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## Economic progress in twentieth-century Portugal: Revisiting the evidence

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### Abstract

A recent commentary claims that one of the three sources that we relied in previous work is not representative, and that contrary to our findings the greatest improvements in Portuguese living standards took place during the democratic political regime (Cardoso and Murray 2025). We revisit the matter and show conclusively that the authors systematically misrepresent our arguments, the sources, and the historical evidence for the time. In addition, they cherry-pick the data and misuse statistics in multiple unjustified ways. The conclusions of our original work remain valid.

JEL Codes: I15, N34, O15

Keywords: anthropometrics, economic development, poverty, child health.

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# **ECONOMIC PROGRESS IN TWENTIETH-CENTURY PORTUGAL: REVISITING THE EVIDENCE**

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## **Abstract**

A recent commentary claims that one of the three sources that we relied in previous work is not representative, and that contrary to our findings the greatest improvements in Portuguese living standards took place during the democratic political regime (Cardoso and Murray 2025). We revisit the matter and show conclusively that the authors systematically misrepresent our arguments, the sources, and the historical evidence for the time. In addition, they cherry-pick the data and misuse statistics in multiple unjustified ways. The conclusions of our original work remain valid.

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## 1. Introduction

Using three archival sources, plus complementary qualitative evidence, we previously argued that the prevalence of stunting and wasting in Portugal fell considerably during the Estado Novo dictatorship (Cermeño et al. 2023). Our evidence shows that there were gradual improvements in living standards in the city of Lisbon from the 1950s, and that the largest declines occurred before the 1970s, prior to the changes brought by the transition from a dictatorship to a democratic political regime, including the creation of a universal national health service.<sup>1</sup> We showed that progress was gradual and not only due to better nutrition over time, but also increased access to health and public sanitation services. Two of our sources pertain to evidence from children in the city of Lisbon, but importantly, a third source is representative of Portugal as a whole.

In a recently published commentary to our article, Cardoso and Murray (2025) – henceforth CM – claim instead that most of the living standards improvements instead happened in the democracy, not before. They make this claim by asserting that the data from one of our three sources – the *Hospital de São Roque* is not representative of the city of Lisbon or Portugal more broadly.<sup>2</sup> In this paper we revisit the evidence and confirms that sustained progress began earlier than had previously been documented, and before democracy.<sup>3</sup> The assertions made by CM lack empirical foundation. Their discussion misrepresents the archival sources that we use and mischaracterises the arguments developed in our original study.

CM misrepresent much of the literature including our work, about which they make multiple erroneous claims. First, they exclude without valid justification a large share of our data: two out of three sources, all the weight information, females, and even children beyond 5 years of age. Second, CM misattribute to our study the view that evidence from Lisbon is representative of Portugal as a whole; this claim appears nowhere in our article.<sup>4</sup> Third, CM claim that the children

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<sup>1</sup> The creation of a national health system was gradual and began well before democracy, and although it became universal only in 1979.

<sup>2</sup> The hospital's full name is *Hospital Infantil de São Roque*, and it was part of *Santa Casa da Misericórdia de Lisboa* (Cermeño et al. 2023, p. 2).

<sup>3</sup> CM only mention the other two sources that we used in passing, claiming that they can be ignored because they concern the period before 1974 (Cardoso and Murray 2025, pp. 2. 9). This is an incorrect argument: for that period, results from those two datasets are similar to those of the *Hospital de São Roque*, hence they serve as an independent cross-check for the latter's representativeness. The *Livros de Recenseamento Militar*, in particular, contain an unmistakably random sample (Palma and Reis 2021).

<sup>4</sup> CM's suggestion that we treated the Lisbon data as representative of Portugal as a whole — repeated even in their abstract — is one of several serious misrepresentations of our argument. Nothing in our article supports such a characterization. On the contrary, as shown in Cermeño et al. (2023, p. 8), we explicitly

in the Hospital de São Roque were a “very selected group of the most underprivileged and sick” (Cardoso and Murray 2025, p. 8). They justify this claim on two grounds. One is statistical, and another is historical, based on contemporary documents. These assertions are unjustified: they rely on an arbitrary censoring of the dataset and mislead readers by advancing incorrect claims about the historical sources underlying our study.

Even when focusing exclusively on boys from this source, CM remove over 27% of the observations from a dataset that had already been cleaned and released in our replication files. While they state that they computed height-for-age, weight-for-age, and weight-for-height z-scores, they neither report the thresholds used nor the number of deletions attributable to each indicator. This lack of transparency renders their trimming procedure arbitrary and irreproducible. This lack of transparency renders their trimming procedure arbitrary and irreproducible — particularly given that they do not make their analysis or code available to the academic community.

Fourth, CM claim to use data from two additional sources to back up their claim that children in Hospital de São Roque were particularly poor, facing unusually high child mortality rates, and they furthermore assert that this hospital was specialized in receiving children with tuberculosis. CM did not collect the data or had access to it and instead rely on third hand reporting of descriptive statistics concerning that data in secondary sources. Furthermore, what they write is misleading: confidence intervals for our data, which CM fail to show, demonstrate that the results for their preferred source are statistically indistinguishable from ours except for the section of the data they decide to show. The evidence contradicts their description of *Hospital de São Roque*: child mortality at this institution was lower than national rates, and diagnostic records reveal that merely about 5% of admitted children were diagnosed tuberculosis.

This rejoinder is organized as follows. In section 2, we cover how CM misrepresent our original work. In section 3, we go over how they misrepresent the historical sources and illegitimately modify them in arbitrary ways in order to fit their narrative. In section 4, we show that CM conclusions are not supported by a careful statistical analysis. In section 5, we show that they misrepresent the historical evidence more broadly as well. Finally, in section 6 we conclude.

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compared the Lisbon evidence with data representative of Portugal as a whole to highlight the differences between the two.

## 2. Cardoso and Murray misrepresent our findings

CM claim that one of the three sources we used is not representative of the underlying population of children, and the entirety of their conclusions rest on this claim. This claim is mistaken, as we detail in Section 3. In this section, we discuss that even if that source could not be used, the two other sources we rely on – and whose representativeness CM do not question – show precisely the same results. CM omit this straightforward point.

