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**Working Paper**

## The Survival of the Royals

CESifo Working Paper, No. 12047

**Provided in Cooperation with:**

Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

*Suggested Citation:* Batinti, Alberto; Costa-Font, Joan; Shandar, Vasuprada (2025) : The Survival of the Royals, CESifo Working Paper, No. 12047, Munich Society for the Promotion of Economic Research - CESifo GmbH, Munich

This Version is available at:

<https://hdl.handle.net/10419/327657>

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**CES ifo**

**12047  
2025**

August 2025

# Working Papers

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CES ifo

Imprint:

**CESifo Working Papers**

ISSN 2364-1428 (digital)

Publisher and distributor: Munich Society for the Promotion  
of Economic Research - CESifo GmbH

Poschingerstr. 5, 81679 Munich, Germany  
Telephone +49 (0)89 2180-2740

Email [office@cesifo.de](mailto:office@cesifo.de)  
<https://www.cesifo.org>

Editor: Clemens Fuest

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# The Survival of the Royals\*

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\* This version: July 15<sup>th</sup>, 2025, accepted in *Kyklos*. We thank seminar's participants at LSE, Sapienza Department of Social Sciences and Economics, Silvaplane Political Economy Workshop 2024, AIES24, SIEP24, for useful comments. All errors and mistakes are our own. Costa-Font is corresponding author: E-mail: [j.costa-font@lse.ac.uk](mailto:j.costa-font@lse.ac.uk). Batinti: [alberto.batinti@uniroma1.it](mailto:alberto.batinti@uniroma1.it); Shandar: [vshandar@wharton.upenn.edu](mailto:vshandar@wharton.upenn.edu)

***Abstract:*** We study the effect of royalty status - historically rooted legal privilege enjoyed by hereditary monarchs - on human longevity, a proxy of individuals' health capital. We disentangle royalty status that encompassed serving as heads of state, and hence subject to status-related stress, from other family members alongside their contemporary countrymen. We exploit a dataset containing relevant demographic data and specifically the lifespan (age at death) of European Royals and their families spanning the past three centuries (1669 to 2022) from the *sixteen European countries*, including information for 845 high-status nobility and relative monarchs which is compared to otherwise similar countrymen by adjusting for relevant confounders. We document robust evidence of a statistically significant gap in life expectancy between monarchs and other members of the royal family, as well as between monarchs and the general population of an average of 5.2 to 7.1 years longer than their contemporaneous countrymen.

***Keywords:*** royal family, monarchy, life expectancy, health inequality, social determinants of health, healthy lifestyles, universal health insurance, age at death.

***JEL:*** I18, N13, P00

*"The king is dead, long live the king!"*

## 1. Introduction

Social conditions, particularly those related to living, working, and employment circumstances, can exert a significant impact on individuals' welfare, and especially in the development of disease to the point that they are the strongest predictors of a population's average life expectancy (Rosen, 1979). Among them, social hierarchies, namely individual differences in social status, are responsible for socio-economic health disparities (Marmot et al., 2013).

Nonetheless, social status effects can result from several pathways, including access to networks and connections (Link and Phelan, 1995) alongside differences in cognitive development and wealth in childhood and adolescence, leading to preventable risk factors in adulthood. Similarly, social status might be a side effect of a successful career choice, involving a higher effort in pursuing an education or setting up a successful business, or at times, the payoff of positions involving leadership and responsibility, and hence higher levels of stress. Hence, to isolate the effects of status resulting from positions of privilege, one can explore evidence from inherited status, such as that of royals. This is the focus of the rest of the paper.

In the last two centuries, global life expectancy has improved across the board, with the improvements in social and political rights, because of the deepening of democratic systems (Besley and Kudamatsu, 2006; Batinti et al., 2020). This process provides a fertile setting where to examine status effects on individuals' health by examining the effect at the extremes of the socio-political hierarchy. This is possible by comparing the survival or longevity trajectories of ruling royals\* and

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\* A royal in this context refers to a member of a royal family, typically associated with a monarchy. Royals often hold titles such as king, queen, prince, or princess and may have ceremonial, political, or cultural roles depending on the country's system of governance. Their status is usually hereditary, passed down through generations, and they are often symbols of national identity, tradition, and history.

individuals who, more generally, enjoyed a higher and similar social status. Individuals in positions of legal privilege in society, such as people belonging to high-ranked nobility. Indeed, the social status of royals is not the result of their choice but subject to strict inheritance rules. Typically, royals are appointed by specific succession laws in various countries' constitutions, and hence their status position is not the result of a choice unless they abdicate, are deposed or are deemed unfit, which is an exceptional circumstance, often following a military conflict<sup>†</sup>. The only appreciable effects of succession of salic laws would have mostly privileged male over female members, and older over younger male siblings<sup>‡</sup>.

Furthermore, royalty status provides two additional advantages. First, such status is comparable across countries (royalty) which allows cross country comparisons. That is, providing an answer to the question about whether ruling royals enjoy better health outcomes, with respect both to their close family and the general population, will be the focus of the rest of the paper. Second, the royalty effects on health are partially driven by their dynastic status. Hence, one can examine royal house dynastic effects on age-at-death patterns of royals, and whether time varying technology and standards of living exerted a difference in reducing the health gaps due to privilege and occupation of apical roles within a well-defined and structured social ladder.

During the period of analysis, Europe has been exposed to improved hygiene, medical care, and lifestyle choices which have steadily increased life expectancy, especially at birth. For example, from 2020 to 2022 the average person born in the UK can expect to live approximately 81 years (ONS, 2024), a sharp contrast to the mere 28-year life expectancy registered in 1750 (Rosen, 1979).

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<sup>†</sup> Exception is if they abdicate, which, at least in our sample is a rare event, and even in such a circumstance they often continue being members of the royal family.

<sup>‡</sup> Exceptionally, some royal families might have been deposed by other royal families, and more frequently, a country's political system might change to adopt a Republic permanently such as in Italy, France, Germany, Romania, Bulgaria or Portugal, or for some time such as in Spain in the two recent republican periods among other European countries.

While life expectancy has steadily risen for commoners, trends among the royalty, which included both ruling monarchs and high-ranking nobility, do differ significantly. In many monarchies, the increase in age at death of nobility has been much slower, often converging with the life expectancy at birth of the general population. This evidence raises questions about the role of socioeconomic differences in shaping life outcomes, and how these effects vary across countries. Further complexity arises when comparing the age at death of monarchs to that of other royals, such as their siblings and spouses, who enjoy substantial privileges, lifestyle, upbringing, and even large portion of genetics, but do not hold positions of power, and hence do not bear the status-related (di)stress associated with representing the country and taking leadership roles. What advantages does royalty confer on longevity, and how does one's specific status within the elite, i.e., being king, queen, prince, or sibling—impact life spans differently?

By comparing monarchs to other royals, we can differentiate the impact of public responsibility from the mere privilege of royal status. Unlike aristocrats, who primarily enjoy their elevated position, monarchs often face unique stress-related duties that are uncommon among other high-ranking nobility, though often are supported by a fortune of their own and transfers from the state. Psychosocial stress (distress) related to their increased responsibility may potentially affecting their longevity. However, eustress is a form of stress which can induce positive effects—and holding a position of authority may foster a greater sense of control, which has been linked to improved longevity (McGonigal, 2016; Selye, 1956). Given the empirical nature of the question, we examine how age at death has evolved across different countries, comparing the life expectancy of members of the royal family to that of the general population.

This paper studies the age at death of royals over time as with the expansion of parliamentary democracies, royals started taking over more symbolic roles shielding them from the



consequences of institutional, social, and economic crises. That is, our focus is on how long a person taking up a royal status lived which is compared to the life expectancy of the population, namely the average number of years their country fellows lived based on current mortality rates. Life expectancy is skewed by child mortality as well as the social distribution of wealth across the population as wealthier families typically experienced lower child mortality rates due to better access to healthcare, nutrition, and living conditions compared to poorer families (Oeppen and Vaupel, 2002). However, several studies show evidence of limited socio-economic differences in survival in the first years of life (Davenport, 2019, Corsini et al., 1997). In contemporary contexts, royals have increasingly become public figures, taking primarily the role of heads of state, influencing society much like nowadays celebrities and movie stars, or steering further values and principles of the constitutions of the countries they represent.

This study has assembled a comprehensive dataset of a number of European countries to study how inherited privilege, and royalty status more specifically, which is largely independent of effort or career choice, impacts life outcomes. To our knowledge, this is the first study examining socioeconomic status disparities in health (Rosen, 1979; Marmot et al., 2013) in this context. Our approach helps in isolating the health effects of social status from other confounding factors by comparing monarchs—those royals who bear public responsibilities of general government, inner and outer conflict resolution, self-preservation in power—to other royal members of the Court, while largely sharing genetic characteristics, upbringing, education, and lifestyle. By analysing longevity trends across different political systems and historical periods, this research sheds light on the role of privilege, stress, and institutional change in shaping health outcomes.

The structure of the paper is as follows. The next section discusses where the paper fits considering the evidence of the effect of status in longevity. Section three describes the data and

methods employed. Section four reports the results, section five discusses the evidence, and a final sixth section concludes.

## **2. Social Status and Longevity**

### *2.1 Status and health*

*Caste and Racial Status.* Social distance and status have been shown to impact health in various studies. One alternative approach to studying status effects is through India's caste system. Vyas et al. (2022) examine life expectancy disparities based on caste, religion, and indigenous identity, finding that lower-caste individuals (Adivasis) have a life expectancy over four years shorter than higher-caste Hindus, while Muslims live about one year less than Hindus. Such differences can be compared to the Black-White racial gap found in studies for the U.S. (Varcoe et al., 2019; Williams et al., 2019), suggesting that legal status alone does not eliminate social disparities. Since caste-based privilege still requires individual effort and opportunity to secure socioeconomic advantages, isolating the effect of status from broader socioeconomic factors remains a challenging task.

