

Aragonese Socioeconomic Inequality at Death Database (ASIDD). Studying Mortality Changes Since the 1870s in a Population of Approximately one Million Individuals

By Francisco J. Marco-Gracia, María Pilar Rodrigo Val & Judit Gil-Farrero

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Aragonese Socioeconomic Inequality at Death Database (ASIDD)

Studying Mortality Changes Since the 1870s in a Population of Approximately one Million Individuals

Francisco J. Marco-Gracia	Universidad de Zaragoza & Instituto Agroalimentario de Aragón, Spain
María Pilar Rodrigo Val	Gobierno de Aragón & Universidad de Zaragoza, Spain
Judit Gil-Farrero	Universidad de Zaragoza, Spain

ABSTRACT

Aragonese Socioeconomic Inequality at Death Database (ASIDD) is an ongoing project. Once finalized (expected in early 2029), it will contain mortality data for approximately 65% of all individuals who died in the Aragón region (Spain) between 1874 and 1994, primarily sourced from burial records. The project consists of two subprojects: one covering the period 1874–1939 and the other covering the period 1940–1994 (which is expected to be completed by the end of 2026). Aragón comprises 731 municipalities — ranging from small settlements to the city of Zaragoza (ca. 700,000 inhabitants) — with diverse geography, climate, and levels of development, spread over nearly 50,000 square kilometers. The database will include anonymized information on nearly one million individuals, including date and place of death (and often origin), age, sex, marital status, and presence of descendants at death. For about 75%, socioeconomic status is available, approximated through occupation and literacy, or that of close relatives. Additionally, for a representative sample of 30 urban, semi-urban, rural, and almost-depopulated localities, cause of death is known for nearly all individuals, based on civil registers and parish records. For each locality, information on access to health and emergency services is also available. ASIDD aims to enable the study of social inequality in mortality during the modern era, providing valuable insights into the determinants of health disparities.

Keywords: Mortality data, Spain, Database

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1 INTRODUCTION

Causes of death and socioeconomic gradients in mortality are central topic in both historical demography and the social epidemiology of health (Bengtsson et al., 2020; Clouston et al., 2016; Marmot, 2004; McKeown et al., 1972; Omran, 1971). For Spain, long-run micro-level evidence linking individual socioeconomic position to certified causes of death remains comparatively scarce, particularly beyond large urban contexts and for the decades in which public health, medical provision, and living standards changed most rapidly (Germán Zubero, 2012; Robles et al., 1996). This article introduces the Aragonese Socioeconomic Inequality at Death Database (ASIDD), a newly assembled, individual-level mortality resource for Aragón.

Aragón is a region in northeastern Spain that encompasses the provinces of Zaragoza, Huesca, and Teruel (see Figure 1). Its geographic and demographic diversity ranges from urban centers and isolated rural communities to the high mountain ranges in the Pyrenees, and the semi-arid zones along the Ebro Valley. Historically shaped by successive transitions in agriculture, industry, and services, Aragón provides a complex socio-economic landscape that has evolved significantly over the 20th and 21st centuries. The region's combination of deep-rooted traditions and gradual modernization makes it a compelling case for examining long-term structural changes in Spain (Germán Zubero, 2012).

Studying Aragón over the past century offers a valuable lens for understanding major demographic, economic, and social processes such as the decline in mortality, urbanization, educational expansion, and the development of public health systems. Infant mortality rates, for instance, fell from roughly 200–250‰ in the mid-19th century, to around 30–50‰ by the mid-20th century, and below 5‰ in the early 21st century, (Marco-Gracia, 2021). It is difficult to find long-term studies on the evolution of causes of death in this period or in earlier periods, leaving an area still largely unexplored that may offer valuable lessons.

The region's diverse settlement patterns and uneven development, ranging from remote rural villages to the regional capital of Zaragoza, make it possible to analyze in detail how broader transformations have affected different populations. Aragón is the first region in Spain to have fully digitized its civil registers from the 1940s to the present; this project was completed in 2023.¹ These records contain detailed information on deceased individuals, including place of residence, sex, age, marital status, socioeconomic status, and cause of death. As a result, they provide broad access to mortality data, once the appropriate authorizations have been obtained (Brel Cachón, 1999).

Figure 1 *Location of the region of Aragón*



Source: Instituto Geográfico de Aragón (IGEAR).

1 See the link to the newspaper articles: <https://www.heraldo.es/noticias/aragon/2023/06/09/aragon-primer-comunidad-autonoma-todos-registros-civiles-digitalizados-1657691.html> or <https://www.aragonhoy.es/presidencia-y-relaciones-institucionales/aragon-convierte-primer-comunidad-autonoma-registros-civiles-digitalizados-92359>. Retrieved April 2, 2026.