CM recognize that the data from Hospital de São Roque was only one of three sources that we used. In fact, these were given equal analytical weight in our original study, and our core empirical pattern — falling stunting and wasting during the Estado Novo — is corroborated across the three distinct datasets. Yet CM critique our conclusions focusing exclusively on a single source, ignoring the fact that the same improvements hold in the other two datasets, whose relevance or representativeness they omit to discuss in detail. They further omit the additional evidence that we reported concerning GDP convergence, and substantial improvements in nutritional and child mortality that took place under the dictatorship, — evidence directly at odds with their narrative.<sup>5</sup> For example, Cermeño et al. (2023, p. 9) document that infant mortality declined from 94.1 per 1000 in 1950 to 38.9 in 1975.<sup>6</sup> The fall in subsequent years was more modest, sitting uneasily with CM’s claims that most health improvements happened after democracy began.

In addition to the *Hospital de São Roque*, we used data from *Casa Pia*, a home for children who lost one or both of their parents, and from *Livros de Recenseamento Militar*, a military source belonging to the Army.<sup>7</sup> The results from the latter two serve here as an independent check

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<sup>5</sup> As we detailed in our original paper, the Estado Novo coincided with a period of improved nutrition and sanitary conditions, as well increased availability of medical care. These are well known to have impacts on stunting and wasting (Fogel 2004; Deaton 2013). There is no reason to believe that Portugal would have been different, and our results confirm this. Unlike CM claim, we never “make the explicit assumption that the increase in Portuguese GDP over the second half of the 20th century is driving the decline in stunting and improvement in the standard of living”. Instead, we only argued that, naturally, higher incomes tend to correlate with better health outcomes. There is a long and high-quality literature contradicting CM’s claim that GDP is a “a relatively poor predictor of secular gains in height”; see, for example, Fogel (2004), Guntupalli and Baten (2006), Steckel (2009), Case and Paxson (2008), Peracchi (2008). All the papers cited by CM in support of their unfounded assertion affirm on the contrary that that there is a strong correlation between height as a proxy for living standards and per capita GDP, even if complexities such as inequality and the disease environment must also be considered.

<sup>6</sup> This had been as high as 164.1 in 1920, and 143.6 in 1930, around the time the dictatorship began.

<sup>7</sup> This source had been previously used by other anthropometric studies, namely Stolz et al. (2013) and Palma and Reis (2021).

concerning the representativeness of the *Hospital de São Roque*, and indeed the results are similar.<sup>8</sup> Importantly, the *Livros de Recenseamento Militar* data – 26,412 observations – shows a lagged effect on individuals observed at the age of 20, as expected, and as we originally pointed out (Cermeño et al. 2023, p. 8). CM mislead readers by referring to this as “conscript data” (Cardoso and Murray 2025, p. 9). This characterization is incorrect, and the distinction is crucial for understanding the representativeness of this source: every male had to do a military inspection, regardless of later becoming a conscript or not. As a result, this dataset covers the entire male population of the country at age 20, not only those selected for military service.<sup>9</sup>

CM then dismiss these two additional sources on the grounds that they do not extend into the democratic period after 1974—a rationale they use to sidestep evidence that directly contradicts their claims. Their argument is unfounded: both sources independently confirm the pattern observed in the *Hospital de São Roque* results for the period of the dictatorship. Related to our military data, CM assert that “stunting – and improvement in living standards – may actually reflect positive changes before the beginning of the Estado Novo dictatorship” (Cardoso and Murray 2025, p. 9). A simple examination of Figure 4 in our original paper (Cermeño et al 2023, p. 8) directly contradicts this claim: except for the cohorts of 1924 and 1930, all individuals in our sample spent most or all of their childhood under the dictatorship.<sup>10</sup> CM’s interpretation does not withstand even a straightforward visual inspection of the evidence.

Finally, CM also assert that we argue for a causal effect of the dictatorship on standard of living outcomes. They write that we “assign most of the progress in the well-being and living standards of the Portuguese population over the second half of the twentieth century to a dictatorship” (Cardoso and Murray 2025, p. 2).<sup>11</sup> This is false under multiple counts. Our paper explicitly focused on documenting changes over time, while recognizing that some of the improvements

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<sup>8</sup> Concerning *Casa Pia*, CM claim that there was no “noticeable decrease in the prevalence of stunting during the dictatorship”; this claim is directly contradicted by Figure 3 of our original paper (Cermeño et al. 2023, p. 7).

<sup>9</sup> The fact that only males are observed is moot in this case, since CM also restrict the sample to only males. On details about the representativeness of the *Livros de Recenseamento Militar* source, see Palma and Reis (2021, p. 417), and Cermeño et al. (2023, p. 5), where we had clearly explained that, for males, the “military inspection was universal”.

<sup>10</sup> Note in particular that those observed in 1940 were only around 6 years old in 1926, and all others in subsequent years spent their entire lives under the dictatorship.

<sup>11</sup> Likewise, Cardoso and Murray (2025, p. 8) write that they “are challenging is the notion that most of the improvements in living standards over the second half of the twentieth century can be attributed to the dictatorship”, a statement that does not correspond to anything we wrote in Cermeño et al. (2023).

were associated with public policies. Cermeño et al. (2023) is a descriptive paper, and we reviewed the relevant literature accordingly.<sup>12</sup> No counterfactual was calculated, and accordingly we made no claims concerning causality. CM's accusation is therefore unjustified.

### **3. Cardoso and Murray misrepresent the *Hospital de São Roque* source**

Another important misrepresentation by CM is the characterization of the *Hospital de São Roque*. CM claim that the improvements that we documented in the hospital are not indicative of broader progress under the dictatorship because the children there were among the “the poorest and the sickest” (Cardoso and Murray 2025, pp. 4, 8). In this section, we demonstrate that CM's characterization of this hospital is inconsistent with the historical evidence.