Similarly, in the United States, disparities in mortality between Black and White Americans have persisted for decades, reflecting deep-rooted social and economic inequalities (Varcoe et al., 2019; Williams et al., 2019). While racial differences in health outcomes are well-documented, these disparities are partially confounded by other determinants of health, such as access to healthcare, income levels, environmental exposures, and historical patterns of discrimination. Hence, while race remains a significant predictor of life expectancy, it is intertwined with broader socioeconomic and systemic influences that contribute to shaping health outcomes over time.

*Status in Academia.* Another setting where it is possible to examine differences in status is in academia. A study using Swedish data reveals that individuals with a Ph.D. have a longer life

expectancy than those with a master's degree or professional qualification, who, in turn, outlive those with a bachelor's degree (Erikson, 2001). However, in interpreting such evidence it is worth mentioning that educational attainment may be endogenous, as cognitive ability, socioeconomic background, and health behaviors could confound both study choices and longevity. This raises the possibility of omitted variable bias and potentially restricts the external validity of these results. Relatedly, one can examine a source of status that results from a relative assessment of the academic performance and creativity of academics, which allows one to compare distinguished academics. The recognition of a Nobel Prize acts as an exogenous boost to an individual's status—one that remains relatively fixed over the life course following the award. Redelmeier et al. (2001) document evidence of an extra life-expectancy gain resulting from winning the Nobel prize of about 3 years compared to being nominated, and Rablen and Oswald (2008) undertake a more extensive analysis and document a similar effect of about 1 to 2 years of extra longevity. However, again the evidence might be confounded by individuals' effort and early life effects, hence selection and possibly the time of the prize matters, which, not always happens to be at old age when individuals might have already acquired a certain reputation or status independently of the actual recognition.

*Status in the Civil Service and the Military.* Another source of evidence comes from the hierarchies in the civil service. As mentioned earlier, one of the most significant studies on the relationship between social status and health is the Whitehall study, conducted in the United Kingdom. This long-term investigation examined British civil servants and revealed substantial differences in life expectancy based even on relatively small differences of employment grade levels (Marmot et al., 2013). In this study, British civil servants were stratified by employment grade, revealing that higher-ranking individuals experienced significantly lower mortality rates and better overall health compared to their lower-grade counterparts (Marmot et al., 2013). This finding

persisted even after controlling for variables such as age and baseline health status, emphasizing the powerful role that psychosocial factors—like sense of control in the job’s position and social standing conducive to chronic stress, play in shaping health outcomes of individuals (Marmot, Shipley, & Rose, 1984; Wilkinson & Pickett, 2006). Subsequent research has reinforced these observations, suggesting that occupational hierarchies contribute to pronounced health disparities, even within relatively homogenous populations (Adler et al., 1994; Marmot, 2006). However, together, these studies not only highlight the intrinsic link between social status and health, but are still affected by selection and effort bias, which might confound the effect of status on health.

Alternative evidence does exist on the role of well-defined hierarchies in influencing the health of individuals in the military. Sunandi (2022) examined the health of individuals who were among promoted U.S. submarine personnel during World War II, finding an average life expectancy increase of 2.4 years compared to their peers. In contrast, being a Nobel Prize laureate, which confers not only significant status, but also substantial economic rewards<sup>§</sup>, military promotions offer smaller rewards and encompass status changes in a highly hierarchical setting. Indeed, just like in the Whitehall study, status acquired through a working career, might be affected by the associated responsibilities, stresses and personal sacrifices which might deplete individuals’ health. For example, while a monarch or a member of a royal family may enjoy inherited status without the daily pressures of high-stakes professional roles, individuals who climb the career ladder to the very top may endure chronic stress and other health risks as a trade-off for their apical status.

*Stress form Corporate and Electoral Contests.* Recently Nicholas (2023), uses information about white collar at General Electric employees in the 1930 cohort that had access to a corporate

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<sup>§</sup> The magnitude of which can vary based on factors such as the number of winners and the recipient’s decision regarding prize donation.

health and welfare programs. The paper documents that senior managers and executive experienced a 3 to 5 years reduction in lifespan outcomes relative to those in lower levels, the largest mortality increase experienced by managers in the second level of the corporate ladder. Hence, it is far from clear from Nicholas (2023) that status always is beneficial to one's health, and instead one ought to account for the influence of contextual stressors which add up as one improves in the social hierarchy. Borgschulte et al. (2021) document that managerial stress—especially stemming from industry crises—can accelerate aging and increase mortality among CEOs of large U.S. companies, with an estimated reduction in life expectancy of about one year following an industry distress shock. Similarly, Borgschulte and Vogler (2019) show that winning a close election in the U.S. is associated with a life expectancy gain of more than one year compared to losing candidates. These findings suggest that acute stressors and subsequent relief, or the boost of achieving a high-status position, have measurable effects on longevity. However, it is important to note that these studies focus on white-collar professionals, such as CEOs and elected officials, who are a specifically selected sample. Critics argue that distress and eustress dynamics and associated health outcomes observed in these elite groups might differ from those in the general population, where different stressors and coping mechanisms may be at play. In our specific setting we can test this effect by comparing high nobility with rulers.

*Status and sports competition.* Finally, another possible setting where to study the effect of status is in sports competitions. Some studies challenge the straightforward association between higher achievement and better health outcomes. For example, Leive (2018) found that Olympic track and field silver medallists from 1896 to 1948 lived on average, about one year longer than their gold medal-winning counterparts. This counterintuitive result suggests that the relationship between status or achievement and longevity may be influenced by distress generating factors such

as the pressures of maintaining top performance, the distress of being at the pinnacle, or even differences in post-competition lifestyles. Such findings underscore the need to critically examine how various dimensions of status impact long-term health outcomes.

*Our contribution.* A major limitation in previous studies lies in the challenge of selection into positions of status, which can result from different underlying mechanisms, including the possibility of health selection, where better health could lead to higher social status rather than the reverse. Costa-Font and Ljunge (2018) document using a sample of migrants that health influences the probability of employment promotion. Indeed, there is strong evidence that better physical and mental health increased selection into high-status corporate positions in Sweden (Keloharju et al, 2023). Access into a specific social role is influenced by individual attitudes, non-cognitive abilities, risk and time preferences, investment in physical appearance, and patterns of social interactions—which can confound the relationship between social status and health. Such sources of selection are of less concern in our setting as we study royal status within a sample of hereditary monarchies, where the order of succession is largely predetermined by birth. This exogenous assignment of status means that, aside from potential genetic confounders, which we control by looking at siblings and household fixed effects, within which the genetic variability is attenuated, the association between status and longevity is not influenced by individual effort or post-birth social mobility. However, it's worth mentioning that to undertake an ideal causal analysis of such effect we would need an analysis of twins where one was a monarch, for which we do not have a sample.

## *2.2. Psycho-social stress*

*Stress and health outcomes.* A potential explanation for the relationship between status and health is *psychosocial stress*. Sapolsky (2005) presents evidence from baboon populations, showing that

individuals at the top of a *stable* hierarchy are often shielded from stress, while lower-ranking members experience heightened stress that negatively affects their health. This concept has been extended to humans, with research highlighting the role of psychosocial stress in shaping health disparities (Cutler et al., 2006; Lazarus & Folkman, 1984; McGonigal, 2016; Selye, 1956). Overall, these perspectives suggest that higher-status individuals tend to be more insulated from negative stress (distress), and that status influences both the type of stress experienced, as those in higher positions may be more exposed to positive stress (eustress) and might be endowed with higher resources to cope with and appraise stressful experiences.

Concerning the historical perspective adopted in this paper, the closest study to our work is Stelter et al. (2021), which examines life expectancy among European scholars during the Holy Roman Empire, suggesting that status-based health disadvantages began to decline by the early twentieth century.

*Stress and hierarchies.* A potential mechanism linking social status to health outcomes is psychosocial stress. For instance, Borgschulte et al. (2021) document that managerial stress—triggered by industry crises—accelerates aging and increases mortality among chief executive officers of large U.S. companies, estimating that an industry distress shock can reduce life expectancy by approximately one year, along with producing visible signs of accelerated aging. Similarly, using data from close elections in the U.S., Borgschulte and Vogler (2019) report that winning a tightly contested election is associated with a life expectancy gain of over one year, possibly reflecting the relief of distress and the boost in social status that comes with electoral victory. However, higher electoral status exposes individuals to higher stress. So, it is unclear whether the stress transition dynamic (from distress to eustress) as individuals move up into the ladder that drives the effect.

### 3. Data and Empirical Strategy, and Descriptive Statistics

#### 3.1 The Data

Our dataset on high nobility and ruling royals is comprehensive and has been hand-collected using and comparing various publicly available sources with biographical information (e.g., the Roglo database, the Encyclopaedia Britannica and other trusted sources used to collect historical information), which all report the birth and death years of monarchs, included their age of accession to the throne and time in power, and family relationships; descriptive statistics of the main variables are shown in Table 1, panels A, B, C and D. Specifically we show both descriptive based on the overall sample for all the nobility (A), the one depending on the availability of population life expectancy at birth (C), and the respective samples when excluding observations of people dies at 14 years or older. Overall, we have collected information for 844 *combinations* of high-status nobility and monarchies of seventeen European countries (see also Table 2), these are: Austria (AUT), Belgium (BEL), Bulgaria (BGR), Germany (DEU), Denmark (DNK), Spain (ESP), France (FRA), Great Britain (GBR), Greece (GRC), Italy (ITA), Liechtenstein (LIE), Monaco (MCO), the Netherlands (NLD), Norway (NOR), Portugal (PRT), Romania (ROU), and Sweden (SWE). For each Monarchy, we collected also information on spouses and siblings and grouped them in *household groups*. More specifically, we also coded the type of relationship between the ruler and the other members of the household. Table 3 shows both the breakdown of the within royal households' roles by gender (Panel A) and the frequency distribution. We find that co-ruling is seldom experienced as form of government, while the relationships more frequent are being ruler consort and sibling. We also coded cases of spousal but not relationships which did not granted the title of ruler's consort as well as relationships that were not spousal at all.