The Aragonese Socioeconomic Inequality at Death Database (ASIDD) is an ongoing research infrastructure, launched in November 2024 and currently still under construction. ASIDD counts with two interconnected chronological components. The first covers the period from the 1870s to the 1930s, while the second — larger and currently more advanced — covers the period from the 1940s to 1994. This dual structure reflects both the substantive aims of the project and the practical conditions under which the sources can be accessed and processed. Although ASIDD remains under construction, work has so far focused primarily on the 1940–1994 component. This was a strategic decision. In general, sources for the earlier period are easier to consult because most of them are no longer subject to the same level of protection once more than one hundred years have elapsed, while records from the years immediately preceding and during the Spanish Civil War often receive special archival attention because of their historical significance. Progress is expected to be concentrated in this initial phase during the period 2027–2029. By contrast, access to post-1940 Civil Registry material required specific permissions and was subject to substantial legal and technical restrictions. For that reason, the first stage of the project (2024–2026) concentrated on securing and exploiting access to this later period, which was both more difficult to obtain and especially valuable for studying the transformation of mortality under changing medical, political, and institutional conditions. The earlier and later components of the database are therefore being developed at different speeds, but they form part of a single research infrastructure.

Consequently, the present article focuses primarily on findings for the decades following the Spanish Civil War (1936–1939), a conflict that was particularly destructive in Aragón and that marked a major turning point in the region's demographic and social history. The period from 1940 onward is of particular interest because it captures the decades in which medicine and healthcare services assumed a much more decisive role in shaping mortality patterns. The expansion of medical provision, together with improvements in diagnosis, treatment, and certification, make these years especially suitable for analyzing how access to healthcare affected social inequalities in mortality (Floud et al., 2011, 2014; Komlos & Kelly, 2016; Salvatore et al., 2010; Voth, 2004). The second period of the database is also especially relevant because it spans markedly different political and institutional settings, from the Franco dictatorship to the democratic transition and the consolidation of regional self-government in Aragón. This changing institutional context provides an important backdrop for the study of mortality, since it may have influenced healthcare provision, territorial inequalities in access to services, and the broader public-health environment.

There is broad consensus that health and mortality inequalities by socioeconomic status persist in contemporary societies and this is linked to habits, health patterns, and, as a result, differences in causes of death by socioeconomic status (Cockerham, 2017; Marmot, 2004; Saldana-Ruiz et al., 2012; Semyonov et al., 2013), a pattern reinforced by evidence from the COVID-19 pandemic (Nwosu & Oyenubi, 2021; Sun et al., 2021; Wildman, 2021; Wu et al., 2021).

From a historical perspective, however, both the timing, magnitude and relation with some of the causes of death of these disparities remain contested. International evidence is heterogeneous: some studies identify clear social gradients in mortality from the 16th–18th centuries onward, linking it to famines and contagious diseases that could spread more easily in unsanitary and overcrowded environments (Luque de Haro et al., 2021; Perrenoud, 1975, 1981; Schumacher & Oris, 2011), whereas others do not find marked differentials until the late 19th or 20th century (Bengtsson & Dribe, 2011; Bengtsson et al., 2020; Debiasi & Dribe, 2020; Gagnon et al., 2011).

Therefore, this project places particular emphasis on causes of death, as determinants of mortality and social gradients differ across disease categories (Elo et al., 2014; Smith, 1983) and often follow divergence–convergence dynamics with advances in medical knowledge (Clouston et al., 2016; Vallin, 2013). These processes unfolded within the demographic and epidemiological transition, in which shifts from infectious to chronic and degenerative diseases reflected a multifactorial interplay of medical progress, hygienic and sanitary conditions, socioeconomic development, living standards, and contemporary medical notions (McKeown et al., 1972; Omran, 1971; Robles et al., 1996; Zuckerman et al., 2014).

2 DESCRIPTION OF SOURCES

A foundational source for the construction of the Aragonese Socioeconomic Inequality at Death Database (hereafter ASIDD) is burial records. These registers typically document the deceased's full name (given name plus two surnames), sex, age at death, burial location, and the individuals responsible

for arranging the funeral. In some cases, the information is even publicly accessible on the websites of local municipalities (for example, the City of Zaragoza maintains an open-access cemetery search tool: <https://zaragoza.es/gicem2/kiosko/cementerio.jspx>), so the relatives can locate their deceased family members more easily.

These records originated in the late 18th or early 19th centuries, depending on the locality, following the royal decrees of Charles III, which mandated that burials be moved from church premises to better-ventilated areas outside urban centers (Baudez, 2014). The primary purpose of these registers was to identify the deceased and record their burial location. A major limitation of this source is that only the most recent burial registers are often preserved, while older records may be missing or damaged due to poor preservation. The beginning of the source depends on the construction date of the cemeteries, with more than 85% dating from before the 20th century and almost 95% from before 1945, and the end of the source is the present day.