A central claim that CM make concerning the *Hospital S. Roque* concerns the incidence of tuberculosis, a disease known to have particularly affected the poor. CM claim that this hospital would have been “specialized in infectious diseases” and accordingly that the incidence of tuberculosis would have been very high in this hospital before 1979, emphasizing that the children in our sample for this hospital are “a selected group of the sickest of the sick due to the incidence of tuberculosis” (Cardoso and Murray 2025, pp. 2, 8). The authors argue that an “extraordinary high incidence of infectious disease, in particular tuberculosis, is an indication of the extremely compromised health and growth of the children in the sample” (Cardoso and Murray 2025, p. 8).<sup>13</sup>

CM's claim that tuberculosis was widespread in this hospital before 1979, is only support is an anonymous statement noting that, after the hospital's integration into the national health system in that year, “the Hospital de São Roque was no longer mandated to and restricted the care for children with infectious diseases,” and that tuberculosis was therefore “virtually absent after 1974–1985”.<sup>14</sup> While is true that by 1984, children with tuberculosis were sent to other

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<sup>12</sup> Portugal's experience was not unique in this regard, and Portugal's growth under dictatorship was not “unusual”, unlike CM claim (Cardoso and Murray 2025, p. 2). See, for example, the case of reforms in Spain under Franco (Prados de la Escosura et al. 2011).

<sup>13</sup> The source on which CM rely to claim that from 1979 this hospital existed to serve the “most deprived and underprivileged social groups in the city of Lisbon” (Cardoso and Murray 2025, p. 4) is an interview with a head nurse, where tuberculosis was never mentioned. The nurse mentions in passing that the hospital catered for the poorest but does not present any evidence suggesting the degree to which this happened from 1979, rather than later, from the mid-1990s (Marques 2016, p. 28).

<sup>14</sup> Cardoso and Murray (2025, p. 4). What “virtually absent” means in this context was not quantified by CM, and the source given in support of this statement is an unsigned interview with the clinical director of the hospital that was published in an obscure magazine in 1984 (Anonymous 1984).

hospitals (Anonymous 1984, pp. 34-37), in fact tuberculosis was also largely absent before 1979. The reasons for this are twofold. First, there was a major decline in the incidence and crude mortality rate by tuberculosis in Portugal from around 1950; tuberculosis was residual by 1960, having disappeared before 1970.<sup>15</sup> Second, and more importantly, our dataset confirms this pattern based on the recorded diagnosis of the patients: the incidence of tuberculosis was around only around 5% in the *Hospital de São Roque* between 1945 and 1994.<sup>16</sup> The hospital records list the motives for hospitalization or consultation, and contrary to CM's claims, most health issues treated were not infectious diseases. The records list cases of anaemia, conjunctivitis, dehydration, dyspepsia, dystrophy, jaundice, laryngitis, tonsillitis, or toxicosis among others.<sup>17</sup> The frequency of tuberculosis cases is far too low to characterise this hospital as specializing in the disease, as CM assert.<sup>18</sup> Gastroenteritis was the most frequent reason for hospitalization or consultation. CM's claim that the hospital was specialized in treating infectious diseases and cases of tuberculosis are “clearly overrepresented in the sample”, is simply false.<sup>19</sup>

CM furthermore write that by 1979 the hospital no longer provided care to children with infectious diseases, including tuberculosis, and that exclusion (sic) “seem to coincide” with an increasing number of children being sent there from shelters (Cardoso and Murray 2025, p. 8). No attempt is made to prove or quantify this surprising claim, after the emphasis previously given to the incidence of tuberculosis and its correlation with poor socioeconomic conditions. If children with tuberculosis were common before 1979, and no longer present afterwards, as CM argue, that should in fact bias upwards the hospital's measured living standards from that date. Arguing otherwise would necessarily rely on a complex net effect which is entirely undemonstrated by the authors, given that no alternative evidence was given beyond an undocumented claim. We argue instead that the incidence of tuberculosis declined over time in Lisbon as well as the entire country, and its disappearance in the sources was mainly not due to a change in

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<sup>15</sup> Matos and Santos (2015, p. S103), Morais (2002).

<sup>16</sup> Even if we restrict the sample to 1945 to 1979, the incidence of tuberculosis in this hospital was only around 8%.

<sup>17</sup> Some of these could result from being symptoms of an underlying infectious disease, but it is not possible to be sure of how often that may have been the case.

<sup>18</sup> The cases of tuberculosis are 113 out of 2265, so they correspond to around only 5% of the total.

<sup>19</sup> This claim is made in Cardoso and Murray (2025, p. 4). It evidently makes no sense to compare incidence of tuberculosis among children in an hospital with that among the population as a whole (including adults) in Portugal in a single year, as CM do. For the population as a whole, tuberculosis could easily be underdiagnosed, due to weak healthcare systems and limited access to advanced diagnostics.

the nature of the hospital, but instead to the general improvement in living standards over time: precisely the forces that we originally documented.

A second misleading statistic given by CM concerns child mortality. CM note that the hospital's crude mortality rate was 7% for 0- to 4-year-olds in 1968, which they consider to be high and hence evidence in favour of their claim that the sample from that hospital would have been biased towards the poorest. CM compare that statistic with 1.05% corresponding to the population at large (Cardoso and Murray 2025, p. 4).<sup>20</sup> They admit in passing that it does not make sense to compare child mortality in an hospital to that of the population at large, but the only other comparison they make is with that in a children's hospital in Brazil, for the period of 2018 to 2022 – where it was half that of *Hospital de São Roque*. This is an apples-to-oranges comparison: Portugal in 1968 was far poorer than Brazil in 2018-22.<sup>21</sup> Our paper reported a much more natural and reasonable comparison, which CM omit: infant and child mortality in Portugal in the period corresponding to our study which was 7.75% in 1960 and 5.5% in 1970 (see Cermeño et al. (2023, p. 9). Furthermore, Reis (1960) – the source on which CM relied on – reports that child mortality for children less than 5 years old corresponded to around 8.46% in 1958.<sup>22</sup> In light of this, the 7% of the *Hospital de São Roque* seems strikingly normal.