Although we could have expanded for several centuries backwards, we focused on a period that captures the profound transformation of societies—from pre-industrial to modern—and the accompanying shifts in economic, political, and technological conditions that have shaped public health outcomes. For example, this period encompasses the Industrial Revolution, the completion of the main modern nation-states, and the concomitant end of the *ancient regime* where monarch gave up most of their political power. The period includes as well significant advancements in medicine, sanitation interventions, and relevant changes in the overall living standards of the population, all of which have contributed to dramatic increases in life expectancy. Overall, the timeframe from the earliest birth to the latest death spans from 1635 to 2022 (Table 4) and provides a unique opportunity to study how ascribed social status, such as that of European royals, has interacted with evolving societal structures. By spanning several centuries, we capture the effects of inherited privilege from contemporary selection biases and observe how long-term structural changes have influenced health disparities. Finally, it's worth mentioning that inevitably, contemporary data is more available especially for country-level variables as population life expectancy at birth and per capita GDP.

The period chosen is sufficient to identify the presence of trends in the country and the Royal Houses chosen. Our data span a large historical breadth—starting from 1669, when Archduchess Maria Antonia of Austria (sister of Joseph I, Holy Roman Emperor) and Infanta Isabel Luísa of Portugal (sister of John V of Portugal) were born, to very recent times, notably marked by the death of Queen Elizabeth II in 2022, who reigned for 70 years and celebrated her *Platinum Jubilee*, monarch who to a large extent has represented a symbolic figure of the contemporary era of European royalty. This extensive timeline allows us to capture the evolution of royal status, the

effects of institutional frameworks on longevity, and the broader shifts in societal and health determinants over several centuries.

### 3.2 Empirical strategy

#### 3.2.1 Estimating the life span of monarchs with respect to their peers

Eq.1 below represents our preferred specification (Table 5, columns 1 to 4):

$$\Delta_{ik}^j = \beta_0 + \beta_1 Ruler_{ik} + \beta_2 Female_{ik} + \beta_3 Year\ of\ Birth_{ik} + \beta_4 Year\ of\ Birth_{ik}^2 + \alpha_{cy} + \gamma_{rh} + \varepsilon_{ik} \quad Eq.1$$

the dependent variable is the difference in age at death, whose formula is  $\Delta_{ik}^j = \left( a_i - \frac{1}{n_{kj}} \sum_{h \in k} a_{hk} \right)$ .

This formula shows that high-nobility member  $i$  in household  $k$  might or might not be in the  $h$ -set depending on the criteria  $j$  used for computing the household average (see Table 5 and Table A2 with the set of alternative estimations).  $Ruler_{ik}$  is the dummy variable defining the ruling status of  $i$  (=1 if ruling);  $Female_{ik}$  is a dummy equal to 1 for being female, we then use a quadratic formula of the year of birth to capture dynamic effects,  $\alpha_{cy}$  is a set of combined country-period fixed effects,  $\gamma_{rh}$  are Royal House (rh) fixed effects, and  $\varepsilon_{ik}$  is the error term. Referring instead to columns 5 to 7 of Table 5, here we use directly the age at death of individual (Eq.2 below).

$$a_{ik} = \sigma_0 + \sigma_1 Ruler_{ik} + \sigma_2 Female_{ik} + \sigma_3 Year\ of\ Birth_{ik} + \sigma_4 Year\ of\ Birth_{ik}^2 + \alpha_{cy} + \gamma_{rh} + f_k + \varepsilon_{ik} \quad Eq.2$$

Labels carry the same definition, except the additional use of  $f_k$ , the household (family)  $k$ -th fixed effects, which allows a *within family estimator* by removing between household variation due to families' fixed characteristics. For robustness, we expect the introduction of these fixed effects to produce similar results than using directly the difference  $\Delta_{ik}^j$  because we are technically mean differencing within households.

#### 3.2.2 Estimating the life span advantage of ruling status with respect to population

The specification in Eq.3 (See Table 6 for results) is used to test the relationship between ruling status and the gap advantage between the age at death of a ruler as compared to the gap advantage of a high-status member of the nobility. In other terms, this estimate tests the ruling status advantage on more general high-status advantage with respect to the general population.

$$\Delta pop_i^{cy} = \gamma_0 + \gamma_1 Ruler_{ik} + \gamma_2 Female_{ik} + \gamma_3 PCGDP_{icy} + \gamma_4 Year\ of\ Birth_{ik} + \gamma_5 Year\ of\ Birth_{ik}^2 + \alpha_{cy} + \gamma_{rh} + f_k + \varepsilon_{ik} \quad Eq. 3$$

Where  $\Delta pop_i^{cy} = a_i - \bar{e}_0[b_i, d_i]_c$  and  $\bar{e}_0[b_i, d_i]_c$  is the average Life Expectancy at Birth (LEB) of the population of the monarchy  $c$  calculated as:  $\bar{e}_0[b_i, d_i]_c = \frac{1}{a_i} \sum_{y=year_{birth_i}}^{year_{death_i}} e_0^c$ . In other terms, it is the average of all period-life expectancies at birth available from the date of birth to the date of death of the  $i$  observation. We use also the same methodology for per Capita GDP,  $PCGDP_{icy} = \overline{pcgdp_{cy}}[b_i, d_i]_c$

We use the lifespan average because the use of the simple (period) LEB measured at the date of birth of the individual would underestimate the life expectancy of the population used to compare with the age at death of the nobles and rulers, and doing so will be overestimating the difference between the age at death and the LEB. For similar, but opposite, reasons, the LEB measured at the date of death will overestimate the LEB to be compared to the age at death of high nobility and rulers, and underestimate the difference between the age at death and the LEB. The average allows us to limit both misestimations. The average limits (probably poses stricter than necessary limits in several cases) the source of upward bias and provides a more consistent comparator regarding life expectancy of the general population. In short, this is done at the cost of systematically *reducing* the royal-population gap in life outcomes, and this needs to be accounted for when illustrating our

findings.\*\* Similar reasoning applies for the *GDPPC* measure, which accounts for the notable increase in life standards during the lifetime of many royals and high nobility, especially those who lived around the first and second industrial revolutions, during which life standards sharply moved upwards with unprecedented momentum. Furtherly, it is worth noting that subtracting a life expectancy measure (an *expectation* in each population) from an age at death (namely the *realized* longevity outcome concerning a specific individual) stresses the relative survival advantage or social health disparities using empirical population benchmarks of life expectancy. For interpretation, our methodology is thus very close to computing a measure of Years of Life Lost (or gained) YLL, but with respect to empirical (and not standardized) population benchmarks of life expectancy. For historical periods, standardized YLL reference tables do not exist, and age-specific life expectancies are rare or incomplete. However, LEB is the most consistent and available baseline across time and geography and taking the average along the lifespan captures to good extent the realization of life extensions in the population for the early years. While we do not measure a life expectancy gap, we can interpret our measure as a *realized longevity differential*. Taking the average from birth to death allows capturing a net cumulative survival advantage, a metric which is useful to gain insight into historical disparities in health and longevity.

### 3.3 Descriptive Statistics

Table 1 provides descriptive statistics for the variables used. Panel A presents the main variables collected for a total sample of royals including their age at death, birth year, death year, and, for those who became rulers, the years they began and ended their reign. It shows an average age at

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\*\* This would be typically the case for those royals born in cohorts which were less exposed to limited improvements of life standards at young ages, where most of health benefits tend to cumulate, and for which period life expectancy at birth would have been a better indicator.

death of 50.29 years, and an average birth and death year of 1802 and 1853 respectively. Looking at power tenure for those in the subsample of ruling monarchs, the starting and ending years for being in power for royals involved in the panel are respectively of 1843 and 1864. The proportion of female observations in this sample is 56%. Panel B panel adds GDP per capita and population life expectancy at birth as additional variables. The average age at death for this subset is 63 years, with an average birth and death year rounded to 1825 and 1887 respectively. The average lifespan of these royals is longer than in Panel A, reflecting a difference caused by the selection towards more recent royals in the dataset.

Finally, the average GDP per capita over the lifetime of the royals is \$4,852 with a standard deviation of 4,587, and the average population life expectancy at birth across the lifetime of these royals is 46.48 years. The smaller sample size in Panel B is due to limitations in data availability, particularly for the life expectancy at birth for the population indicator at the country level.

**[Insert Table 1, Panel A & B; Table 2 – about here]**

Table 2 reports countries and observations by country, and altogether we have 844 observations ranging from 19 for Bulgaria to 99 for Portugal. The countries in our sample have been chosen based on the continuity and general stability of their monarchies and the comparability of similar trends in health knowledge and technology diffusion. This allows for a better understanding of how age at death may differ between those with social status without having to consider what internal conflicts may have played a role in the lifespans of specific monarchs. We define the high-nobility status as monarchs, their spouse and siblings. To compare age at death among royals to that of the general population, we draw on period-life expectancy at birth data from available public databases.

