Path dependence, stigmergy, and memetic reification in the formation of the 27 Club myth[*]

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ABSTRACT

The "27 Club" refers to the widespread legend that notable people, particularly musicians, are unusually likely to die at age 27. A 2011 inquiry in *The BMJ* showed this is not the case, dismissing the 27 Club as a myth. We expand on this discourse by demonstrating that although the existence of the phenomenon cannot be empirically validated, it is real in its consequences. Using Wikipedia data, we show that while age 27 does not hold greater risk of mortality for notable persons, those who died at 27 are as a group exceptionally notable compared to those who died at other young ages. The 27 Club legend originated from a statistically improbable event circa 1970, wherein four superstar musicians died within the span of 2 years all at age 27. This coincidence captured the public imagination such that our fascination with the 27 Club brought itself into being, producing greater interest in those who died at age 27 than would have been otherwise. This demonstrates path dependence in cultural evolution, whereby an effectively random event evolves into a narrative that shapes otherwise unrelated events and thus the way we make and interpret history.

Introduction

The legend of the 27 Club emerged in the early 1970s following the deaths of famous musicians Brian Jones, Jimi Hendrix, Janis Joplin, and Jim Morrison, each aged 27, within a span of two years [19]. The mystique of these deaths was strengthened by further uncanny parallels including participation in the counter-cultural music scene and festival circuit, the drug-related nature of the deaths, and the occurrence of the fourth and final death on the second anniversary of the first, as well as the apocryphal white lighter found on each musician [10]. This event fostered a widespread belief that there is an increased risk of mortality at the age of 27 compared to other ages, particularly other similar young ages. Subsequently, the 27 Club expanded to include other notable cultural figures Jean-Michel

Basquiat, Kurt Cobain, and Amy Winehouse, and even those who died before the term was coined, such as blues pioneer Robert Johnson in 1938. At present the English Wikipedia page for the 27 Club lists 87 individuals, and parallel pages exist in 50 other languages. No other year-age group has such a page on Wikipedia.

It is perhaps natural to assume the 27 Club is merely a myth and of no real significance. Supporting this view, a 2011 retrospective cohort study of British musicians conducted by Wolkewitz and colleagues found no evidence of increased risk of dying specifically at age 27 [22]. Instead, the study noted a generally higher risk of mortality throughout musicians' 20s and 30s, challenging the validity of the 27 Club narrative. There is no credible evidence or plausible medical mechanism supporting an increased likelihood of death at age 27.

Thomas & Thomas famously stated in their eponymous Thomas Theorem that, "If men define situations as real, they are real in their consequences" [20]. Given the persistent legend of the 27 Club, we propose that the club is reified (made real) as a cultural phenomenon and measurable in its consequences even as empirical death rates do not support it. We argue that persons who die at the age of 27 receive outsized attention that can only be explained via a real 27 Club effect.

Thus, the reality of the 27 Club is decoupled from its myth. While the legend states that famous persons are more likely to die at 27, in actuality dying at 27 makes a person more famous than they would have been otherwise. The increased attention that members of the 27 Club receive posthumously inflates our perception of the number of deaths at 27, at least among the uppermost echelons of notable persons. We demonstrate this decoupling and the true 27 Club effect with a series of Bayesian quantile regression models, which show a moderate and statistically significant boost to attention to persons who died at 27 around the 90th percentile of notable persons, and an even greater effect around the 99th percentile. Therefore, one might say, "To shine brightest in death, aim for 27."

Our theory of the 27 Club phenomenon has three components: path dependence, stigmergy, and memetic reification. We will explain
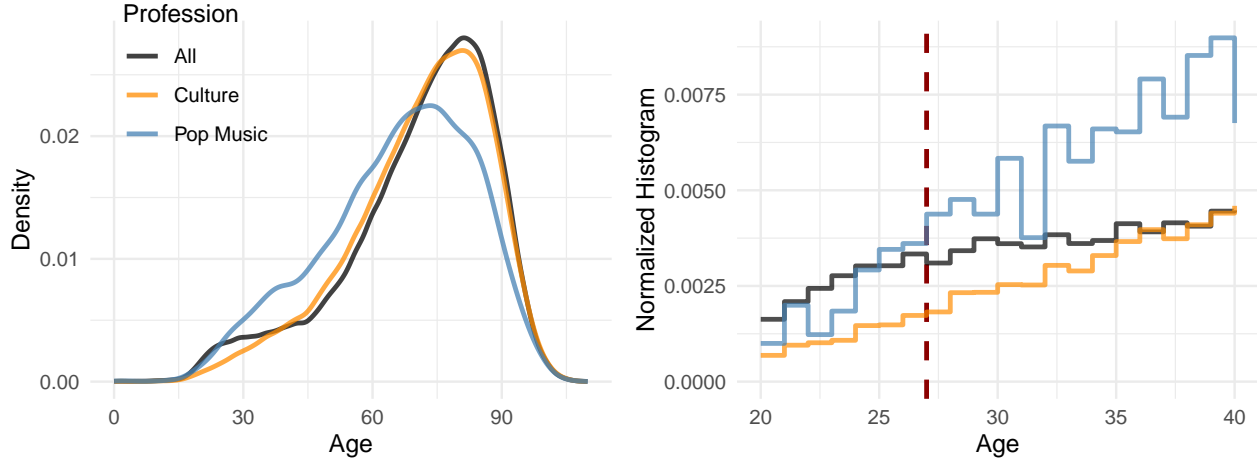
Figure 1: Death-age distributions among persons on Wikipedia born after 1900. Left: Kernel density for age of death in Wikipedia. Right: Normalized histogram of the same data for ages 20–40. Black: All notable persons. Orange: Persons whose primary profession is cultural. Blue: Persons whose primary profession is the production of popular music.