Cemetery books are preserved locally, typically in municipal archives and, in some cases, particularly in larger towns, at the cemeteries themselves. As a result, members of the research team were required to travel to the respective municipalities to collect the data. In exceptional cases, cemetery books include additional information, such as cause of death, especially for individuals killed during the Spanish Civil War and the subsequent repression, or details concerning the deceased's occupation. However, this source does not usually record cause of death and must therefore be supplemented with information from the Civil Registry or from parish registers, which are described below.

To determine socioeconomic status (based on occupation and literacy), we conducted nominal linkage between burial records and electoral census data from 1860, 1890, 1924, 1934, 1955, and 1975 (the latter only available for certain localities). This linkage was performed using individuals' full names, sex, and year of birth. Therefore, we have information on occupation and literacy at the individual level, or we can infer it from the husband if both are recorded in the same household in the census and that household is not shared with any other married individuals. To date, since the database is still under construction, linkage has been successful for 78.2% of male individuals. In the case of women, when no occupational data was available (which occurs in 85.1% of female cases), we used the socioeconomic information of the husband or father (if unmarried). This strategy has been feasible in 72.2% of cases. For children, when parents could be identified, typically through the burial records, we assigned the father's occupation as a proxy for family socioeconomic status. Literacy data is available for both men and women as long as they appear in a census, while it remains missing for children. After completing the linkage process, we removed all identifying information such as names and surnames, thereby generating fully anonymized samples for each locality.

For information on causes of death, we rely primarily on the Civil Registry, which has been digitized as a collection of images for the region of Aragón (see Figure 2 for an example of a death record). Access to this source requires appropriate permissions because of data protection regulations. Moreover, the agreements governing data extraction from the Civil Registry do not permit the retrieval of personal data. For this reason, we link burial records to Civil Registry data using the date of death, sex, age, and location. Although the Civil Registry cannot serve as our sole primary source, it constitutes our principal source for information on causes of death. In Spain, the Civil Registry was officially established in 1870 as part of the broader secularisation process initiated during the *Sexenio Democrático* (Santiago-Caballero, 2018). Although implementation took several months or even years in some localities, from that point onward, the registry provided standardized civil death records nationwide. Today, the Civil Registry operates under the jurisdiction of the Spanish Ministry of Justice.

Each death entry in the Civil Registry contains detailed information including full name, sex, age, marital status (along with the name of the spouse, including in cases of widows or widowers), place of origin, place and time of death, and cause of death. The latter, which constitutes the most novel data point compared to previously discussed sources, was reported in all cases by a licensed local physician. The physician issued a formal statement identifying the official cause of death, which was submitted to both the Civil Registry and the local parish (Valero Escandell, 1986). A significant limitation of this information is that it typically identifies only the ultimate cause of death, without detailing the underlying conditions or illnesses that led to it. Usually, only one cause is recorded; however, in fewer than 10% of cases, multiple potential causes are listed when the physician was uncertain. This 10% has remained fairly constant over time, only falling to 6.6% in the 1980s and 1990s.

Figure 2 Example of a death certificate entry from the Civil Registry for the year 1915

REGISTRO CIVIL DE L 012187 P 253

DATOS DE IDENTIDAD DEL DIFUNTO:

Nombre Fernando

Primer apellido Blasco

Segundo apellido Hortera

hijo de Teresa y de Manuel

Estado soltero

Nacido el día doce de mayo de mil novecientos quince en Celadas (Teruel)

Inscrito al tomo de

Domicilio último Teruel - C/ Joaquín Arana, 6

DEFUNCION: Hora once de la noche día diecisiete

Lugar Teruel de mil novecientos quince y causa Hospital Provincial

Causa Hospital Provincial

El enterramiento será en Zaragoza

DECLARACION DE D. José Manuel Andrés Alorís

En su calidad de Industriales

Domicilio Teruel - C/ San Andrés, n.º B-1-D

Comprobación: Médico D. M.º Jesús Eliseo Esteban

Colegiado núm. 338 número del parte 338

OTROS TITULOS O DATOS

ENCARGADO D. D.ª María Teresa Rivera Blasco

SECRETARIO D. D.ª Gracia Martínez Blanco

A las once horas del diecisiete de mayo de mil novecientos quince

[Signatures]

Source: Teruel Civil Registry.