Finally, we identify two additional erroneous claims made by CM. First, note that Anonymous (1984), mentions that free beds were occasionally available in Hospital de São Roque in that year, and that they often had free capacity and received children from other establishments including from two large public hospitals, the Hospital Santa Maria and the Hospital Dona Estefânia.<sup>23</sup> CM fail to inform their readers of this information, which directly contradicts their claims that this hospital was specialized and had limited capacity after 1979 (Cardoso and Murray 2025, pp. 4, 8). Second, CM also write that that we were “unclear” about why we used 1994 as a cut-off date for this hospital, but we did explain that unlike for 1979, from the mid-1990s

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<sup>20</sup> CM only give the statistic for 1968, but mortality in Hospital de São Roque could naturally vary from year to year; in 1967, for example, it had been lower: 6.4% (Braga 1969, p. 7).

<sup>21</sup> In constant dollars of 2011, Portugal's GDP per capita in 1968 was \$7,767, around half of Brazil's \$14,215 corresponding to its 2018-2022 average (Bolt and van Zanden 2025).

<sup>22</sup> Reis (1960, p. 52) also shows that Portugal's child mortality was the highest in Western Europe.

<sup>23</sup> A year later free capacity continued to exist, according to an interview given by the head nurse (Anonymous 1985, pp. 12-17).

there is indeed evidence about a selected nature of the sample of children going to this hospital (Cermeño et al 2025, p. 3).<sup>24</sup>

#### **4. Cardoso and Murray misuse data and statistics to produce their intended results**

We begin by noting in passing that CM claim that there was a peak in the prevalence of stunting for children aged 0-2 years in the Hospital de São Roque data during 1965-74 but admit that they find this based on a “very small sample size” (Cardoso and Murray 2025, pp. 4-6).<sup>25</sup> This limitation motivated our original exclusion of these observations, as is explained in Cermeño et al. (2023). In the absence of additional data, CM’s decision to rely on such a limited subsample is unwarranted.<sup>26</sup> In light of this, their emphasis and speculative discussions about that period are moot.

It is also worth noting that CM focus exclusively on heights, and consequently stunting statistics, thereby ignoring our weight data and wasting results altogether. There is no good reason to do so – CM justify it due to a desire to (sic) “streamline” their paper, along with vague statements about weights being a non-cumulative measure of health (Cardoso and Murray 2025, p. 2). However, it should be evident that the disappearance of underweight children over time is naturally a statistic that should not be ignored.<sup>27</sup> Finally, note that CM reject weights as a useful measure, yet in their data cleaning, they in fact use weight-for-age, and weight-for-height/length statistics (Cardoso and Murray 2025, p. 2).

In an attempt to cast doubt on our dataset, CM introduce two alternative sources to argue that our sample from the *Hospital de São Roque* was biased. For infants, they use a small sample of only 69 observations from a single year (1959) taken from *Centro de Enfermagem Assistência*

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<sup>24</sup> CM do some analysis including the post 1994, data, but its selected sample is easy to show: elsewhere, heights of children and young adults in Portugal did not decrease from the 1990s, and they even improved a little for males (see the Appendix to Rodriguez-Martinez et al. 2020).

<sup>25</sup> CM never explain why they have decided to focus only on the 0- to 2-year-old sample, ignoring the data for children over 2 years old. More generally, CM suspiciously change the subsample under study repeatedly without justification or explanation.

<sup>26</sup> In our original paper, we had explained in detail why in the main paper we did use the data for this hospital corresponding to 1965-1974 for that age group: there were only 20 observations in total, including 9 boys and 11 girls together, as clearly shown in table 3 of the main paper (Cermeño et al. 2023, p. 4). We explained that this low number of observations was why this was interpolated, and in the online Appendix we reported additional results using the full dataset, including 1965-1974 (Tables A15-A19). The results from CM for the 1965-74 period are based on only 9 observations (Cardoso and Murray 2025, p. 3).

<sup>27</sup> Wasting specifically refers to low weight-for-height, indicating acute malnutrition, while being underweight consists of a composite measure of low weight-for-age that can reflect both acute and chronic malnutrition and repeated infections characterized by low height-for-age (i.e., stunting.)

à *Maternidade de Infância*. CM cite Reis (1960) as the source for this data, yet Reis clearly states that the underlying material comes from a 1958 bachelor's thesis (Lourenço 1958) and cautions that the limited number of observations likely biased the results (Reis 1960, pp. 67–68).

For children aged between 1 and 5, CM compare our data with that from that from *Centro de Saúde de Lisboa*. CM they rely on summary statistics, namely point estimates and standard errors, from Reis (1960, p. 89).<sup>28</sup> Without access to the original microdata, CM had no way to assess normality, detect skewness, evaluate age-heaping or digit preference, or identify and treat outliers as we do with our archival data. Hence, inference based on normal-theory confidence intervals is therefore speculative and unverifiable. Furthermore, CM omit critical information given in Reis (1960, p. 88): namely that the author presented this study as unfinished work in progress.<sup>29</sup> Finally, CM fail to report on the fact that the *Centro de Saúde de Lisboa* was in fact not a hospital, but instead a clinical institute with a research focus using cutting-edge technology (Mendes 2009) and located in a wealthy area of Lisbon (Campo de Ourique).<sup>30</sup>

CM furthermore claim that they cleaned our dataset to “remove unrealistic outliers and other discordant observations” (Cardoso and Murray 2025, p. 2). They do not motivate the need to do so, since our data was already shared clean in our replication package to begin with.<sup>31</sup> CM also decided to focus only on children aged up to (and including) 5 years old. They thus deleted a

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<sup>28</sup> This work is focused on nutrition and diseases of the Portuguese population. Its presentation of height data for children is incidental and presented as incomplete and not representative – details that CM omit.

<sup>29</sup> Reis (1960, p. 88) never suggests that the *Centro de Saúde de Lisboa* data were representative. CM's use of this data, omitting these details from their readers reveals a double standard: they filtered our dataset of 1900 observations based on unspecified “outliers” criteria, but by contrast they retained all observations from a much smaller sample (fewer than 200 observations), where any outlier carries much more weight — and where in fact by construction no outlier cleaning is even possible, since CM did not have access to the original individual-level data. This style of inference — calculating precision from inadequate, likely biased, or unverifiable summary data is wrong and advised against in all statistics manuals.