each of these briefly here, and elaborate on their relationships to the empirics and each other in the discussion.

The first concept, path dependence, refers to the highly improbable event that inspired the myth of the 27 Club. Path dependence is a theoretical tool for understanding historical developments in social systems [14]. While individual events are often hard to predict, they may catalyze a causal chain of events which are predictable. In the case of the 27 Club, the original 4 deaths were a fluke, yet it is unsurprising that such a remarkable event with high public visibility would inspire a myth.

The second concept, stigmergy, is a mechanism of indirect coordination through the environment, whereby individual actions leave signs that trigger subsequent actions by the same or different agents [21]. This process facilitates complex, collective behaviors without centralized control. A classic example in human behavior is so-called "desire" paths through urban green space. As people repeatedly walk along paths, they leave traces that encourage others to follow the same routes, reinforcing the trails' formation and guiding the flow of traffic. Stigmergy is also a driver of recommendation algorithms: as users designate a product or resource as useful, the system makes it easier to find. In this study of the 27 Club, stigmergy occurs through links to 27 Club members throughout Wikipedia, increasing the probability of page visits, and potentially inspiring subsequent authors to create new links to 27 Club members in Wikipedia and beyond. Thus is stigmergy a mechanism of contagion, spreading cultural knowledge through traces left in the environment.

By the final concept, memetic reification, we refer to the cultural evolution implicated by the Thomas Theorem. The 27 Club myth transformed into a real phenomenon through memetic processes, i.e., the transmission of culture. Real consequences for our shared understanding of the world, in this case, who among us reach fame and become part of the culture, were shaped by the spread of a relatively small story, the myth of the 27 Club.

Results

We employ the Notable Persons data set curated in 2018 [13]. The data comprise (nearly) all persons with Wikipedia pages at the time of collection. As a proxy for notability we use Wikipedia page visits from 2015–2018 as recorded in the Notable Persons data set. To remove spikes in attention in the period immediately following death, we restrict our data to those who died prior to 2015. Due to survival biases, which lead more notable persons to be more likely to persist in the collective memory, we further restrict our data to those who were born after 1900. Finally, we pulled exact dates of birth and death from each person's Wikidata page. The final data comprise 344,156 persons with pages across all languages. We chose not to restrict our analysis by language, as the 27 Club phenomenon is internationally known, with entries in 51 languages.

Musicians die younger, but there is no increased risk of death at 27. Figure 1 shows the distribution of death ages for notable persons in Wikipedia. We give three distinct perspectives on mortality, dividing the data into all figures (N = 344,156), cultural figures (N = 125,198), and pop musicians (N = 14,517). Professions were determined using the Notable Persons occupational class variables. Figure 1 indicates pop musicians tend to die younger than other notable persons. However, the discrepancy for musicians is partly obscured by the full set's fatter tail, which includes many who found fame at younger ages, such as athletes and aristocrats. The distribution for cultural professionals shows elevated rates of early death for pop artists compared to others in similar fields, consistent with other studies [12, 22, 9, 1].