Cause-of-death reporting thus depended on the physician's training and interpretation, and this information is available from the beginning of the Civil Registry in the 1870s through 1994. Before a body could be buried (or incinerated), it had to be examined and identified by the officially appointed physician for that locality or district, who was responsible for determining the cause of death and certifying that it had not been violent. The procedure followed and the quality of the registration depended largely on the physician's diligence and, to a great extent, on his prior knowledge of the deceased, whom he had presumably treated in life, especially in rural areas where there was usually only one doctor per municipality (Rodríguez-Ocaña & Bernabeu-Mestre, 1997). Therefore, throughout the study period, death had to be certified by a physician. One copy of the death certificate signed by the physician was submitted to the Civil Registry and another to the parish priest before the funeral (in the case of Catholic funerals, which accounted for almost all those held in the region, whether by religious conviction or by legal requirement). After 1994, the reporting of medical causes of death was restricted to internal medical records and ceased to be included in both the Civil Registry and parish registers. Unfortunately, the doctor's name does not appear in the (civil or parish) records, as only data considered relevant was copied.

The extraction of Civil Registry data adheres to strict data protection protocols. These records are linked to the broader database using the date and location of death, sex, and age at death. In 99.1% of the cases, there is only one individual in both anonymized datasets that meets all these criteria.

As shown in Table 1, for the urban and rural localities of Teruel, Villaspesa, San Blas, and Concul, we have been able in 54.3% of cases to link burial records both to census data, in order to recover socioeconomic status, and to Civil Registry records, in order to obtain information on cause of death. It should be emphasized that linkage with the Civil Registry is not nominal; rather, it relies exclusively on date of death, age, sex, and locality. In approximately 10% of cases, the dates recorded in the two sources may differ by a single day, possibly as a result of delayed registration of the death. However, we adopt a strict matching criterion, since, given the limited identifying information available, it is entirely possible that two individuals of the same age and sex could have died on consecutive days. With regard to the distribution of causes of death among linked and unlinked cases, the patterns are almost identical in both sources, with only minor differences that are not statistically significant at the 95% confidence level. As noted above, linkage between census data and burial records is even more satisfactory, reaching around 75%, although this higher success rate must be interpreted in light of the fact that more identifying variables are available to assess cases that do not match perfectly across sources. Finally, it should be noted that the linkage has so far been conducted only within each locality. Some individuals may nevertheless have been buried in other localities in Aragón, particularly in the regional capital, Zaragoza. We therefore expect the linkage success rate to improve slightly in future stages of the project, and our initial tests suggest gains of between 2% and 5%.

As an alternative to the Civil Registry, we also use information from parish death records (see example in Figure 3), which reproduce the same cause-of-death statements provided by physicians and thus constitute an equivalent source of medical information. In other words, both civil and parish records in Aragón contain information on causes of death since the 1870s, with the same origin. This allows us to use parish records as a supplement when there are problems with the Civil Registry. For our area of study, we have found no differences in the cause of death recorded in more than 1,000 observations, except in exceptional cases where one source recorded the main cause and another included additional information about another disease suffered by the individual. For example, following a cardiac arrest in the municipality of Alfamén in 1923, the Civil Registry included that the woman had been in poor health since the Spanish flu epidemic.

Access to these parish registers requires formal permission, but they are especially valuable for periods more than a century old, since public consultation is generally permitted after 100 years. In principle, unless they have been damaged or destroyed, they remain available in parish archives either within the municipalities themselves or in the corresponding provincial capitals, making consultation considerably easier than travelling to each individual locality. The quality of parish registers should be broadly comparable to that of the other sources because, as noted above, copies of the same death certificate were distributed to all parties involved in the registration of the deceased. Some variation in recording quality may nevertheless exist, depending on the historical context and the degree of involvement of the different agents (Brel Cachón, 1999). Even so, these data must be handled with caution, as parish priests occasionally introduced discretionary modifications. For example, we identified cases in small villages in Zaragoza in which all deaths were recorded uniformly as "cardiorespiratory arrest."

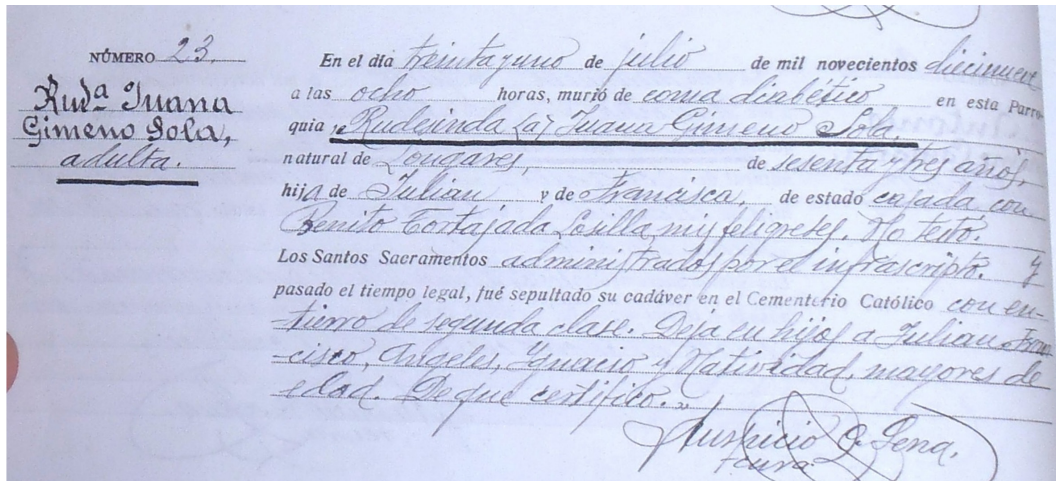
Table 1 *Percentage of successful linkages*