**[Insert Tables 3 and 4 about here]**

Table 3 provides a breakdown of household roles among royals, distinguishing between different positions within royal families. Panel A categorizes individuals by gender and role, showing that most rulers were male (113 out of 122), while most ruler consorts and spouses were female (62 out of 68 ruler consorts and 78 out of 79 spouses). The largest category overall is siblings, comprising 481 individuals (227 males and 254 females). Panel B presents the frequency and percentage distribution of these roles. Siblings account for the largest share (57.24%), followed by rulers (14.49%), spouses (9.38%), and ruler consorts (8.08%). Less common roles include individuals in non-marital relationships (5.58%), half-siblings (4.99%), and co-rulers (0.24%). The cumulative percentage column indicates that siblings, rulers, and their consorts together make up over 85% of the dataset.

Table 4 provides an overview of the temporal coverage of the sample across different countries, detailing the number of observations and the range of birth and death years for royals in each nation. The table captures data from 17 countries, with Austria (AUT) having the earliest recorded birth date (1669) and the United Kingdom (GBR) having the most recent recorded death (2022). As noted, when describing Table 2, the number of observations varies by country, with Portugal (PRT) having the largest sample (99 individuals) and Romania (ROU) the smallest (24 individuals). The latest birth years range from 1782 (France) to 1956 (Belgium), while the latest death years extend to the 21st century for most countries, with notable recent cases such as the UK (2022) and Greece (2007). This temporal distribution highlights the long historical span covered in the dataset, allowing for an analysis of life expectancy trends among royals over several centuries.

## 4. Descriptive Evidence

Additional descriptive statistics are shown in Figure 1, portraying the distribution of ages at death of the royal members of the family according to the full sample size, and where the red line is the Gaussian fitting of the distribution. The data shows evidence of three distributions with the modal age at death between 40 to 60 years. The overall distribution is right-skewed, with some royals living exceptionally long lives, while others, particularly in middle age and other in adolescence or early life (infants or childhood), which most likely had shorter lifespans due to disease, conflict, or other historical factors. When broken down by gender, we find broadly similar patterns of male and female mortality. Additionally, distinguishing between ruling monarchs and non-ruling royals allows for an examination of whether leadership responsibilities, stress, or other factors influence longevity. As expected, we document that the distribution for rules is centred at about 60-70 age whilst that of non-rulers is more uniform and more right skewed.

**[Insert Figure 1 about here]**

Figure 2 is a scatter plot presenting on the y-axis, the difference between a royal member's age at death and the royal's life span average of the period life expectancy of the general population. The x-axis simply indicates the year of death. A horizontal line at zero serves as a reference, where points above the line signify royals outliving the general population's life expectancy, while points below indicate shorter-than-expected lives. The scatterplot suggests an inverse-U shape, where the longevity advantage of royals increased up until the late 19th century before declining, eventually converging toward zero. Purple hollow diamonds refer to the subsample made of kings and queens (actual reigning monarchs) while hollow-red scatters refer to the rest of the high-nobility



population. Moreover, a quadratic interpolation shows an inverse U-shaped relationship, which tops around the end of the 1800s, and then inverting trend coming closer to the 0-threshold. As expected, most of the sample (both monarchs and high-end nobility) is above the 0-threshold, but there are some cases where scatters lay below the line, mostly for premature deaths. The negative difference identifies early deaths (mostly royals not in power but some kings and queens anyway).

The observed pattern implies that, while members of the royal families historically enjoyed a significant survival advantage, their relative longevity diminished over time, potentially due to improvements in public health interventions, medical advancements, and social changes triggered by social movements that narrowed mortality gaps between elites and the general population. However, we note that the inverse U-shaped relationship is much less evident and thus shows that the difference between rulers and population is much more stable across the centuries explored.

**[Insert Figure 2 about here]**

Figure 3 explores the relationship between the year of death and age at death, distinguishing between different royal statuses and comparing them to general population life expectancy. The red hollow diamonds represent royals who did not hold ruling power, while the full purple diamonds indicate monarchs (kings and queens) who exercised royal authority. The hollow circles refer to the general population's average life expectancy at the corresponding year of death of each royal. The figure *suggests that monarchs and non-ruling royals historically outlived the general population*, particularly in earlier centuries. However, as in we already highlighted in Figure 2, the gap appears to narrow over time, reflecting overall improvements in public health and longevity across society. The presence of variation among royals—some living well beyond the population average while others dying earlier—also indicates that status alone did not guarantee extended lifespan. Hence,

distinguishing between ruling and non-ruling royals provides further insight into whether holding power had an additional effect on longevity.

**[Insert Figure 3 about here]**

*Summary of trends* : Our descriptive data reveals a clear and statistically significant gap in life expectancy between the general population and royalty. In 1750, for countries with available data, royals outlived the average individual by approximately 20–30 years. However, this gap gradually narrows over time, likely due to advancements in sanitation, medical knowledge, and the broader diffusion of health technologies across nations. Interestingly, our findings indicate that reigning monarchs tend to live longer than other members of the royal family, suggesting that holding the throne may confer certain advantages and exposes rulers to some positive stressors. This challenges the expectation that the (di)stress of ruling would reduce longevity compared to royals who enjoy privilege without governance responsibilities, and thus being higher in the ladder enlarges the health gap. Further exploration is granted and necessary to understand the factors driving these differences in life expectancy among various royal statuses.

## 5. Results

### *Being in power compared to peers*

The regression analysis in Table 5 examines how ruling status, gender, and other factors influence life expectancy among royals from a multivariate perspective. Columns 1–4 use the difference between a ruler’s age at death and their Royal family’s average; specifically, columns 1 to 2 use the difference between rulers and all the components of the royal households (spouses and siblings,

male and female), while columns 3 and 4 use the difference with only the average age at death measures on the subsample of only male members of the royal household. Columns 5 to 7 use age at death as the dependent variable, but include Royal family fixed effects, so in practice by mean differencing within the royal family average age at death. Last column 7 uses the full sample, including royals prematurely dying before the 14<sup>th</sup> year of life. Overall, Table 5 shows robust positive association of an effect of ruling status. We estimate 5.4 to 7.1 years more compared to their populations, and 10-11 years of extra years of life when using age at death and controlling for Royal family's fixed effects. Estimates differ between the years in power in a linear and non-linear fashion, and age at death of royals. Estimates suggest a significant life expectancy advantage for rulers compared to their non-ruling family members, with ruling status associated with an increase in lifespan. Female royals also exhibit a clear longevity advantage, living 5.5 to 12.5 years longer than their male counterparts, but ruling females' effects cannot be estimated due to lack of sufficient observations. Additionally, birth year effects suggest an overall upward trend in life expectancy over time, though this effect is not consistently significant. The inclusion of fixed effects for royal families, country-birth periods adjusting for dynamic temporal effects, and Royal houses fixed effects throughout, helps accounting for several factors of unobserved heterogeneity, reinforcing the robustness of these findings. Notably, the results persist even after restricting the sample to individuals who lived at least 14 years, confirming that the longevity differences are not merely due to early childhood mortality.

**[Insert Table 5 about here]**

For a robustness test, we also estimate using alternative measures and samples in Table A2 in the appendix section. A first group of regressions (1 to 6) obtained by restricting the sample to only observation of people who died at or after 14 years of age (columns 1 to 6). Within this subset of

regressions, we used alternative measures of household averages. Column 1 uses the average age at death of the whole household, regression in column 2 uses only the male population within household to compute the mean; regression in column 3 excludes half siblings; regression in column 4 does the same test by excluding in the average the age of the ruler. In column 5 we use instead the average using only siblings in the household, Column 6 instead calculates the average by excluding. A second set of regressions still in Table A2 (columns 7 to 12) replicates the same regressions but by using the whole sample. Finally, Table A3 shows that increasing the threshold for the age at death year by year from 14 to 18 produces similar results.

*Being elite & elite in power compared to “commoners”*

Table 6 reports regression results examining the effect of ruling and non-ruling royalty as explaining the difference in life spans between royals, royal rulers and the general population; we consider also controlling for GDP per capita to account for changes in general life conditions. Paralleling the methodology used for the regressions in Table 5, the main dependent variable is the difference between age at death of the royal and, this time, the royal's life average of the period life expectancy at birth among the kingdom's population. Independent variables are the ruling status (Ruler dummy), gender (Female dummy), GDP per capita, and year of birth (introduced both in linear and squared terms). Consistently with the results in Table 5, the Ruler dummy shows a consistently positive and significant coefficient, suggesting that rulers' gap increases with respect to general royal gap with the general population of 5.2 to 7.1 years a premium which tops the baseline effect for all royals with respect to the total population indicated by the coefficient of the “Year of Birth” variable and spanning from 7 to almost 15 years difference. As expected from the visual exploration in Figure 2 and 3, we find evidence of negative quadratic time trends which

suggest that age differences between royals and their subjects decline over time. The Female dummy indicates that, consistent with Table 5, female royals generally have a higher life expectancy compared to their male counterparts, though this effect is not always statistically significant and cannot be controlled for lack of sample size for ruling females. Additionally, we note that GDP per capita does not eliminate the large and significant difference in life expectancy, supporting the idea that economic prosperity is linked to longer life spans for royals, like broader population trends. We progressively introduce different fixed effects to control for potential confounding factors. Columns 2, 4, and 7 include Royal House fixed effects, capturing family-level variations, while Columns 3, 4, 6, and 7 adjust for country-birth period fixed effects, which account for regional and temporal differences. Columns 5, 6, and 7 also introduce royal family fixed effects, isolating the impact of the royal family structure. Overall, the results suggest that ruling status, gender, and economic conditions play significant roles in determining the life expectancy advantage for royals relative to the general population.

[Insert Table 6 about here]

## 6. Mechanisms

### *6.1 Ruling Royals and their Peers*

In the introduction, we suggested that the disparity in age at death between monarchs and their close peers within the same family may stem from the exposure to either eustressors or reduced exposure to distressors associated with their prominent social positions of power. Below, we uncover some of the factors could account for this phenomenon.

