconomic distribution. This study examined educational inequalities in euthanasia use during the first three years after legalisation. This question is grounded in diffusion of innovations theory, which suggests that new practices may initially be adopted more by socially advantaged groups.

**Methods:** We conducted a national mortality study using individual-level data on all deaths in Spain between 2021 and 2023. Age-standardised death rates (ASDRs) and rate ratios (RRs) with 95% confidence intervals using Poisson regression with robust variance were estimated by educational attainment, sex and age group. Analyses compared euthanasia deaths with non-euthanasia deaths, both overall and from euthanasia-related conditions, followed by specific analyses of malignant neoplasms and diseases of the nervous system.

**Results:** We identified 643 euthanasia deaths and 1,342,700 non-euthanasia deaths. Euthanasia rates were higher among people with upper secondary and university education than among those with primary education, in both men (RR=2.35[1.49-3.71]; RR=2.14[1.29-3.55]) and women (RR=2.32[1.72-3.13]; RR=2.08[1.56-2.76]). The educational gradient was particularly pronounced among adults aged over 80 years. Conversely, all-cause mortality and mortality from euthanasia-related conditions showed the expected inverse educational gradient. Similar patterns were observed for malignant neoplasms and diseases of the nervous system.

**Conclusion:** During the early implementation of euthanasia in Spain, its use showed a clear educational gradient opposite to that observed in all-cause mortality, indicating unequal access to euthanasia. Monitoring systems should incorporate socioeconomic indicators across the entire euthanasia process to identify inequalities and inform policies aimed at ensuring equitable access to this right.

**Keywords:** euthanasia, assisted dying, educational inequalities, socioeconomic inequalities, euthanasia use

**BACKGROUD**

Assisted dying (both euthanasia and assisted suicide), defined as the deliberate medical act of ending a patient's life at their request, with the aim of alleviating irreversible suffering, has undergone a process of increasing legalisation and regulation in various countries over recent decades (1). In Spain, assisted dying was legally regulated through Organic Law of Euthanasia Regulation, which entered into force in June 2021 (2). The term "euthanasia" is used in the Spanish legal and policy context to refer to both euthanasia, in which the healthcare professional administers the medication, and assisted suicide, in which the person self-administers it. Accordingly, throughout this article, we use "euthanasia" as an umbrella term to refer to both practices in the Spanish context, while recognising that they constitute distinct modalities of assisted dying.

This phenomenon has internationally opened a significant field of study not only in bioethics and law, but also in public health where whether it is used equally across social groups remains an open question. This question arises because socioeconomic determinants of health shape health trajectories throughout the life course and influence health-related outcomes, including morbidity and mortality (3). These inequalities are evident not only in health outcomes, but also in healthcare access. Previous studies have shown that socioeconomic differences in healthcare utilisation persist beyond differences in healthcare needs, suggesting that equal access for equal needs is not consistently achieved (4) . While lower socioeconomic groups tend to use primary and emergency care more frequently, they are less likely to use specialist services, indicating persistent socioeconomic barriers to accessing specialised healthcare (5,6). Indeed, previous research has identified socioeconomic inequalities in access to palliative and end of life care, with people experiencing socioeconomic disadvantage facing barriers related to information, navigation of health services, and access to care; although the magnitude and manifestation of these inequalities vary across settings and care models (7,8). Consistent with these findings, qualitative studies have highlighted the need for equity-focused policies and tailored interventions to improve access to end-of-life care and advance care planning among structurally vulnerable populations (9).

In this context, assisted dying may also replicate these broader social gradients. Beyond its ethical and legal implications, assisted dying can also be understood as a healthcare innovation. According to Diffusion of Innovations theory (10), the adoption of innovations is rarely neutral on a social level. People with more social, economic and educational resources often adopt them earlier, while those in more disadvantaged situations may take longer because they have less access to information, lower health literacy, lower trust in institutions or because they face more barriers. Applied to health, this idea is supported by health capital models, which suggest that education plays an important role in shaping people's health knowledge and health-related behaviours (11,12). Although access to assisted dying is formally determined by legal and clinical eligibility criteria (2,13), receiving euthanasia involves several steps, including understanding the law, communicating with healthcare professionals, navigating the healthcare system, and completing administrative and clinical procedures. These steps may be influenced by social factors. As a recently introduced healthcare practice, assisted dying may therefore initially prove more accessible to socially advantaged groups, in line with the framework for the Diffusion of Innovations theory (10).