Source 1	Source 2	Variable of interest	Success rate
Burial records (Males)	Censuses	Occupation and literacy	78.2%
Burial records (Females)	Censuses	Occupation and literacy	72.2%
Burial records + SES	Civil Registry	Cause of death	54.3%

Note: Results for the city of Teruel and the villages of Villaspesa, San Blas, and Concul.

Source: ASIDD (2026, April).

Figure 3 Example of a death certificate entry from the Parish Registres, 1919



Source: Parish Registry of Longares (province of Zaragoza).

In practice, whenever permission has been granted to extract post-1940 cause-of-death information from the Civil Registry, we have usually also been able to consult the earlier volumes for the same localities. As a result, the project already holds cause-of-death information for the first period from the 1870s to the 1930s (with similar success rate of linkage in our preliminary test). However, for that earlier component, the systematic extraction of burial records is still at a much less advanced stage, and in many cases the material has been collected and stored for later processing.

At present, the database includes cause-of-death information for the provincial capital of Teruel, as well as the following 20 municipalities: Alfamén, Almonacid de la Sierra, Aylés, Botorrita, Cadrete, Cartuja Baja, Codos, Cosuenda, Cuarte de Huerva, Jaulín, Longares, María de Huerva, Mezalocha, Mozota, Muel, Rubielos de Mora, Torrecilla de Valmadrid, Tosos, Valmadrid, and Villanueva de Huerva. The distribution of causes of death in the rural sample available thus far (which we will examine below) does not change substantially, as it consists of villages with a relatively homogeneous economic structure and social context, albeit with some variation in their geographical setting. However, as we will show, certain differences do emerge when we compare this rural sample with an urban environment in the same region.

In addition, we are systematically enriching our database with contextual information that is particularly relevant for analyzing social inequalities in mortality. At the health-system level, we compile historical and contemporary documentation on local healthcare infrastructure, including the presence and number of physicians, opening hours of medical practices, availability of basic equipment (e.g., defibrillators), proximity to primary care centers and hospitals, and the existence of sports and other health-promoting facilities. These indicators are derived from archival sources on the deployment of healthcare personnel in each locality, together with administrative records from the regional health department of Aragón. We also attach a set of geospatial variables to each locality — altitude, climatic conditions, travel time by road to provincial capitals and semi-urban county centers, terrain ruggedness, and other environmental characteristics currently under construction — with the aim of incorporating them as contextual covariates in small-area and multilevel analyses of mortality. This strategy follows recent work that combines individual-level mortality data with detailed indicators of healthcare access, spatial accessibility and local socioeconomic context (Benach et al., 2003; Merlo et al., 2012; Weiss et al., 2020).

3 PRELIMINARY DESCRIPTION OF THE DATABASE AND THE CAUSES OF DEATH IN THE DATABASE

ASIDD is still under construction; therefore, the data presented here should be considered provisional. Nevertheless, we provide an overview of the current state of the database as of early-2026. As shown in Table 2, the region of Aragón is composed of 731 municipalities — 293 in the province of Zaragoza, 236 in Teruel, and 202 in Huesca. At present, the database includes mortality records from 100% of

the municipalities in Zaragoza province (approximately 500,000 individuals), from 181 municipalities in Teruel (76.7%), covering around 150,000 individuals, and from 179 municipalities in Huesca (88.6%), covering around 200,000 individuals. Men account for 51.8% of deaths in the sample and women for 48.2%. With respect to age at death, 5.9% of individuals died before reaching age 10, 51.8% between ages 65 and 90, 7.7% between 90 and 99, and 0.3% survived to at least 100 years of age.