*Succession rule:* First, agnatic primogeniture is the rule of, which in our sample is the dominant process for ranking high nobility and assigning royal succession. Agnatic primogeniture—where the firstborn heir is automatically designated ruler—can significantly reduce competitive stress. Unlike meritocratic or elective systems, primogeniture removes the need to prove fitness, which literature shows can be psychologically protective. Male primogeniture helps mitigate sibling rivalry by assigning roles based on birthright rather than performance (Sulloway, 1996). *As a result, firstborn monarchs benefit from a clearly defined and stable role*, reducing the need for competition and lowering exposure to chronic stress through decreased strategic risk-taking (Sapolsky, 2005). In contrast, younger siblings—despite sharing similar genetics and upbringing—often face greater uncertainty and pressure to prove themselves, which can lead to heightened stress, increased career risk-taking, and, ultimately, elevated long-term mortality risk.

*Perceived control, self-agency and efficacy:* A substantial body of literature provides strong empirical support for the idea that higher status—particularly when tied to decision-making authority—reduces perceived uncertainty, fosters autonomy, and, most importantly, enhances individuals' sense of control over their destiny and potential for achievement. These factors closely align with the elevated perceived control often experienced by rulers, which has been shown to reduce distress and significantly improve health outcomes, lower mortality risk, and extend lifespan (Rodin, 1986; Heckhausen & Schulz, 1995; Gale et al., 2008; Infurna et al., 2013; Cerino et al., 2024). Perceived control functions both as a mediating and moderating factor in the stress-health relationship. As emphasized by Lazarus and Folkman (1984) and Selye (1956), when higher status positively shapes exposure to eustress over distress, perceived control may provide the psychological and cognitive resources necessary to amplify the beneficial effects of positive stressors while also mitigating the impact of negative ones through cognitive appraisal and

subjective interpretation. Moreover, psychological research (Becchetti et al., 2023; Ryff & Singer, 1998) shows that individuals with a greater sense of purpose (eudamonic well-being) tend to have better health outcomes and live longer. A ruler's responsibilities and symbolic importance may reinforce this. rulers experience a stronger sense of purpose derived from a defined leading role in society

*Birth order effects:* A strand of literature suggests that firstborns tend to live longer than their siblings (Modin, 2002; Barclay & Kolk, 2015). In the context of hereditary succession—where the ruling role is typically assigned to the firstborn—this alone could offer a straightforward explanation for differences in average age at death between monarchs and their family members. However, the existing empirical evidence does not fully apply to our case. First, the longevity advantage is primarily observed when the firstborn is female (Barclay & Kolk, 2015), whereas our sample consists almost entirely of male monarchs, with only two exceptions. Second, the birth-order effect tends to diminish by adulthood and disappears when controlling for the siblings' shared socioeconomic background (Modin, 2002).

Consistent with the mechanisms discussed earlier, a more plausible interpretation is that birth order becomes consequential when paired with formal rules that assign power and confer high-status roles—such as those found in systems of agnatic primogeniture. In this context, the combination of low chronic distress, high perceived control, and social role stability emerges as a potent set of protective factors, helping explain why firstborn rulers may enjoy longer lifespans than their siblings.

## *6.2 Royals and Commoners*

The effect of royal status—specifically, the advantages conferred by higher social status—can be attributed to a range of mechanisms, several of which are well-documented in the literature. These include better access to stable and nutritious diets, reduced exposure to poverty-related risks such as crowded living conditions and communicable diseases, and distinct patterns in health-related behaviors. Conversely, other factors such as increased exposure to conflict, political violence, and criminal targeting may offset some of these advantages, particularly in historical periods marked by instability or military engagement.

*Dietary differences and socio-economic status.* Another possible explanation relates to the distinct diets of royals, which often differed significantly from those of the general population. While some studies argue that the working-class diet in mid-Victorian Britain resembled a nutritionally robust version of the Mediterranean diet (Clayton & Rowbotham, 2008), poorer populations generally consumed less meat and had more limited access to high-quality food (Walton, 2003). However, the role of socioeconomic status in shaping survival outcomes is contested. Several studies have identified a U-shaped relationship between mortality and socioeconomic status in early childhood during the early nineteenth century, suggesting that both the poorest and the wealthiest experienced elevated mortality risks (Jaadla et al., 2020). That said, *wealth and nutrition did not uniformly protect against infectious disease*. For many communicable diseases, improved nutrition conferred little survival advantage—with the notable exception of tuberculosis. In this case, better nutrition significantly reduced mortality, and this effect is evident in historical records showing lower death rates from tuberculosis among royals (Greaves, 2018).



*Health behaviours and medical technologies.* Royals, due to their more restricted exposure to environmental and occupational risks, may have engaged in different health-related behaviors compared to their subjects. Patterns of alcohol and tobacco consumption are one notable distinction: royals typically consumed wine, while the working class primarily drank beer. Furthermore, the widespread adoption of industrially produced cigarettes in the late 19th century led to a sharp increase in smoking among the general population (Clayton & Rowbotham, 2008). Physical exertion also played a role in health disparities—children engaged in long hours of strenuous labour required higher caloric intake, and when nutritional needs were unmet, this imbalance contributed to poorer health outcomes (Sarpe, 2012). Similarly, another important source of advantage for royals and other elites was better access to medical care. However, it is important to note that until the 20th century, the overall efficacy of medical interventions remained limited, as major scientific advances in medicine were still in their infancy.

*Conflict, accidents and military casualties.* Deaths resulting from accidents, violent conflict, and military engagements were significantly less common among members of royal families and elite groups, primarily because their elevated status typically shielded them from direct exposure to combat and hazardous conditions. Although some royals held military titles or formal roles, these positions were often ceremonial or strategic in nature, involving limited participation in frontline combat and thus reducing their risk of injury or death. In contrast, ordinary soldiers and lower-ranking officers were far more likely to experience direct combat and battlefield dangers, with studies showing higher injury-related mortality among deployed military personnel (Knapik et al., 2009). Additionally, psychological stressors such as post-traumatic stress disorder (PTSD) have been found to disproportionately affect lower-ranking or less-prepared troops compared to elite

officers (Hoge et al., 2007). These disparities highlight the need to interpret elite mortality data with caution, as it likely underrepresents deaths from war-related and accidental causes—an important consideration when comparing life expectancy across social strata (Roelfs et al., 2010).

*Crowded Living and access to heating.* One significant difference between individuals of higher and lower social status—such as royals and their subjects—in historical contexts was access to private, heated living spaces. Wealthier individuals, including royals, typically resided in larger, better-insulated, and regularly heated accommodations, which not only provided greater physical comfort but also reduced exposure to cold-related illnesses. In contrast, lower-status individuals were often confined to overcrowded and poorly heated dwellings. While communal living in single-room or shared spaces offered certain economic efficiencies—such as shared heating and food preparation—these advantages came with serious health trade-offs. Densely populated and poorly ventilated environments significantly increased the risk of communicable diseases, particularly respiratory infections. Historical evidence indicates that these structural differences in housing quality and access to heating played a substantial role in shaping disparities in morbidity and mortality across social classes (Woods, 2000; Fogel, 2004).

*Sanitation and exposure to communicable diseases.* Finally, an important distinction between royal or elite populations and the general populace in historical contexts was access to superior sanitation. Royal households typically benefited from cleaner water sources, more controlled waste disposal, and better-maintained hygiene practices—often made possible by dedicated servants and superior infrastructure. In contrast, much of the general population, particularly in urban areas, lived in overcrowded and unsanitary conditions with limited access to clean water and effective sewage systems. These disparities had profound health consequences, especially in relation to

gastrointestinal infections, which were among the leading causes of death in pre-modern societies. As McKeown and Record (1962) demonstrated, improvements in sanitation played a critical role in reducing mortality from diseases such as cholera and dysentery, well before the advent of antibiotics or widespread vaccination.

## 7. Discussion

A well-established body of literature has documented the influence of privilege and elite status on health outcomes. Studies examining various organizations and socioeconomic groups—such as the British civil service—consistently find that higher income, education, and status are associated with better health, lower mortality, and longer life expectancy (Marmot, 2006; Marmot et al., 2013). However, probably a natural experiment to examine the differential lifespan trends resulting from social status is to focus on one of the highest-status groups in recorded human history, namely royalty. Our results reveal evidence of a gradual convergence in life expectancy between monarchs and their subjects. We estimate that historically, monarchs enjoyed a significant life expectancy advantage, living 5.2 to 7.1 years longer than the general population. However, such effect exhibits a quadratic time trend, suggesting that the life span gap has been narrowing over time, reflecting broader improvements in population health.

Our evidence is consistent with Stelter et al. (2021), who documented a decline in the health advantage of medical scholars over the past 300 years, particularly towards the end of the 19th century. Similarly, the narrowing life expectancy gap between royals and their general populations can be attributed to several factors, including greater access to health information and the development of public health systems such as universal healthcare and welfare institutions.

However, such convergence is modest in magnitude and disappears when focusing specifically on ruling monarchs. These changes likely diminished some of the health advantages once uniquely afforded to royals, making life in the 21<sup>st</sup> century comparatively less privileged than in earlier centuries. Additionally, the health of royals today may be more strongly influenced by broader socioeconomic factors than by the institutional privileges that historically defined their status.

While a certain degree of convergence in life expectancy was expected, the evidence suggests that ruling monarchs—the “top of the top”—have largely been protected from these shifts throughout history and lifespan trajectories in power versus elite status tend to diverge. The 20<sup>th</sup> - century transformation of many monarchies into constitutional systems reduced monarchs’ powers and influence, leading to a likely decrease in the stress and responsibilities experienced by today’s monarchs relative to their predecessors. This shift may have reduced exposure to distressors while potentially increasing exposure to eustressors. In other words, evolving patterns in the nature and intensity of stressors suggest a complex and heterogeneous dynamic in health disparities between individuals at the highest social levels and others. Research on stress and health indicates that such changes can profoundly affect immune function and the regulation of stress hormones (Steptoe et al., 2003; Steptoe & Marmot, 2004; Sapolsky, 1993).