Some support for this hypothesis comes from the limited evidence available so far, largely because comprehensive individual-level socioeconomic data are rarely collected or reported and

systematically updated national databases are not consistently available (14) and assisted dying remains legally permitted in relatively few countries. Compared with non-treatment decisions, assisted dying and other life-shortening practices have been reported less frequently among older adults, women and individuals with lower educational attainment (15,16). In the same direction but with other metrics, previous studies have also reported a higher use of assisted dying among individuals with higher income, and residence in socioeconomically advantaged areas (17–20). However, most of this evidence is based on area-level measures of socioeconomic position derived from patients' place of residence or on aggregated data reported in annual national monitoring reports, rather than on individual-level socioeconomic information. To our knowledge, only one previous study has examined educational inequalities in Switzerland using individual-level educational attainment (21).

This lack of evidence has important implications for health policy. If socioeconomic inequalities are not identified, they may not be considered when developing laws, monitoring systems or implementation strategies, even though assisted dying is a legally recognised healthcare right in an increasing number of countries. In Spain, euthanasia is a relatively new legally recognised healthcare right. Spain therefore provides a valuable setting in which to examine whether socioeconomic inequalities emerge during the early implementation of euthanasia. Accordingly, this study aimed to examine educational inequalities in euthanasia use in Spain during the first three years after legalisation, by age group and sex and to compare these gradients with those observed in all-cause mortality and in non-euthanasia deaths from conditions associated with euthanasia. In addition, disease-specific analyses were conducted to assess whether these patterns were consistent across diagnostic groups.

## METHODS

A national based study of mortality rates was conducted using deaths recorded between 2021 and 2023, corresponding to the first three years following the legalisation of euthanasia in Spain. Individual-level mortality data by cause of death was obtained from the Spanish mortality Statistics by Cause of Death from the National Institute of Statistics (INE) in Spain for the period 2021-2023. These statistics are based on information recorded in Medical Death Certificates. These data also include information on educational attainment, obtained from the INE and linked to various sources, including municipal population registries. Population denominators were obtained from the Annual Population Census (Education and Labour Force Status) for 2021–2023.

Educational attainment was recoded into four categories based on International Standard Classification of Education (ISCED-2011): primary or less (ISCED 0–1), lower secondary (ISCED 2), upper secondary (ISCED 3), and higher education (ISCED 4+). For age- and cause-stratified analyses, these were collapsed into two groups (low: ISCED 0–2 and high: ISCED 3+) to ensure sufficient case numbers.

### Identification of euthanasia related deaths

According to the INE, Spain uses ICD-10 code Z418 to identify euthanasia cases due to the absence of a specific ICD-10 code (22). However, under the methodology of the Spanish Mortality Statistics, Z418 cannot be recorded as the underlying cause of death but should be recorded as immediate cause of death on the Medical Death Certificate following the “Good practice manual on euthanasia” developed by the Spanish Ministry of Health (23). Instead, the

underlying cause should correspond to the disease or condition that led the patient to request euthanasia [see euthanasia underlying causes' disease groups in **Additional file 1]**. Deaths were classified as euthanasia deaths when code Z418 appeared in any of the mentioned cause-of-death fields. All remaining deaths were classified as non-euthanasia deaths.

**Statistical Analysis:**

Age-standardised death rates (ASDR) were calculated by educational level for men and women, distinguishing between (1) deaths due to euthanasia, (2) deaths from causes other than euthanasia (overall mortality), and (3) non-euthanasia deaths from conditions that had led to at least five euthanasia procedures during the period 2021-2023.