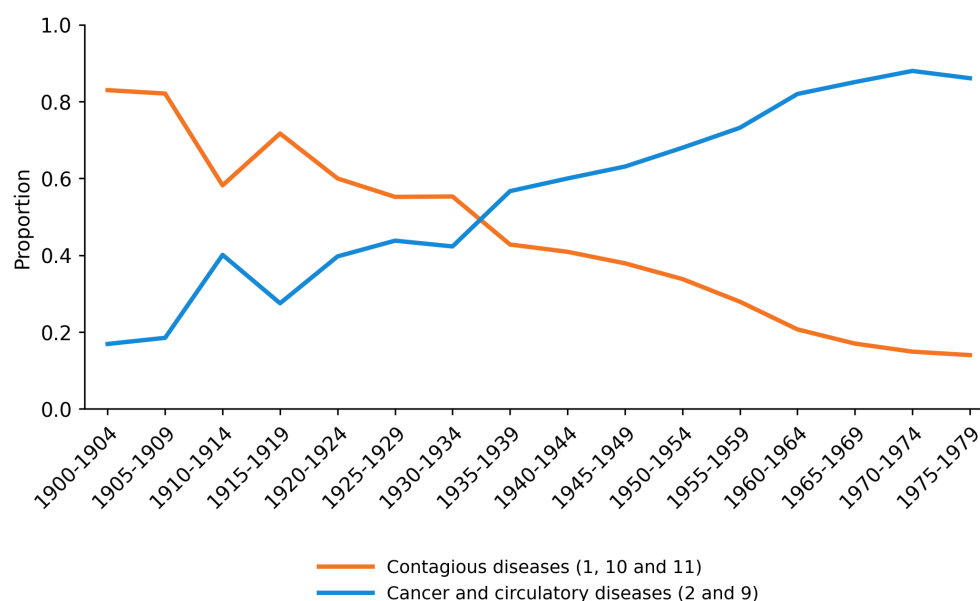
Table 2 *Description of the available data*

Province	Inhabitants in 1950	Squared km	Number of municipalities	% of data available
Zaragoza	621,768	17,274	293	100%
Huesca	236,232	15,626	202	88.6%
Teruel	236,002	14,809	236	76.7%

Source: ASIDD (2026, April).

Regarding causes of death, Figure 4 compares the evolution of contagious diseases vs. cancer and circulatory diseases across 17 rural municipalities in Aragón between 1900 and 1980. These data belong to the earlier component of ASIDD, which currently remains less fully processed than the 1940–1994 component but is already sufficiently advanced to illustrate the longer-term epidemiological transition in the study area. We believe it is interesting to show since it represents a transition in mortality rates in the study area. In all cases, these causes have been classified according to the International Classification of Diseases, 10th Revision (ICD-10), and we plan to harmonize them with the ICD-10h classification in the near future. This was achieved through retrospective medical interpretation of historical terminology and alignment with contemporary disease categories, allowing for consistent comparison over time. The figure emphasizes the shift from infectious diseases — predominant in earlier decades — to the growing prevalence of circulatory diseases, and cancers, which characterize later periods. We can observe that the turning point from mortality due to infectious diseases to deaths caused by circulatory conditions and cancers occurred around the 1930s, following significant public health improvements implemented across the region since at least the 1920s (Robles et al., 1996). In other words, the turning point lies in the transition from our first period of study to the second one.

Figure 4 *Evolution of contagious diseases vs. cancer and circulatory diseases, 1900–1980, in 17 rural municipalities*



Note: The total number of individuals who died from these groups of causes was taken as a value of 1. The numbers refer to the ICD-10 chapters. Only deaths in the categories indicated are taken into account.

Source: ASIDD.

Table 3 *Comparison of causes of death (ICD-10) between Teruel and 17 rural villages, 1940–1994*

	Urban town of Teruel		Rural area	
	Observations	%	Observations	%
Infectious and parasitic diseases	722	4.78	110	3.22
Neoplasms	876	5.8	408	11.93
Diseases of the blood	57	0.38	95	2.78
Nutritional and metabolic diseases	82	0.54	34	0.99
Mental and behavioral disorders	72	0.48	55	1.61
Diseases of the nervous system	92	0.61	78	2.28
Diseases of the eye and adnexa	0	0	0	0
Diseases of the ear and mastoid process	0	0	0	0
Diseases of the circulatory system	8,560	56.69	1,749	51.14
Diseases of the respiratory system	1,673	11.08	400	11.7
Diseases of the digestive system	590	3.91	184	5.38
Diseases of the skin	0	0	5	0.15
Diseases of the musculoskeletal system	5	0.03	2	0.06
Diseases of the genitourinary system	499	3.3	100	2.92
Pregnancy, childbirth and the puerperium	90	0.6	3	0.09
Originating in the perinatal period	60	0.4	54	1.58
Congenital malformations and deformations	642	4.25	0	0
Abnormal clinical and laboratory findings	25	0.17	41	1.2
Injury and poisoning	262	1.74	64	1.87
External causes of morbidity and mortality	793	5.25	38	1.11
TOTAL	15,100	100	3,420	100

Source: ASIDD.

Additionally, Table 3 presents a comparative overview of the causes of death between 1940 and 1994 in the provincial capital of Teruel and in 17 rural villages in the region listed above, using the same ICD-10 classification criteria. These rural villages are located to the north of Teruel, along the Huerva River corridor that connects the province of Teruel with the regional capital, Zaragoza. The data reveal the classic pattern whereby mortality gradually shifted from being dominated by infectious and preventable diseases to being driven by degenerative diseases and cancers.