Overall, our results suggest that the moderate convergence in life expectancy between royals and the general population is driven by broader socio-political transformations, and specifically, the rise of democratic governance and constitutional monarchy in Europe—where surviving monarchies gained limited powers and broader access to health resources improved. Simultaneously, the transition to more stable and peaceful regimes (Sapolsky, 2004) may have offset the loss of monarchs’ decision-making power by improving the balance between distress and

eustress. This shift would reinforce health advantages for monarchs relative to both high nobility and commoners, reflecting a complex interplay of political, social, and physiological factors shaping longevity. Moreover, our findings suggest that the longevity advantage historically enjoyed by ruling monarchs, relative to their high-nobility peers, cannot be explained by material socioeconomic status alone. Both groups shared high levels of wealth, education, and access to resources, yet only those in formal positions of power experienced systematically longer lives. This distinction points to the potential role of power status—defined by authority, perceived control, and social legitimacy—as an independent determinant of long-term health outcomes.

While our historical dataset does not allow direct extrapolation to modern populations, it highlights how long-standing and durable the relationship between social position and health has been. Thus, these results echo, at least to some extent, in contemporary research that emphasize the protective role of purpose, autonomy, and meaningful social roles in aging and mortality. While our analysis is historical in nature, the findings offer insights relevant to contemporary discussions of health inequality and the social determinants of longevity. Ruling monarchs systematically lived longer than their high-nobility peers, despite both groups occupying the highest tiers of socioeconomic status (SES) in their respective societies. This suggests that power status—defined not simply by wealth or class, but by one's role, perceived authority, and formal position in the social hierarchy—may independently contribute to longevity. This distinction has several implications also for policy making. First, health disparities are not driven solely by material conditions such as income or access to medical care, but also by psychosocial mechanisms—including autonomy, purpose, and perceived control, which are not evenly distributed across the status ladder both for demand and supply-side factors. This finding resonates with current debates about stress, status anxiety, and the health effects of social comparison, which can persist at all levels of the

socioeconomic spectrum, and social policies aimed at reducing health inequality should also consider factors beyond income redistribution—for example, promoting role fulfilment, agency, and status security, especially among those facing precarity or role loss. This might be especially relevant when health hazardous habits might be the effect and results of the progressive loss of perceived control, sense of meaning, and purposeful life that one might experience for the occurrence of adverse events.

## **8. Conclusion**

This paper has examined the impact of royal and ruling status on individuals' age at death, focusing on differences in longevity between monarchs, their family members, and the general population. We provide robust evidence of a statistically significant life expectancy gap of 5.2 to 7.1 years between monarchs and other members of the royal family, and an even larger gap of 7.4 to 14.5 years between royals and the general population across several European monarchies. Such gap is particularly although gap narrowed in recent decades, has been consistent over time as monarchs have consistently lived longer than the average life expectancy at birth within the general population. This is true despite the substantial improvements in living standards and access to healthcare that have progressively characterized European societies over the past 250 years.

The narrowing of health disparities between royals and the rest of the population over time, is likely the results of the fact that the actual power of monarchs has been significantly reduced compared to their historical predecessors - with modern “ruling” royals often serving symbolic or ceremonial roles constrained by constitutional frameworks. However, the largest drivers lies in that constitutional monarchies have generally adopted universal healthcare systems, providing

comprehensive medical care to the general population and driving unprecedented improvements in living standards over the last two centuries.

It's worth mentioning that historically, monarchs wielded absolute or near-absolute power, granting them greater control but also exposing them to higher risks of revolts, social unrest, and violent attempts at assassination. In contrast, modern monarchs face fewer life-threatening pressures and tend to experience less distress. The demands to maintain a public image, satisfy family, government, and citizen expectations, or endure constant media scrutiny, while significant, are arguably less severe than the historic risks of violent overthrow or assassination. However, despite their privileged status, these contemporary pressures can negatively impact monarchs' health and longevity. Paradoxically, the very limitations on their power that have transformed them into largely symbolic figures may also restrict their ability to maximize their life expectancy.

Unlike historical monarchs who wielded near-absolute authority, modern constitutional monarchies operate within robust welfare systems that include social safety nets, public health initiatives, and universal healthcare access. Despite these structural transformations, health disparities between ruling and non-ruling royals have remained relatively stable over time. One possible explanation is that although monarchs' political power has diminished, the survival of the most stable monarchies may have generated positive eustress—beneficial stress that contributes to overall well-being.

Furthermore, monarchies that endured waves of democratization, which reshaped government structures in many countries, have demonstrated greater stability. In these stable regimes, individuals in top leadership positions might derive more benefits from eustress than suffer from distress. Our findings point to counterbalancing effects: while health outcomes between non-ruling royals and the general population have converged, indicating shifting longevity patterns,

the life expectancy gap between ruling monarchs and both their kin and the general population has remained consistent throughout the period analysed.

Overall, these factors may have contributed to improved health outcomes for the general population, reducing the longevity gap between non-ruling royals and the population. Meanwhile, the contemporary roles of monarchs in democratic and welfare-driven systems may not provide the same health advantages as in the past, but they also seem to expose monarchs to fewer distress/more eustress factors. The increasing stability of monarchies was facilitated by the transition from absolute to constitutional rule, allowing surviving monarchies to maintain the hierarchy and stability, while mitigating some of the health-related risks associated with ruling power.



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# Tables, Figures, and Appendix

## (A) Tables

**Table 1. Descriptive Statistics**

Descriptive Statistics	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
Variable	(A) Whole sample - Individual Level					(B) Sample 14 or older - Individual Level				
Ruler	845	0.14	0.35	0	1	702	0.17	0.38	0	1
Age at death	841	50.29	28.75	0	101	698	60.21	20.35	14	101
Birth year	845	1802	63.31	1635	1956	702	1807	64.41	1635	1956
Death year	841	1853	76.04	1679	2022	698	1867	71.72	1683	2022
Power start	243	1843	67.41	1643	1993	243	1843	67.41	1643	1993
Power end	243	1864	69.63	1683	2022	243	1864	69.63	1683	2022
Female	844	0.56	0.5	0	1	702	0.59	0.49	0	1
Variable	(C) Whole sample - Country Level					(D) Sample 14 or older -Country Level				
Ruler	257	0.17	0.38	0	1	247	0.18	0.38	0	1
Age at death	254	62.99	22.15	0	101	244	65.44	18.9	15	101
Birth year	257	1825	57.54	1705	1956	247	1826	57.26	1705	1956
Death year	254	1887	64.51	1733	2022	244	1890	62.45	1758	2022
Power start	86	1871	56.13	1751	1993	86	1871	56.13	1751	1993
Power end	86	1895	60.14	1771	2022	86	1895	60.14	1771	2022
Female	257	0.56	0.5	0	1	247	0.57	0.5	0	1
GDP per capita (average lifespan)	257	4852	4587	1433	25954	247	4908	4654	1433	25954
Population life expectancy (average lifespan)	257	46.48	10.32	29.5	76.2	247	46.8	10.36	29.5	76.2

*Notes:* Table 1: Panel A reports descriptive statistics of the main variables collected. Table 1 Panel B adds country-level variables (i) GDP per capita and (ii) Population Life Expectancy at Birth. Both variables are averages of the data available throughout the lifetime of the Royal. The smaller sample is due to data availability concerning especially the Life expectancy indicator.

**Table 2. Countries and Observations by Country**

iso3c	Freq.	Percent	Cum.
AUT	85	10.06	10.06
BEL	41	4.850	14.91
BGR	19	2.250	17.16
DEU	32	3.790	20.95
DNK	64	7.570	28.52
ESP	76	8.990	37.51
FRA	45	5.440	42.96
GBR	68	8.050	51.01
GRC	29	3.430	54.44
ITA	23	2.720	57.16
LIE	65	7.690	64.85
MCO	29	3.430	68.28
NLD	30	3.550	71.83
NOR	59	6.980	78.82
PRT	99	11.72	90.53
ROU	24	2.840	93.37
SWE	56	6.630	100
Total	844	100	

*Notes:* Breakdown of countries available. Table 1A, in the appendix section, reports also the breakdown of the different royal families which have been recorded in the dataset.

**Table 3. Breakdown of Frequencies Household Role**

Panel A - gender breakdown	Male	Female	Total
Coruler	1	1	2
Ruler	113	9	122
Ruler consort	6	62	68
Sibling	227	254	481
Spouse	1	78	79
Non-spousal relationship	1	46	47
Total	349	450	799

Panel B – roles' frequency distribution	Freq.	Percent	Cumulative
Co-ruler	2	0.24	0.24
Half - Sibling	42	4.99	5.23
Ruler	122	14.49	19.71
Ruler consort	68	8.08	27.79
Sibling	482	57.24	85.04
Spouse	79	9.38	94.42
Non spousal relationship	47	5.58	100
Total	842	100	

*Notes:* We distinguished 7 within household roles. Rulers are those royals who became Kings, Queens, Emperors or Princes whenever this is the title conferring ruling power. Co-rulers are usually spouses with official attributes of the title and roles of formal power. We included in this category also spouses which became titled after the marriage date. Rulers' consorts are official spouses with formal attribution of the title but not formal attribution of power within the crown. Spouses included usually individuals who contracted formal marriage with the ruler but were not attributed the official title of the Rulers' consort. Non marital/spousal relationships include all informal unions from which we were able to collect information. These are usually non-formalized relationships.