In addition to analyses of all-cause mortality (2), we performed analyses of non-euthanasia deaths by underlying disease groups to compare educational gradients between euthanasia and mortality for the same causes (3). These analyses were restricted to underlying disease groups that accounted for at least five euthanasia cases between 2021 and 2023, representing 63.14% of all euthanasia cases during the study period [see **Additional file 1**]**.** Age-specific rates were also estimated, CI was calculated with the following formula:

$$\text{asdr } 95\%\text{ CI} = \text{asdr} \pm \left(1.96 \frac{\text{asdr}}{\sqrt{\text{n deaths}}}\right)$$

Poisson regression models with robust variance estimation were used to estimate rate ratios (RR) and 95% confidence intervals. The models for the overall population were adjusted for age and estimated separately for men and women. Analyses were carried out for all ages combined across the three mortality groups described (1-3). These analyses were subsequently repeated, stratified by age group. In addition, specific analyses were carried out for malignant neoplasms (ICD-10 chapter C) and diseases of the nervous system (ICD-10 chapter G). Underlying causes associated with at least five euthanasia procedures were grouped into ICD-10 chapters C and G and compared with non-euthanasia deaths from the same underlying causes. The complete list of underlying causes included in these analyses is provided in **Additional file 1**. In all analyses, the corresponding reference populations were used as the denominator for calculating rates and as an offset in the regression models. Statistical significance was set at $P<0.05$. Data processing and statistical analyses were performed using R Studio 2024.12.1.

**Ethics:**

The study used secondary confidential microdata provided for scientific research under controlled access conditions. The dataset did not include any direct personal identifiers. Access to confidential mortality microdata was authorized through the Spanish National Statistics Institute's (INE) confidential data access procedure for scientific research (reference BE119-2025). The project received a favourable assessment from the INE Statistical Secrecy Committee, and all analyses were conducted within a secure research environment from which results could only be extracted after verification by the INE that they complied with statistical secrecy requirements. Only MB and UM had access to this secure research environment after signing confidentiality commitments.

**RESULTS**

A total of 643 euthanasia deaths and 1,342,700 non-euthanasia deaths were recorded between 2021 and 2023 [see **Additional file 2**]. Among euthanasia deaths, 51.32% occurred in men and

48.68% in women, while the distribution of non-euthanasia deaths was similar (50.73% men and 49.27% women). Most individuals who died by euthanasia had an upper secondary level of education (30.64%) and were aged 65–79 years (44.01%). In contrast, most non-euthanasia deaths occurred among individuals with a primary level of education (54.04%) and those aged 80 years or older (61.67%). The study population had a similar distribution by sex and three highest educational levels, whereas individuals with primary education accounted for only 6.03% of the population. The largest age group was 25-64 years, representing 73.72% of the study population.

**Figure 1**: Age-standardised death rates by education, sex and cause of death. Spain, 2021-2023.

Age-standardised death rates (ASDR) for euthanasia showed higher rates among individuals with upper secondary and university education than among those with primary or lower secondary education. This pattern was observed in both men and women (**Figure 1**). In contrast, ASDR for non-euthanasia deaths showed the expected inverse gradient, with mortality rates decreasing progressively as educational attainment increased in both sexes. A similar, although less pronounced, pattern was observed for non-euthanasia deaths from conditions that had resulted in euthanasia procedures. Crude mortality rates are presented in **Additional file 3.**

**Table 1:** Age-adjusted rate ratios by education, sex and cause of death. Spain, 2021-2023.

| | | Men | | Women | |
|---|---|---|---|---|---|
| | | RR (95% CI) | p-value | RR (95% CI) | p-value |
| Euthanasia | Primary | ref. | | ref. | |
| | Lower secondary | 1.08 (0.70-1.65) | 0.73 | 1.45 (1.04-2.00) | 0.026 |
| | Upper secondary | 2.35 (1.49-3.71) | <0.001 | 2.32 (1.72-3.13) | <0.001 |
| | University | 2.14 (1.29-3.55) | 0.003 | 2.08 (1.56-2.76) | <0.001 |
| Non-euthanasia deaths | Primary | ref. | | ref. | |
| | Lower secondary | 0.87 (0.77-0.98) | 0.024 | 0.78 (0.73-0.85) | <0.001 |
| | Upper secondary | 0.71 (0.63-0.80) | <0.001 | 0.70 (0.63-0.72) | <0.001 |
| | University | 0.58 (0.44-0.76) | <0.001 | 0.57 (0.44-0.74) | <0.001 |
| Non-euthanasia deaths from euthanasia-related conditions | Primary | ref. | | ref. | |
| | Lower secondary | 0.95 (0.86-1.06) | 0.349 | 0.91 (0.82-1) | 0.05 |
| | Upper secondary | 0.78 (0.72-0.86) | <0.001 | 0.86 (0.79-0.95) | 0.0027 |
| | University | 0.65 (0.54-0.80) | <0.001 | 0.73 (0.59-0.91) | 0.0049 |