The differences between the town and the rural areas are not particularly pronounced. There is a higher prevalence of originated in the perinatal period causes of death (1.58% vs. 0.4% in Teruel), likely due to the more limited healthcare infrastructure in the countryside until the final quarter of the 20th century (Barceló Prats & Lanero Táboas, 2022). In both settings, deaths from circulatory and respiratory conditions clearly predominate (approximately 68% in Teruel and 63% in the rural areas), while infectious diseases account for barely 5% of all causes of death and are largely concentrated in the early decades of the study period. The markedly higher proportion of deaths attributed to neoplasms in the rural villages relative to Teruel likely reflects a combination of compositional effects (a relatively older age structure shaped by sustained rural out-migration and selective survival) and differences in medical certification/diagnostic specificity, with urban physicians more frequently assigning deaths to circulatory conditions while rural certificates more often recorded cancer as the proximate cause. In any case, we hope that future research using the database will allow us to explore possible explanations in greater depth.

Therefore, this dataset on causes of death is valuable for understanding the transformation of mortality patterns in the region and how these shifts may have contributed to socioeconomic disparities in health outcomes.

Finally, variables related to medical infrastructure, healthcare access, geographic distance, and other spatial characteristics have been incorporated at the municipal level for the full available sample and will continue to be extended as additional municipalities are integrated into the study. For the period prior to the health system reform of the 1986,² we identify whether there was a resident physician (or more than one) in each locality who attended all consultations. For the post-reform period, we document the number of physicians assigned to each municipality, the days on which they are available, and the opening hours of local primary care practices. In addition, we record the existence of emergency medical services in the surrounding area and the distance to them, as well as the distance to the main hospital assigned to each locality, measured as travel time by road, taking into account both the type and quality of the connecting routes. These indicators are currently available in a pilot version and are being progressively developed for all municipalities in the dataset, following recent work that combines detailed measures of healthcare supply and spatial accessibility with mortality and health outcomes (Guagliardo, 2004; Weiss et al., 2020).

4 PREVIOUS RESEARCH USING A SIMILAR (AND SMALLER) DATABASE

This research originates from prior studies conducted by several members of the ASIDD project on social inequality in mortality, using data from the Alfamén & Middle Huerva Database (AMHDB), which covers 17 rural villages in the province of Zaragoza.

The foundational working paper (Marco-Gracia & Luque de Haro, 2023) examined social differences in mortality from the 16th to the 21st century. Across all periods, the authors found persistent social disparities in adult mortality, and from at least the 18th century onward, a clear socioeconomic gradient. This study also finds that cause of death mattered: historically, infectious diseases and famine-related mortality were disproportionately concentrated among the poorest social groups. However, contrary to the dominant literature (Bengtsson & Dribe, 2011; Bengtsson et al., 2020; Debiasi & Dribe, 2020; Gagnon et al., 2011), they observed that, by the late 20th and early 21st centuries, these disparities in adult mortality appeared to be diminishing or even disappearing in the small Aragonese villages under study.

As a result, the original article was published in *Cliometrica* (Marco-Gracia & Luque de Haro, 2025), but the analysis concluded in the mid-20th century.³ The period from the 1940s to the 2020s was left for further investigation through the development of a new, comprehensive database for the whole of Aragón, enabling a deeper exploration of local patterns and individual experiences of social inequality in mortality. This has led to the creation of the ASIDD database, which we describe in this article.

In addition to the aforementioned research, further studies focused on these Aragonese villages have examined the impact of literacy on the longevity of individuals and their family members (Luque de Haro & Marco-Gracia, 2024), as well as the influence of household composition on life expectancy, also differentiating by cause of death (Marco-Gracia et al., 2024). This body of research, rooted in the same regional context, has provided a critical foundation for the present project, which has received generous funding from the *Observatorio Social de La Caixa*.

Regarding the use of civil registry records in Spanish research, a long-standing strand of historical demography has been built on the systematic exploitation of nominative vital registration — above all the post-1870 Civil Registry — and its triangulation with parish series, population lists, and other local sources, thereby enabling rigorous reconstructions of mortality regimes (levels, age patterns, and causes of death) across the demographic and epidemiological transitions. Source-critique and methodological reflection have been central to this tradition: the institutional consolidation and practical constraints of Civil Registry material for demographic inference were clarified early on (Valero Escandell, 1986), its reliability and internal coherence were tested comparatively against ecclesiastical registration (Brel Cachón, 1999), and the historically contingent relationship between medical certification, statistical

2 "General Sanitary Law" (*Ley General Sanitaria de 1986*) marked the transition from a model in which rural doctors resided in the municipality to a centralized healthcare system based on local clinics with opening hours, zonal urgent care centers and large hospitals located in the main urban areas.