**Table 4. Sample: Temporal Coverage**

Country	Obs.	Latest birth date	Latest death date	Earliest birth date	Latest death date
AUT	85	1895	1989	1669	1679
BEL	41	1956	2014	1778	1782
BGR	19	1921	2015	1844	1889
DEU	32	1892	1980	1794	1794
DNK	64	1910	2000	1720	1724
ESP	76	1887	1970	1707	1709
FRA	46	1782	1882	1635	1683
GBR	68	1930	2022	1732	1733
GRC	29	1913	2007	1811	1817
ITA	23	1914	2001	1820	1827
LIE	65	1921	2011	1690	1724
MCO	29	1929	2011	1717	1718
NLD	30	1947	2019	1769	1769
NOR	59	1930	2012	1706	1745
PRT	99	1890	1966	1683	1688
ROU	24	1923	2017	1835	1859
SWE	56	1889	1979	1705	1713

*Notes:* Observations by country, with earliest and latest year of birth and death by country.

**Table 5. Regression Results**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable is:	(i) diff with family average		(ii) diff with family average only male			(iii) age at death	
Age at death							
Sample selection			(A) Individuals 14 or older				(B) full sample
Ruler (dummy)	5.366** (2.102)	5.252** (2.106)	7.124*** (2.212)	6.971*** (2.215)	10.10*** (2.158)	10.89*** (2.148)	24.26*** (2.394)
Female (dummy)	5.850*** (1.890)	5.456*** (1.930)	8.505*** (2.326)	7.882*** (2.342)	5.937*** (2.149)	5.908*** (2.158)	12.51*** (2.583)
Year of birth		2.162** (0.918)		3.887** (1.572)		-1.679 (4.080)	0.513 (4.771)
Year of birth squared		-0.000596** (0.000256)		-0.00108** (0.000436)		0.000542 (0.00113)	-2.47e-05 (0.00131)
Observations	639	639	614	614	629	629	760
R-squared	0.143	0.148	0.226	0.237	0.377	0.383	0.399
Royal House FE (20)	✓	✓	✓	✓	✓	✓	✓
Country-birth FE (18)	✓	✓	✓	✓	✓	✓	✓
Royal families FE (42)	×	×	×	×	✓	✓	✓

*Notes:* All regressions are clustered within rulers' families where a family include: (i) the ruler, individuals related to the rulers as (ii) Co-rulers, rulers consorts, spouses and people recorded as having had informal relationships with the ruler; (ii) siblings and half-siblings. ; Sample included all royals with age at death  $\geq 14$  years; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Dependent variables in: Columns 1 and 2 is the difference between Ruler's age at death and Rulers' family average age at death. Columns 3 and 4 use a similar dependent variable as in columns 1 and 2, but the difference is between the Ruler's age at death and the average of only the male population of the family of the ruler. This is done as in the sample only 9 cases of the 122 Rulers in the sample are female. Columns 5 to 7 use age at death as dependent variable, and control for royal families FE which should provide similar mean-demeaned estimates than the ones from 1 to 4. In all regressions 1 to 6 only individuals with 14 or more years are included, while regression 7 uses all the observations in the sample.



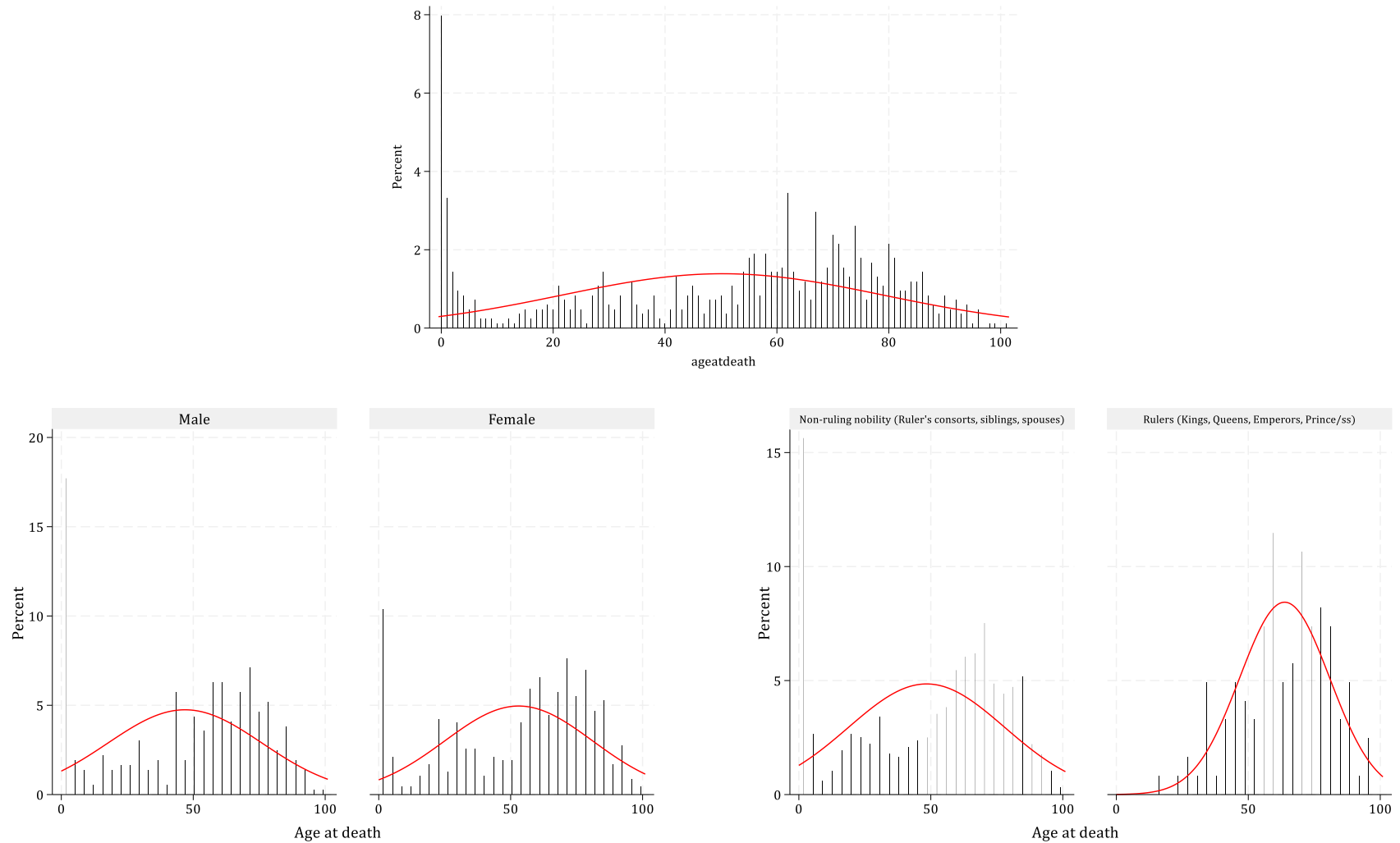
**Table 6. Regression Results**  
**Dependent variable: Difference between age at death and average life expectancy at birth of the kingdom's population**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ruler (dummy)	6.082** (2.380)	5.380* (2.855)	5.196** (2.231)	7.238*** (2.549)	4.807** (2.072)	4.674** (2.113)	5.959** (2.625)
Female (dummy)	4.856* (2.477)	1.834 (2.905)	3.759* (1.962)	4.155* (2.417)	3.399** (1.664)	3.386* (1.696)	3.424 (2.117)
GDP per capita (Maddison)	0.00208*** (0.000637)	0.00333*** (0.000955)	0.00488*** (0.00107)	0.00540*** (0.00179)	0.00900*** (0.00147)	0.00910*** (0.00150)	0.00917*** (0.00164)
Year of Birth	7.453*** (2.111)	9.717*** (2.102)	12.66*** (3.256)	14.56*** (4.476)	5.068 (3.810)	10.13** (3.828)	14.87*** (4.948)
Year of Birth (Squared)	-0.00209*** (0.000583)	-0.00274*** (0.000582)	-0.00359*** (0.000895)	-0.00411*** (0.00123)	-0.00155 (0.00105)	-0.00293*** (0.00106)	-0.00423*** (0.00136)
Observations	230	215	230	215	224	224	207
R-squared	0.166	0.290	0.338	0.422	0.572	0.593	0.651
Royal House FE (20)	×	✓	×	✓	×	×	✓
Country-birth period FE (18)	×	×	✓	✓	×	✓	✓
Royal families FE (42)	×	×	×	×	✓	✓	✓

*Notes:* All regressions are clustered within rulers' families where a family include: (i) the ruler, individuals related to the rulers as (ii) Co-rulers, rulers consorts, spouses and people recorded as having had informal relationships with the ruler; (ii) siblings and half-siblings. ; Sample included all royals with age at death  $\geq 14$  years; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . In all regressions the dependent variable is the difference between age at death of the royal and the average of the kingdom's population life expectancy at birth calculated throughout each royal's life span according to the data available.