Compared with individuals with primary education, men with upper secondary education and university education had significantly higher euthanasia mortality rates (upper secondary: RR=2.35[1.49-3.71], university: RR=2.14[1.29-3.55]), whereas no significant difference was observed for lower secondary education (**Table 1**). Among women, euthanasia mortality rates were significantly higher in all educational groups above primary education, including lower secondary (RR=1.45[1.04-2.00]), upper secondary (RR=2.32[1.72-3.13]), and university education (RR=2.08[1.56-2.76]).

In contrast, overall mortality showed the opposite educational gradient. Compared with primary education, mortality rates decreased progressively with increasing educational attainment, reaching statistical significance for the two highest educational levels among men (upper secondary: RR=0.71[0.63-0.80]; university: RR=0.58[0.44-0.76]) and for all educational levels

among women (lower secondary: RR=0.73[0.73-0.85]; upper secondary: RR=0.70[0.63-0.72]; university: RR=0.57[0.44-0.74]). A similar pattern was observed for non-euthanasia deaths from the main euthanasia-related conditions. Among both men and women, significantly lower mortality rates were found for individuals with upper secondary education (RR=0.78[0.72-0.86] and RR=0.86[0.79-0.95], respectively) and university education (RR=0.65[0.54-0.80] and RR=0.73[0.59-0.91], respectively), whereas no significant association was observed for lower secondary education.

**Figure 2:** Age-standardised death rates by education, age group, sex, and cause of death. Spain, 2021-2023.

For euthanasia deaths, ASDRs were consistently higher among individuals with high educational attainment across all age groups (**Figure 2**). This educational gradient was more pronounced in the two oldest age groups (65-79 and over 80 years) in both men and women, with the largest difference between educational levels observed among men aged over 80 years. In contrast, for total deaths, ASDRs were generally higher among individuals with low educational attainment than among those with high educational attainment in both sexes. A similar pattern was observed for non-euthanasia deaths from the main euthanasia-related conditions, although rates were similar among educational groups women aged 65-79 years.

**Table 2**: Rate ratios by education, age group, sex and cause of death. Spain, 2021-2023.

| | | | Men | | Women | |
|---|---|---|---|---|---|---|
| | | | RR (95% CI) | p-value | RR (95% CI) | p-value |
| Euthanasia | 25-64 | Low | ref. | | ref. | |
| | | High | 1.34 (0.87-2.05) | 0.1854 | 1.41 (1.23 -1.61) | <0.001 |
| | 65-79 | Low | ref. | | ref. | |
| | | High | 2.19 (2.09 -2.30) | <0.001 | 1.77 (1.64 -1.92) | <0.001 |
| | 80 | Low | ref. | | ref. | |
| | | High | 3.70 (3.12-4.39) | <0.001 | 2.62 (1.56-4.40) | <0.001 |
| Non-euthanasia deaths | 25-64 | Low | ref. | | ref. | |
| | | High | 0.49 (0.35-0.68) | <0.001 | 0.49 (0.35-0.69) | <0.001 |
| | 65-79 | Low | ref. | | ref. | |
| | | High | 0.72 (0.60-0.87) | <0.001 | 0.77 (0.59-0.99) | 0.042 |
| | 80 | Low | ref. | | ref. | |
| | | High | 0.81 (0.73-0.91) | <0.001 | 0.76 (0.68-0.85) | <0.001 |
| Non-euthanasia deaths from euthanasia-related conditions | 25-64 | Low | ref. | | ref. | |
| | | High | 0.54 (0.42-0.70) | <0.001 | 0.63 (0.51-0.78) | <0.001 |
| | 65-79 | Low | ref. | | ref. | |
| | | High | 0.76 (0.67-0.87) | <0.001 | 1.01 (0.93-1.10) | 0.8111 |
| | 80 | Low | ref. | | ref. | |
| | | High | 0.86 (0.79-0.93) | <0.001 | 0.86 (0.80-0.94) | <0.001 |