3 Similarly, for the pre-mid-20th century period, there are still questions to be answered by future researchers, especially those related to causes of death and social mobility.

practices, and recorded mortality was analyzed from the perspective of health-statistics production (Rodríguez-Ocaña & Bernabeu-Mestre, 1997) and synthesized in accounts of Spain's 20th-century health transition grounded in official time series (Robles González et al., 1996).

Building on this evidentiary and conceptual groundwork, a substantial body of work moved from aggregate regularities to micro-demographic mechanisms by linking life-course events (birth, marriage, and death) and, where available, causes of death, to study childhood survival and its social determinants in central and interior Spain (Ramiro Fariñas & Sanz Gimeno, 2000; Reher et al., 1997; Sanz Gimeno & Ramiro Fariñas, 2002), to embed local evidence within broader national narratives of mortality decline (Dopico & Reher, 1998; Pérez Moreda et al., 2015), and to interrogate spatial contrasts in mortality change (Reher, 2001). Within this scholarship, the Aranjuez longitudinal database — constructed from complete civil birth, marriage, and death certification (including cause-of-death information) and complemented by nominative lists — has become an exemplary laboratory for historical micro-demography, and the Aranjuez-based research program led by Reher and Sanz-Gimeno has been particularly influential in showing how family and parental contexts structured child health and survival (Reher & González-Quirón, 2003) and how improvements in child survival interacted with reproductive decision-making during the demographic transition, sharpening causal accounts of the mortality–fertility nexus (Reher & Sanz-Gimeno, 2004, 2007).

With regard to the long-term use of cause-of-death information at the microdata level in Spain, the literature remains relatively limited, particularly for rural areas and for Aragón, although several recent contributions have demonstrated its potential. For instance, studies on gender discrimination in rural Spain have used longitudinal microdata to document sex-specific patterns of infant and child mortality, in some cases drawing on detailed burial records and diagnostic labels to distinguish between perinatal and early childhood deaths in small rural communities (Marco-Gracia & Beltrán Tapia, 2021).

At the same time, historical epidemiological research in rural Spain has addressed the methodological challenges posed by historical medical certification by proposing harmonized classification schemes, such as the Classification of Causes of Historical Mortality (CCHM) and the historical system developed by Bernabeu-Mestre et al. (2003), and by applying them to local case studies based on civil and parish death registers (Marín Paz, 2017; Sáinz-Otero et al., 2020). For more recent periods, research on urban–rural mortality differentials in Spain has shown that cause-of-death profiles reflect differences in living conditions and health risks between urban and rural settings, thereby reinforcing the value of cause-specific mortality for the analysis of spatial and social inequalities (Camarero Rioja et al., 2001).

5 FUTURE RESEARCH AND POTENTIAL USES OF THE DATABASE

The purpose of constructing this database is to analyze the evolution of social inequalities in mortality. International evidence generally indicates that, in recent decades, social inequalities in mortality have increased steadily (Bengtsson & Dribe, 2011; Bengtsson et al., 2020; Debiasi & Dribe, 2020; Gagnon et al., 2011). Therefore, by drawing on a broad sample of individuals from the regional population who died in recent decades, we will be able to determine whether inequalities are widening or narrowing across different areas and to identify the characteristics of these communities.

Do geographic location and distance from urban centers play a role? What is the relationship between the evolution of causes of death and population size controlled by available medical services? Does the mountainous terrain promote greater mobility among residents? Could the absence of social differentiation in longevity be explained by shared spaces and common social environments? These are some of the questions we aim to answer, with the broader goal of drawing lessons that may help reduce social inequality in mortality.

Another key dimension involves access to medical services. Understanding both the availability and historical development of healthcare provision, as well as the timing and extent of residents' access to general practitioners, emergency services (health centers and major hospitals), and the travel time required to reach each service, will be crucial. This data will help us assess the role that access to healthcare and other public services plays in shaping longevity, and how this, in turn, contributes to social disparities in mortality. The value of the findings lies in their potential to inform feasible and actionable social policy, provided there is the political will to implement it.

Moreover, having access to cause-of-death data will allow us to investigate how social differences in mortality have evolved according to cause of death (Villegas et al., 2025), helping to refocus research on the causes of death with the greatest impact. By identifying the most influential explanatory factors, we hope to inform the design of public policies aimed at reducing social mortality inequality — particularly in the case of preventable diseases.

This database also enables the study of the unequal impact of epidemics. We will explore how social inequality in mortality manifested during this health crisis, with a particular focus on the role of place of residence and connectivity with major urban areas in influencing the speed of viral transmission.

Finally, the database will allow us to explore other important factors in contemporary research on longevity and inequality, such as the spatial distribution of centenarians over the last century, and the potential effects of long-term relationships and mutual familiarity between patients and their general practitioners on well-being and longevity.

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