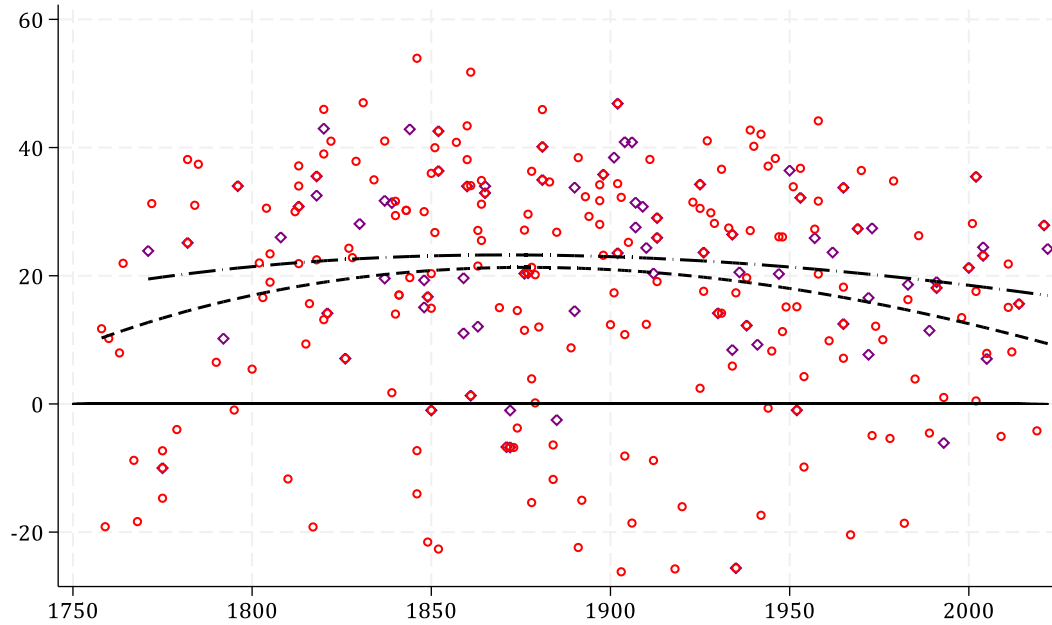
## (B) Figures

Figures 1. Distributions of Age at Death. A) Overall, B) by Gender, and C) by Ruling Status.



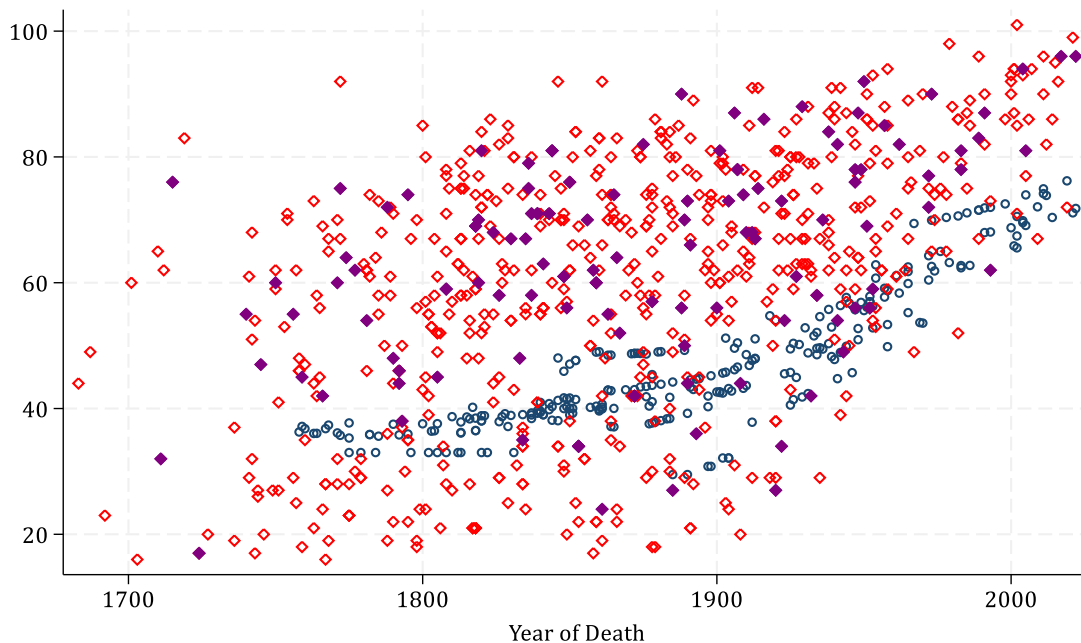
*Notes:* Distribution of ages at death of the royal member of the family according to the full sample (577). The red line is the gaussian fitting.

**Figure 2. Scatter between Age at Death and Population Life Expectancy at Birth.**



*Notes:* (i) y-axis: difference between age at death and royal member's lifetime average life expectancy at birth of the population. (ii) x-axis royal member year of death. Horizontal line is the 0 line along which the difference along the y-axis shows equal age at death and average life expectancy. Possible inverse-U shaped relationship with difference increasing to top around the end of the 1800s and then inverting trend coming closer to 0. The portion of negative difference identifies early deaths (mostly royals not in power but some kings and queens anyway).

**Figure 3. Relationship between Year of Death and Age at Death**



*Notes:* Red hollow diamonds are scatters combination of year of death and average life expectancy of the population during the lifetime of the member of the royal family not in power. Full purple diamonds are the subset of kings and queens with royal power. Hollow blue circles are the population- level life expectancies at the year of death of the royal member.

## (A) Appendix Section

**Table A1 – Noble Families Covered in the Sample**

Aubigne	Windsor
Aumont	Wurttemberg
Austria Este	Zahrigen
Bonaparte	Hesse Kassel
Bowes	Saxe
Brignole	Wettin
Brunswick	Beauharnais
Furstenberg	Belgium
Glücksburg	Battenberg
Holdenburg	Mecklenburg
Kinsky	Orleans
Leszczynski	Schleswig Holstein
Lippe Biesterfeld	Saxe Coburg Saalfeld
Lorraine	Wittelsbach
Lowenstein Wertheim Rosenberg	Hohenzollern Sigmaringen
Manderscheid Blankenheim	Habsburg
Marques de Casa Riera	Orange Nassau
Merode	Grimaldi
Petrovic Njegos	Savoy
Reuss Elder Line	Holstein Gottorp
Reuss Kostritz	Hanover
Sternberg	Bernadotte
Teck	Hohenzollern
Waldeck and Pyrmont	Oldenburg
von Fersen	Glucksburg
von Gutmann	Saxe Coburg and Gotha
von Wilczek	Habsburg Lorraine
Nassau Weilburg	Liechtenstein
Welf	Braganza
Wied Neuwied	Bourbon

**Table A2 – Testing Alternative Within Households Groups Averages**

Average used:	Whole Household	Only Male in H	Ho Half Sibs in H	Excluding Ruler	Only Sibs	Only above 14 in H
	(1)	(2)	(3)	(4)	(5)	(6)
Sample >= 14yrs						
Ruler	5.258** (2.104)	6.586*** (2.182)	5.448*** (2.065)	6.189*** (2.199)	7.270*** (2.396)	7.255*** (1.841)
Female	5.484*** (1.883)	7.666*** (2.126)	5.726*** (1.908)	5.532*** (1.859)	5.156** (1.972)	4.847** (1.888)
Birth Year	2.181** (0.866)	3.424** (1.637)	1.908** (0.833)	2.224** (0.963)	4.025** (1.802)	0.379 (0.635)
Birth Year Squared	-0.000604** (0.000242)	-0.000960** (0.000453)	-0.000524** (0.000233)	-0.000619** (0.000270)	-0.00109** (0.000500)	-9.69e-05 (0.000176)
Observations	669	665	669	662	595	669
R-squared	0.148	0.235	0.156	0.165	0.311	0.080
Royal House FE	✓	✓	✓	✓	✓	✓
Country-birth period FE	✓	✓	✓	✓	✓	✓
	(7)	(8)	(9)	(10)	(11)	(12)
All Sample						
Ruler	18.33*** (2.112)	17.87*** (2.137)	18.31*** (2.106)	19.32*** (2.198)	20.67*** (2.589)	21.60*** (2.089)
Female	11.17*** (2.449)	10.60*** (2.620)	11.16*** (2.505)	11.30*** (2.439)	10.82*** (2.660)	11.02*** (2.608)
Birth Year	0.600 (1.006)	1.864 (1.758)	0.415 (0.952)	0.574 (1.084)	2.381 (1.922)	-1.466 (1.033)
Birth Year Squared	-0.000168 (0.000280)	-0.000537 (0.000484)	-0.000116 (0.000262)	-0.000163 (0.000303)	-0.000639 (0.000531)	0.000410 (0.000288)
Observations	810	806	810	803	735	810
R-squared	0.111	0.167	0.115	0.116	0.182	0.181
Royal House FE	✓	✓	✓	✓	✓	✓
Country-birth period FE	✓	✓	✓	✓	✓	✓

Notes: FAMID cluster ed SEs in parenthesis. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table A3 – Testing Alternative Ages at Death within Households Groups Averages**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Within household average	>=15 yrs	>=16 yrs	>=17 yrs	>=18 yrs	>=15 yrs	>=16 yrs	>=17 yrs	>=18 yrs
Sample Selection	all sample				sample >= 15	sample >= 16	sample >= 17	sample >= 18
Ruler	7.433*** (1.843)	7.550*** (1.844)	7.644*** (1.842)	7.599*** (1.839)	7.046*** (1.831)	6.809*** (1.840)	6.829*** (1.848)	6.428*** (1.823)
female	5.001*** (1.895)	5.049*** (1.903)	5.032*** (1.909)	5.010*** (1.911)	4.753** (1.895)	4.541** (1.926)	4.679** (1.928)	4.278** (1.937)
birth_year	0.374 (0.636)	0.351 (0.646)	0.437 (0.629)	0.623 (0.647)	0.415 (0.634)	0.362 (0.637)	0.367 (0.619)	0.404 (0.621)
c.birth_year#c.birth_year	-9.64e-05 (0.000176)	-8.95e-05 (0.000179)	- (0.000174)	- (0.000179)	-0.000107 (0.000176)	-9.27e-05 (0.000177)	-9.46e-05 (0.000172)	-0.000105 (0.000172)
Observations	669	669	669	669	666	662	660	656
R-squared	0.084	0.085	0.087	0.093	0.082	0.078	0.079	0.079
Royal House FE	✓	✓	✓	✓	✓	✓	✓	✓
Country-birth period FE	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Notes: FAMID cluster ed SEs in parenthesis. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1