For euthanasia deaths, the educational gradient became more pronounced with age in both sexes (**Table 2**). Among men, the association was significant in the two oldest age groups, being more than three times higher in the oldest one (65-79 years: RR=2.19[2.09-2.30]; 80 years or more: RR=3.70[3.12-4.39]), but not among those aged 25-64 years. Among women, significantly

higher euthanasia mortality rates were observed for those with high educational attainment across all age groups (25-64 years: RR=1.41[1.23-1.61]; 65-79 years: RR=1.77[1.64-1.92] and over 80 years: RR=2.62[1.56-4.40]).

Conversely, for non-euthanasia deaths, compared with individuals with low educational attainment, those with high educational attainment had significantly lower mortality rates across all age groups in both men (25-64 years: RR=0.49[0.35-0.68]; 65-79 years: RR=0.72[0.60–0.87]; and over 80 years: RR=0.81[0.73-0.91]) and women (25-64 years: RR=0.49[0.35-0.69]; 65-79 years: RR=0.77[0.59–0.99]; over 80 years: RR=0.76[0.68-0.85]). A similar pattern was observed for non-euthanasia deaths from the main euthanasia-related conditions among men (25-64 years: RR=0.54[0.42-0.70]; 65-79 years: RR=0.76[0.67-0.87]; over 80 years: RR=0.86[0.79-0.93). Among women, lower mortality rates were also observed for those with high educational level in the youngest (RR=0.63[0.51.0.78]) and oldest age groups (RR=0.86[0.80-0.94]), whereas no significant difference was found among those aged 65-79 years.

**Table 3:** Age-adjusted rate ratios by education, sex and causes of death. Spain, 2021–2023.

| | | | Men | | Women | |
|---|---|---|---|---|---|---|
| | | | RR (95% CI) | p-value | RR (95% CI) | p-value |
| Underlying cause: disease of the nervous system *a | Euthanasia | Low | ref. | | ref. | |
| | | High | 2.29 (1.61-3.26) | <0.001 | 1.44 (0.96-2.15) | 0.08 |
| | Non-euthanasia | Low | ref. | | ref. | |
| | | High | 0.91 (0.84-0.98) | 0.02 | 0.78 (0.72-0.84) | <0.001 |
| Underlying cause: malignant neoplasm *b | Euthanasia | Low | ref. | | ref. | |
| | | High | 2.97 (1.74-5.05) | <0.001 | 2.71 (2.50-2.95) | <0.001 |
| | Non-euthanasia | Low | ref. | | ref. | |
| | | High | 0.76 (0.66-0.88) | <0.001 | 0.91 (0.72-1.14) | 0.42 |

* All rate ratios in disease groups were adjusted for broad age groups

[a] The diseases of the nervous system group (ICD-10 chapter G) included the following underlying causes: G122, G20, G35, G111, G231, G232, G959, G301, G10, G300

[b] The diseases of the malignant neoplasms group (ICD-10 chapter C) included the following underlying causes: C349, C20, C189, C719, C169, C259, C509, C679, C61, C710, C56.

For both malignant neoplasms and diseases of the nervous system, individuals with higher educational attainment showed a higher rate of euthanasia than those with lower educational attainment, whereas the opposite pattern was generally observed for non-euthanasia deaths (**Table 3**). Among men, the euthanasia rates were higher for diseases of the nervous system (RR=2.29[1.61-3.26]) and for malignant neoplasms (RR=2.97[1.74-5.05]) among those with higher education. Among women, similar inequalities were observed for malignant neoplasms (RR=2.71[2.50-2.95]), whereas the association for diseases of the nervous system did not reach statistical significance. In contrast, higher educational attainment was associated with lower rates of non-euthanasia deaths for both disease groups, except for malignant neoplasms among women, where no significant educational differences were observed.