<sup>30</sup> This hospital operated only from 1939 to 1949, when it closed, and it was not repurposed afterwards (Mendes 2009, p. 191). Its archives were destroyed (Mendes 2009, p. 193). Concerning this institution, see also Anonymous (1942, p. 192), and Mendes (2009, pp. 189-190).

<sup>31</sup> We shared our data and replication package in a public repository, as listed in Cermeño et al. (2023). By contrast, CM write that their data “will be made available on request” (Cardoso and Murray 2025, p. 10), a practice known to not to be reliable for reproducibility, with multiple studies consistently showing low compliance rates, and journals as well as funders increasingly recommending the mandatory usage of public repositories (Christensen and Miguel 2018, Bradley 2023, Jamshidi-Naeini et al. 2023, Cobey et al. 2024). A few days after Cardoso and Murray (2025) was published, we wrote an email to the corresponding author, Hugo F. V. Cardoso, requesting the data and replication files corresponding to this paper. We obtained no response.

large share of our sample by arbitrary and largely unspecified criteria.<sup>32</sup> For the age group up to and including 5-year-olds, our original sample for the Hospital de São Roque consisted of 1717 observations. CM only use a subsample of 1385 of these, hence around 19.3% were deleted (Cardoso and Murray 2025, p. 3). As we also had children over 5 which CM arbitrarily excluded, in total more than 27% of the data from the *Hospital de São Roque* source alone were deleted without adequate justification. Their vaguely described criteria for deleting observations due to supposed “clerical errors” cannot credibly justify the deletion of over three hundred observations corresponding to more than a fourth of our original sample (see Cardoso and Murray 2025, pp. 2-3).

CM write that “The age of 5 years was set as the upper bound because this was the age limit for children admitted to the hospital (Anonymous, 1984) and only rarely do we find children over 5 years of age in the records” as their justification to exclude these individuals (Cardoso and Murray 2025, p. 2). This false on both accounts: first, formally the age limit was in fact 4 years old as mentioned in the very same source cited by CM (Anonymous 1984). Secondly neither a 4- or 5-year age limit was in effectively enforced by the hospital, given that hundreds of children over the age of 5 are present in the archive data, indeed the same sample which CM had access to and decided to arbitrarily truncate at 5 years of age. Remarkably, despite all these serious methodological problems, confidence intervals for the *Hospital de São Roque* largely overlap those used by CM from *Centro de Saúde de Lisboa*, coincidentally for the age groups that CM omit from the sample: individuals between 6 and to 10.<sup>33</sup> As Figure 1 shows, the confidence intervals often overlap, and even the point estimates largely do so for children over the age of 5, conveniently omitted by CM.<sup>34</sup>

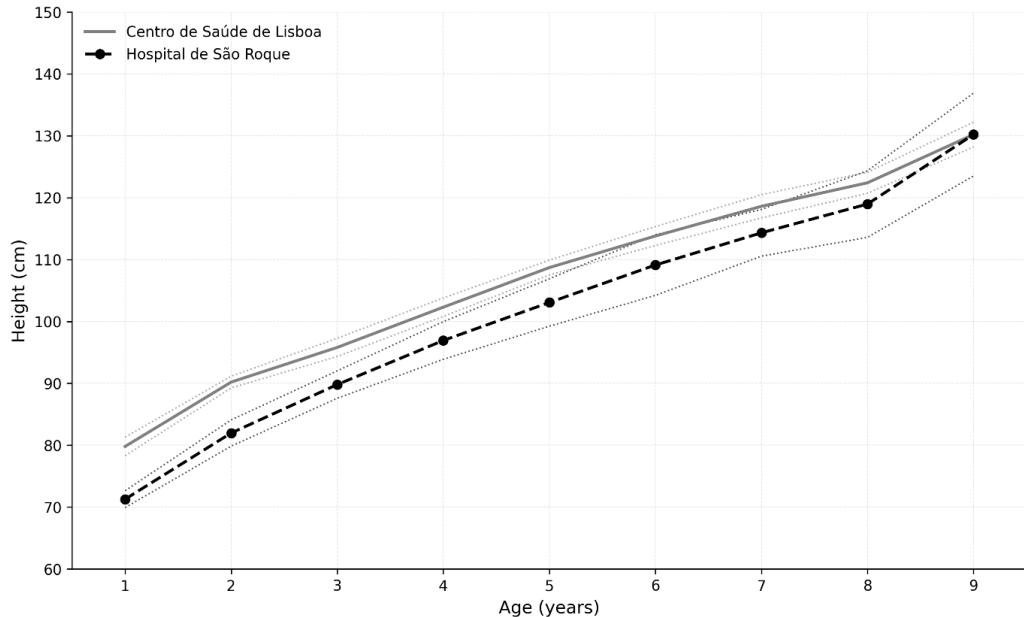
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<sup>32</sup> CM write that additional outliers were identified via weight-for-length z-scores, in addition to the two height- or weight-for-age z-scores criteria that we used (Cardoso and Murray 2025, p. 2). This is a subjective choice that risks removing individuals at the tail ends of the distribution, but in any case, we have replicated this for the purposes of the present paper, and it leads to the removal of only 35 additional observations. It hence leaves unexplained under what criteria CM deleted an additional 300 or so observations.

<sup>33</sup> For the ages that CM show, they rely on a low number of observations: 35 for those aged one; 26 for those aged 2; 49 for those aged three; 51 for those aged four; and 65 for those aged five. CM omit that they are using this small number of observations, easily leading confidence intervals to become highly sensitive to outliers. Most statistical guidelines recommend caution for inference based on samples of this size when the underlying data-generating characteristics are unknown.

<sup>34</sup> In particular, the fact that the estimates clearly converge for later ages is reassuring: any early differences, if real (rather than a statistical artifacts), disappeared after the age of 5. One also wonders why CM omitted the confidence intervals for our data in their Figures 3 and 4, which are presented by them as a central piece of evidence in favour of their viewpoint that our data was not representative (Cardoso and Murray 2025, pp. 6-7).

**Figure 1.** Comparison of the mean height of boys aged 1 to 10 years of age, between *Centro de Saúde de Lisboa* circa 1950 (Reis 1960) and *Hospital de São Roque* between 1945 and 1974. Ninety five percent confidence intervals are represented by the dotted lines.<sup>35</sup>



Note: the confidence intervals for *Centro de Saúde de Lisboa* are based on summary statistics from Reis (1960).

The same source that CM consulted presents detailed statistics concerning how individuals in Portugal were eating gradually better over time during the Estado Novo, as more calories and more protein were available (Reis 1960, p. 158). Remarkably, CM omit from the readers that Reis (1960, p. 68) also shows that there was a tight correlation between height and weight of children and their socioeconomic status in a cross-section corresponding to 1958. There is naturally no reason to believe that this would not also be the case over time.

## 5. Cardoso and Murray omit and misrepresent the historical evidence

The interpretation of Portugal's history presented by CM does not only contradict the evidence provided in our original paper, but it is also at odds with multiple sources concerning the period under discussion. What was remarkable about the Estado Novo regime was that progress began after centuries of economic stagnation (Amaral 2019, Palma 2023). It has been demonstrated decades ago that there was fast economic growth (and convergence) under the

<sup>35</sup> As we previously explained, the confidence intervals for the *Centro de Saúde de Lisboa* data need to be interpreted with a great deal of caution.

dictatorship (Lopes 1996, Lains 2001). Indeed, progress continued under democracy.<sup>36</sup> In this section, we examine how CM systematically misrepresent both quantitative and qualitative evidence in advancing an interpretation that is not supported by the underlying data.

As mentioned before, unlike CM suggest we did not causally attribute the improvements in living standards to actions by the dictatorship. At the same time, is undeniable that there were concrete public actions taken which likely influenced the development outcomes. CM's preferred source, Reis (1960, pp. 44-45) himself recognizes this, writing that mortality had been persistently falling since 1945 due to both improved scientific medical practices and better public health policies, along with a population which was better fed, clothed and housed.

CM make a number of factual errors. For example, they write that "During the *Estado Novo* regime (1926-1974), health care fell largely under the sphere of the family, as well as under the responsibility of the Catholic church and private charity associations" and that welfare policies during the *Estado Novo* "were based on charity and non-universal social insurance, which resulted in almost nonexistent child welfare and protection services until the democracy" (Cardoso and Murray 2025, pp. 3-4).<sup>37</sup> These statements are demonstrably incorrect. In fact, the *Estado Novo* invested in public health policies: by the end of the regime most of the population had access to public healthcare, even though it only became universal in 1979.<sup>38</sup> The regime also regulated charities, including the *Hospital de São Roque*, and provided large subsidies to many of them.<sup>39</sup> More broadly, the historical development of the Portuguese welfare state in contradicts the notion that it was a creation of democracy. While the democratic period after 1974 expanded its services, the essential foundations and a significant initial phase of public services had already been established under the authoritarian regime.

Contrary to the popular beliefs echoed by CM, the provision of public health services increased substantially, both in quantity and quality, during the *Estado Novo*.<sup>40</sup> The regime began laying an

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<sup>36</sup> For a review of these matters in the context of Portugal's history since 1926, see Palma (2023).

<sup>37</sup> Formally, the *Estado* began in 1933 although it resulted from the evolution of a dictatorship in power since 1926, and its main political figure, Salazar, was in power since 1928 (initially as minister of finance).

<sup>38</sup> This was partly done at the municipal level: one of the first legislative initiatives of the *Estado Novo* had been to determine that poor individuals could be treated in hospitals with their costs paid by municipalities (Almeida 2018, p. 18).

<sup>39</sup> For some further information including the amounts of public subsidies given to hospitals and other social institutions, see Almeida (2018, pp. 90, 181).

<sup>40</sup> This discussion is in part based on Palma (2023, pp. 238-9), to which we refer our readers for further details and information.

incipient social safety net from the 1930s.<sup>41</sup> This was done through systems targeted at specific professional groups and compulsory insurance schemes. These offered rudimentary welfare and social security to citizens. Their scale was considerable: by 1945, there were 400 clinics staffed by approximately 500 doctors.<sup>42</sup> A pivotal moment occurred with the Social Security reform of 1945, permitting greater state intervention in social matters.<sup>43</sup> This reform greatly expanded the coverage of public health systems.

Furthermore, the regime undertook major infrastructure projects that remain central to Portuguese healthcare to this day, including the construction of two large public hospitals: the *Hospital de Santa Maria* in Lisbon and the *Hospital de São João* in Porto. By 1965, there were dozens of tax-funded public health institutions including hospitals and clinics in operation.<sup>44</sup> In 1968, the lion's share of investments in public health was done by the state, and most of this was spent in hospitals.<sup>45</sup> While Portugal's National Health Service only achieved full nationwide implementation from 1979, its conceptual and infrastructural foundations were laid under the dictatorship.<sup>46</sup> Its effort translated into a gradual yet cumulatively dramatic expansion of access to healthcare. The percentage of the population covered by these services grew from less than 10% in 1954 to 30% in 1965 and finally reaching 78% by 1975.<sup>47</sup>

It is crucial to note the funding model: while service delivery was often managed privately, the system was funded through taxes and thus provided health free of charge to individual users. Supplementary systems also contributed to coverage, including a dedicated system established in 1963 for civil servants which covered about 8% of the population by 1975, alongside a dedicated health system for the military and their families.<sup>48</sup> In sum, while reaching maturity

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<sup>41</sup> The comparative evidence relevant: in France, for example, only a third of the citizens had access to social insurance as late as 1939 (Almeida 2018, p. 17), and in the UK the National Health Service only began operating in the late 1940s.

<sup>42</sup> Ramos et al. (2009, p. 644).

<sup>43</sup> More generally, from 1945 the state became more directly involved in promoting public health (Almeida 2018, pp. 32, 50-181).

<sup>44</sup> Diário do Governo (1965).

<sup>45</sup> Almeida (2018, p. 123).

<sup>46</sup> Campos and Simões (2002, pp. 111-159). Public health success was also evident in the National Vaccination Program, initiated in 1965, which resulted in the largest-ever reduction in mortality from communicable diseases in the country's history, cutting childhood mortality (ages one to four) by more than half within a decade. See Campos (2000, p. 406).