## DISCUSSION

Our findings show a clear educational gradient in the use of euthanasia in Spain during the first three years following its legalisation. Individuals with higher educational attainment were more

likely to use euthanasia than those with lower educational attainment. The inverse educational gradient in euthanasia was consistent across age groups and remained evident when analyses were restricted to malignant neoplasms and diseases of the nervous system.

Our results are consistent with other cross-sectional studies that showed that individuals with higher levels of education, higher income and residence in socioeconomically advantaged areas are more likely to access assisted suicide or euthanasia (16–18,20,21). Our study adds to existing evidence in two ways. First, we use individual level educational attainment to examine socioeconomic inequalities in euthanasia use, whereas most previous studies have relied on area level measures of socioeconomic position derived from patients' place of residence or on aggregated data from national monitoring reports. Second, we compared educational gradients in euthanasia with those observed in all-cause mortality and mortality from the diseases most associated with euthanasia. This latter comparison suggests that the higher use of euthanasia among people with higher educational attainment cannot be explained solely by differences in the distribution of the underlying causes of death. This social gradient is consistent with the Diffusion of Innovations Theory, which suggests that individuals with greater socioeconomic advantage are more likely to adopt innovations earlier (10).

Similar socioeconomic differences have also been reported in requests for assisted dying among patients receiving palliative care, with requests appearing less frequent among individuals from lower socioeconomic backgrounds (19). More broadly, our findings are consistent with evidence showing that social inequalities extend across end-of-life care (7,9,15,16). As with palliative care, the existence of a legal right does not necessarily guarantee equitable access across all social groups (7,8).

Several mechanisms may contribute to these findings. Rather than viewing assisted dying solely as the final clinical act, we understand it as a process in which social inequalities may accumulate across successive stages, from awareness and information to request, assessment and provision. These steps may be related to the stages of Rogers' innovation-decision process, whereby adoption unfolds through successive stages of knowledge, persuasion, decision, implementation, and confirmation (10). Previous research on educational inequalities in euthanasia requests has yielded heterogeneous findings, while some studies have reported fewer requests among socio-economically disadvantaged populations (24), others have found higher request rates among vulnerable groups (25). In the same direction, previous qualitative research shows that assisted dying is shaped by institutional context, professional support, communication, and the ability of patients to navigate the process (26).

Evidence from Belgium, where assisted dying was legalised in 2002, suggests that educational inequalities may evolve over time. Between 2007 and 2013, the proportion of assisted dying requests that were granted increased significantly among individuals with lower educational attainment, although it remained lower than among those with higher educational attainment (27). This suggests that the educational advantage in assisted dying use may persist in the short and medium term, as the diffusion and normalization of this innovation are likely to unfold gradually over time (10). In contrast, other research has shown that there is not a shift over time in socioeconomic factors associated to assisted suicide (28).

Our finding of stronger educational inequalities in euthanasia use among people aged 80 years and over, particularly men, may reflect the different impact of innovations in end-of-life across age groups. Because euthanasia use remained particularly uncommon among older adults [see **Additional file 2**]**,** those who accessed it may represent a more socially selected group of

adopters. Consistent with Rogers' Diffusion of Innovations Theory, early adoption may be concentrated among individuals with greater educational and social resources (10). Higher education may also be associated with greater health literacy and cultural health capital (11,12), facilitating knowledge of euthanasia, communication with healthcare professionals, and navigation of the healthcare system (29,30). Thus, the stronger educational gradient among older adults may partly reflect the selective nature of euthanasia use at this early stage of the legalisation.

Further, other intermediate mechanisms may also help explain inequalities in the use of euthanasia. Previous studies suggest that cultural factors, including religious beliefs, gender norms and broader cultural values and expectations, shape end-of-life preferences, attitudes towards assisted dying, and other end-of-life care decisions (31–34). Although these factors could not be examined in this study, they may also contribute to the socioeconomic differences observed in euthanasia use. Future studies should examine the role of religiosity, cultural values and end-of-life preferences in explaining these socioeconomic differences.