<sup>47</sup> Carreira (1999, p. 412).

<sup>48</sup> Carreira (1999, p. 412). Despite this significant groundwork, it is undeniable that the welfare state grew substantially after 1974, a shift for instance reflected in public expenditure as a percentage of GDP, which had been only about 20% in the early 1970s, so lower than the over 35% average among other Western

under democracy, Portugal's welfare state was not a purely democratic invention, but rather a structure with authoritarian roots that fully blossomed under democracy.

Given this context, it cannot be surprising that stunting fell the most under the dictatorship. Better nutrition and sanitation generate the strongest height improvements in the poorest societies, because there is diminishing returns in the relationship between public health interventions – like nutrition and sanitation improvements – and health outcomes, such as the reduction of stunting. Accordingly, the first improvements yield the largest gains in the poorest societies, and the evidence that living standards improved dramatically during the dictatorship is undeniable.<sup>49</sup> As Portugal developed further subsequent improvements faced diminishing returns as the lowest hanging fruits of public health measures had already been addressed.

The Estado Novo corresponded to a period of structural change, greatly improved child mortality, and improved nutrition as well as sanitation, as we had reviewed it in our original paper – CM chose to ignore that evidence. Additionally, there is evidence that that at least part of those improvements was due to the actions of the regime, as explained. It is worth noting here in passing that such actions did not only cover health but also successful school policies from the late 1920s (Palma and Reis 2021), and heavy state investment in the building of schools from the early 1940s (Gomes and Machado 2020, 2021). Along with this, the state also invested heavily in public canteens and related school support.<sup>50</sup> The archival evidence shows that only a small percentage of the students paid for their meals, even though primary schooling was close to universal by then.<sup>51</sup> The state also distributed cod liver oil to children in order to strengthen their immune system and provide them with vitamins and other health benefits.<sup>52</sup> Finally, clothing and shoes were distributed through a large number of highly subsidized *Caixas Escolares*.<sup>53</sup>

## 5. Conclusion

As we documented in Cermeño et al. (2023, p. 1), the dominant paradigm in Portugal's historiography considers that the Estado Novo regime prevented the economic and social

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European countries at the time (Amaral 2019, p. 241). During this period, Portugal invested only 1.3 percent and 0.8 percent of its GDP in education and social affairs, respectively, while European averages stood at 3.5 percent and 3.9 percent (Amaral 2019, pp. 181–82).

<sup>49</sup> Amaral (2019), Palma (2023).

<sup>50</sup> See, for example, Instituto Nacional de Estatística (n.d.).

<sup>51</sup> See, for example, Arquivo da Direção Geral da Educação e Ciência (1955, 1970).

<sup>52</sup> Arquivo da Direção Geral da Educação e Ciência (1960).

<sup>53</sup> Arquivo da Direção Geral da Educação e Ciência (1955, 1970).

modernization of Portugal. This is what is taught in schools and at many universities in that country, even though macroeconomic evidence by economists and economic historians had long suggested that it was an inaccurate viewpoint (Lopes 1996, Lains 2001). In Cermeño et al. (2023), we used individual data for infants, children and young adults from three sources to demonstrate that improved living standards had occurred systematically during much of the twentieth century, with an important part of such improvements taking place before democracy.

In this paper we showed that Cardoso and Murray (2025) misrepresent our evidence and findings and make multiple erroneous claims concerning the sources and the broader historical evidence for the period under study. Despite these mischaracterisations, CM now recognize that the Estado Novo dictatorship was associated with a period of noticeable improvements in living standards. In this, they largely agree with our central conclusions, and have revised earlier claims by one of the authors, Cardoso (2008, p. 270–2), who had argued that Portugal “did not experience major social and economic changes after World War II like other European countries”, that “the dictatorship represented a long period of economic stagnation, and that “changes were occurring at an unbearable slow rate”. CM have also substantially moderated the stance taken in a to an earlier version of their paper, which contained libellous and normative accusatory language making false accusations (Cardoso and Murray 2024). Nonetheless, the published version still occasionally insists that “the Estado Novo was actually responsible for a decrease in the standard of living (a raise in stunting prevalence)”, and that improvements in living standards reflected changes before the dictatorship (Cardoso and Murray 2025, p. 9). These assertions are inconsistent with the authors’ own arguments and with the most elementary historical evidence. As such, they represent an internally contradictory and unscientific position.

## REFERENCES

### Archival sources

Arquivo da Direção Geral da Educação e Ciência (1955). Mapa sobre assistência escolar do ano lectivo 1954-55, inquérito às cantinas e caixas escolares. Direção-Geral do Ensino Primário. Lisboa

Arquivo da Direção Geral da Educação e Ciência (1960). Mapas com distribuição de óleos de fígado de bacalhau, 1959-60. Direção-Geral do Ensino Primário. Lisboa

Arquivo da Direção Geral da Educação e Ciência (1970). Mapa sobre assistência escolar do ano lectivo 1969-70, inquérito às cantinas e caixas escolares. Direção-Geral do Ensino Primário. Lisboa

### Printed primary sources

Anonymous (1942). Reportagem Sol da Vida. *Mundo Gráfico*. Year 3, number 54, December 31.

Anonymous (1984). Após Melhoramentos prometidos, Hospital de São Roque receberá doentes até aos 10 anos. *Revista Participar* 1 (2), Santa Casa da Misericórdia de Lisboa.

Anonymous (1985). Enfermagem no Hospital de São Roque. *Revista Participar* 2 (7), Santa Casa da Misericórdia de Lisboa.

Braga, J. J. M. (1969). *Relatório dos Serviços Médicos*. Lisboa: Santa Casa da Misericórdia de Lisboa.

Diário do Governo (1965). Portaria n.º 21249, 27 de abril. Designa os serviços do Ministério da Saúde e Assistência que, para execução do disposto no parágrafo único do artigo 1.º do Decreto-Lei n.º 46307. N.º 92/1965, III Série, de 1965-04-27, p. 503.