Beyond documenting educational inequalities in euthanasia deaths, our findings highlight the need to translate evidence into policies that promote equity in the implementation of assisted dying legislation. This evidence should inform targeted policy interventions to ensure equitable access to information, support and deliberation, regardless of socioeconomic position. Such interventions should also consider healthcare professionals involved in the euthanasia process, given their responsibility to provide information and their potential role in identifying and reducing inequalities (35). More broadly, our findings underscore the importance of embedding an equity perspective into the monitoring and evaluation of assisted dying policies, both in Spain and in other jurisdictions, so that emerging inequalities can be identified and addressed as these practices become integrated into healthcare systems (14).

This article has a number of strengths and limitations that must be taken into account when interpreting the results. One of the study's main strengths is its use of nationwide population microdata, which enables the analysis of a little studied social pattern using individual educational attainment. Furthermore, the consistency of educational gradients across overall, age stratified, and disease specific analyses supports the robustness of the findings. This approach also allows comparisons with overall mortality and mortality from related diseases, providing a relevant empirical basis for incorporating the dimension of equity into the assessment of euthanasia in Spain and for guiding future monitoring systems that include not only the procedures carried out, but also the various stages of the process.

However, some limitations must be taken into account when interpreting the results. Previous studies have highlighted discrepancies between assisted dying cases identified through death certificates and those reported through official assisted dying monitoring systems, suggesting potential underreporting or misclassification in death certificates (36). Using this microdata from Spanish Mortality Statistics by Cause of Death, 643 euthanasia related deaths were identified between 2021 and 2023. However, official reports from the Ministry of Health documented 690 euthanasia procedures during the same period. Although this discrepancy indicates some degree of underreporting mortality records, we have no reason to expect this underrepresentation to be systematically associated with educational attainment.

Finally, given that the data reflect the euthanasia procedures ultimately carried out, but not the preceding stages of information provision, requests, assessment and approval, the results demonstrate educational inequalities in euthanasia access but do not allow us to determine at

which stage of the process these inequalities emerge, including whether they arise in access to information, the decision to request euthanasia, clinical assessment, or approval of the request. In addition, although the relatively small number of euthanasia deaths restricted cause-specific analyses to broad groups (malignant neoplasms and diseases of the nervous system), the associations identified were statistically robust.

**CONCLUSION**

During the early years of the implementation of euthanasia in Spain, mortality rates following this procedure were higher amongst people with high educational levels, in contrast to the educational gradient observed in all-cause mortality and in mortality from related diseases. This pattern highlights educational inequalities in the use of euthanasia and indicates unequal access to this legally recognised healthcare right. However, mortality data capture only completed and registered procedures, without information on the preceding stages of awareness of the law, deliberation, application, assessment approval or withdrawal. Consequently, the inequalities observed may reflect a combination of clinical circumstances, preferences, health and legal literacy, social support and the ability to navigate the healthcare system, as well as possible institutional barriers. These findings support the need to incorporate socio-economic indicators into the assessment of euthanasia throughout the entire process, to determine whether a legally universal service also provides effective and equitable opportunities for information, deliberation and access. The main transferable finding of the study is that social equity should be considered an explicit criterion for implementing and evaluating assisted dying.

## DECLARATIONS

### Ethics approval and consent to participate

The study used secondary confidential mortality microdata accessed through the INE scientific research procedure (reference BE119-2025), under controlled conditions and confidentiality requirements. No direct personal identifiers were available.

### Consent for publication

Not applicable

### Availability of data and materials

The individual-level data underlying this article were provided by the Spanish National Statistics Institute (INE). Access to the individual-level data from the "Statistics on deaths according to cause of death" requires prior permission, which must be requested directly from the INE through its microdata access request procedure available on the website: https://www.ine.es/dyngs/SER/index.htm?cid=1903.

Population denominators were obtained from the Annual Population Census (Education and Labour Force Status) for 2021–2023, available at: https://www.ine.es/dynt3/inebase/index.htm?padre=10608&capsel=10610.

### Competing interests

The authors declare that they have no competing interests

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### Authors' contributions

MBR and UMR designed the study. MBR, STL and UMR developed the methodology. MBR conducted the analyses, with AAG, STL and UMR supervising them. All authors interpreted the results. MBR drafted the manuscript, and all authors critically revised and approved the final version.

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