Instituto Nacional de Estatística (n.d.). Estatística da Educação. Ano letivo 1954 / 1955. Originally published in Lisbon by Sociedade Tipográfica, Lda, 1956. Available at: <https://www.ine.pt/xurl/pub/259241166> (accessed December 9th, 2025)

Lourenço, C. R. E. (1958). *Contribuição para o Estudo do Crescimento em Crianças Portuguesas, Dissertação de Licenciatura em Medicina*, Universidade de Lisboa.

Reis, C. S. (1960). A nutrição e a saúde pública portuguesa. *Revista do Centro de Estudos Demográficos* 12 (supplement), 15–263. Instituto Nacional de Estatística.

### **Secondary sources**

Almeida, A. (2018). *O sistema de saúde do Estado Novo de Salazar*. Coimbra: Almedina.

Amaral, L. (2019). *The modern Portuguese economy in the twentieth and twenty-first centuries*. Cham: Palgrave Macmillan.

Bolt, J. and van Zanden, J. L. (2025). Maddison style estimates of the evolution of the world economy: A new 2023 up-date. *Journal of Economic Surveys*, 39(2), 631-671.

Bradley, S. H. (2023). Data availability statements: a little credit, but not much. *BMJ* 380.

Campos, A. C., and Simões J. (2012). *O Percurso da Saúde: Portugal na Europa*. Coimbra: Almedina.

Carreira, M. (1999). *As Políticas Sociais em Portugal*. In: *A Situação Social em Portugal, 1960–1996* (eds. A. Barreto e C. Preto). Lisboa: Instituto de Ciências Sociais da Universidade de Lisboa, pp. 365-498.

Cardoso, H. (2008). Secular changes in body height and weight of Portuguese boys over one century. *American Journal of Human Biology: The Official Journal of the Human Biology Association* 20 (3): 270-277.

Cardoso, H. F., and Murray, N. J. (2024). The use, misuse, and abuse of historical records of child height to document changes in biological standards of living or well-being. Available at SSRN: <https://ssrn.com/abstract=5006291>

Cardoso, H. F., and Murray, N. J. (2025). Growing up in a growing economy. Reassessing changes in biological living standards in Portugal during the twentieth century. *Economics & Human Biology*, 101556.

Case, A., and Paxson, C. (2008). Stature and Status: Height, Ability, and Labor Market Outcomes. *Journal of Political Economy*, 116(3), 499–532.

Christensen, G., and Miguel, E. (2018). Transparency, reproducibility, and the credibility of economics research. *Journal of Economic Literature*, 56(3), 920-980.

Cobey, K. D., Ebrahimzadeh, S., Page, M. J., Thibault, R. T., Nguyen, P. Y., Abu-Dalfa, F., and Moher, D. (2024). Biomedical researchers' perspectives on the reproducibility of research. *PLoS biology*, 22(11), e3002870.

Deaton, A. S. (2013). *The Great Escape: Health, Wealth, and the Origins of Inequality*. Princeton University Press.

Fogel, R. W. (2004). *The Escape from Hunger and Premature Death, 1700-2100: Europe, America, and the Third World*. Cambridge University Press

Guntupalli, A. M., and Baten, J. (2006). The development and inequality of heights in North, West, and East India 1915–1944. *Explorations in Economic History*, 43(4), 578-608.

Jamshidi-Naeini, A., et al. (2023). Guest editorial: Data availability statements. *Committee on Publication Ethics (COPE)*. Retrieved from: <https://publicationethics.org/news-opinion/guest-editorial-data-availability-statements> (accessed December 8th, 2025)

Lopes, J. S. (1996). *A Economia Portuguesa desde 1960*. Lisboa: Gradiva.

Matos, V. M., and Santos, A. L. (2015). Trends in mortality from pulmonary tuberculosis before and after antibiotics in the Portuguese sanatorium Carlos Vasconcelos Porto (1918–1991): archival evidence and its paleopathological relevance. *Tuberculosis*, 95, S101-S104.

Mendes, J. T. (2009). Centro de Saúde de Lisboa: Notas Históricas. *Acta Pediátrica Portuguesa* 40 (4): 189-93

Gomes, P., and Machado, M. (2021). A escolarização em Portugal no princípio dos anos 40: uma análise quantitativa. *Ler História* (79), 135-164.

Gomes, P., and Machado, M. P. (2020). Literacy and primary school expansion in Portugal: 1940-62. *Revista de Historia Económica-Journal of Iberian and Latin American Economic History*, 38(1), 111-145.

Marques, M. (2016). Os Cuidados de Saúde Primários na Misericórdia de Lisboa. *Cidade Solidária* 35, 26–33.

Mendes, J. (2009). Centro de Saúde de Lisboa. Notas Históricas. *Acta Pediátrica Portuguesa* 40(4):189-93.

Morais, M (2002). *Causas de Morte no Século XX*. Évora: CIDEHUS.

Palma, N., and Reis, J. (2021). Can autocracy promote literacy? Evidence from a cultural alignment success story. *Journal of Economic Behavior & Organization*, 186, 412-436.

Palma, N. (2023). *As causas do atraso português*. Alfragide: D. Quixote

Peracchi, F. (2008). Height and economic development in Italy, 1730–1980. *American Economic Review*, 98(2), 475-481.

Prados de la Escosura, L., Rosés, J. R., and Sanz-Villarroya, I. (2011). Economic reforms and growth in Franco's Spain. *Revista de Historia Económica-Journal of Iberian and Latin American Economic History*, 30(1), 45-89.

Ramos, R., Sousa, B. V., and Monteiro, N. G. (2009). *História de Portugal*. Lisboa: A Esfera dos Livros.

Rodriguez-Martinez, A. et al. (2020). Height and body-mass index trajectories of school-aged children and adolescents from 1985 to 2019 in 200 countries and territories: a pooled analysis of 2181 population-based studies with 65 million participants. *The Lancet* 396, issue 10261, 1511-1524.

Stoltz, Y., Baten, J., and Reis, J. (2013). Portuguese living standards, 1720–1980, in European comparison: heights, income, and human capital. *The Economic History Review*, 66(2), 545-578.

Steckel, R. H. (2009). Heights and human welfare: Recent developments and new directions. *Explorations in Economic History*, 46 (1), 1-23.