Figure 1 does not suggest an increased rate of death at age 27 for any category. The right panel shows a normalized histogram for death age, and 27 does not appear to deviate from the approximately linear trend for each professional class. The histogram does not show an elevated risk of death at age 27, consistent with intuition and Wolkewitz et al. [22].
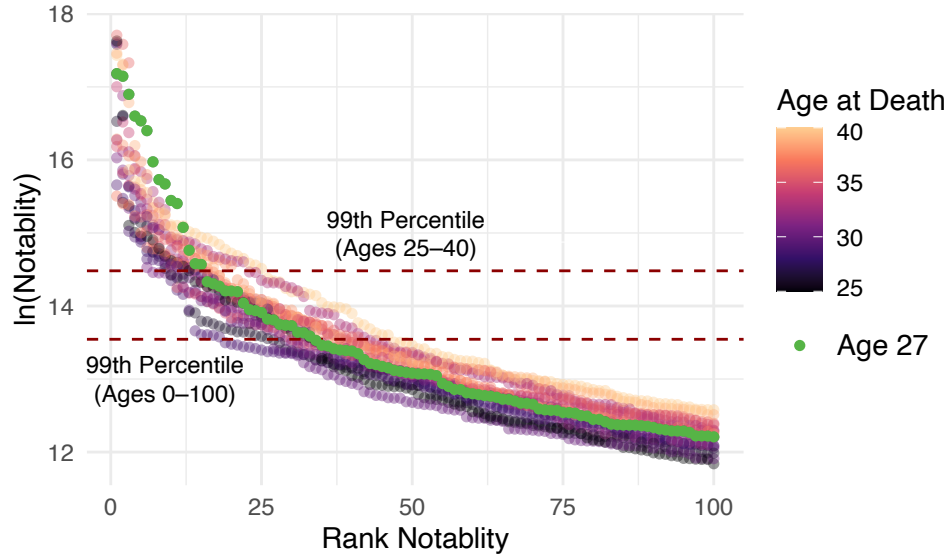
Figure 2: Notability (natural log) by rank within each death-age [25,40]. All 344,156 persons were stratified by age, then ordered and ranked by notability. This plot presents ln(notability) for the 100 most notable persons at each death-age, subsetted ages 25–40. Points are colored by age from dark (low) to light (high). Green points show notability of those who died at age 27. Dashed lines demarcate the 99th percentile for both the subset of ages plotted and the full data set.

The real 27 Club effect: Those who die at 27 are more famous than one would expect otherwise. As the sociomedical hypothesis of higher mortality at age 27 is both implausible and unsupported, we turn to a purely sociocultural framing. This states that the those who die at age 27 are more famous than we would expect otherwise. Figure 2 shows notability arranged by rank for young deaths, those aged 25–40. A color gradient from dark (younger) to light (older) indicates notability increases with age. This is intuitive for two reasons. First, as demonstrated by Figure 1, mortality risk increases smoothly between ages 20 and 40. Within Wikipedia, fame is roughly log-normally distributed, so expected fame at each rank increases with the size of the pool. Second, achievement and network quality grow with age, increasing the probability of reaching exceptional notability [11, 3].

The 27 Club, shown in green, visibly diverge from the tendency for notability to increase with age in Figure 3. For most of the range of rank, e.g., 25–100, the 27 year-old curve is at the midpoint of the distribution, around the early-mid 30s. This suggests a considerable 27 Club effect on posthumous fame. The effect is even starker in ranks 4–12, where the 27 Club floats above all other ages.

We developed a formal test of this 27 Club effect, visualized in Figure 3, by means of a series of Bayesian quantile regressions using the `brms` package in R [5]. Whereas regression typically estimates the conditional mean of the dependent variable, quantile regression estimates the conditional median or any other specified quantile. This allows us to investigate the relationship between age of death and notability at various levels of fame. Fitting quantile regression at the 50th percentile, for instance, would estimate the expected level of notability for those of moderate fame for 27 year-olds as compared to all other ages. Fitting a regression to the same equation but specifying the 99th percentile would estimate how

much more famous the most notable 27 year-olds compared to the all other ages are.

As we have intuitive and empirical support for a positive effect of age on notability, we estimate a continuous term for age in addition to a binary coefficient for the 27 Club. This regression effectively asks "How much more famous are the 27 year-olds than we would expect them to be given the otherwise smooth relationship between age and fame?" We should not necessarily expect the relationship between age and fame to be linear, so we fit a cubic spline to age allowing for some bend in this relationship. Details for the regression models can be found in the Supporting Information.

We restrict our regression to ages 20–40 for a number of reasons. First, our 27 Club hypothesis proposes increased fame at 27 compared to similar ages. Second, the relationship between age and notability is more complex when estimated across the full range of ages and finding a good fit for the range of interest is easier when the spline is fit only in that range. Third, splines are less reliable at their ends, and 27 lies in a tail when fitting a fuller range of ages.

Although we visualize death distributions for different professional classes in Figure 1, the quantile regression model includes all professions. There are 21,931 persons aged 20–40 in our data set fitting the additional specifications enumerated in the first paragraph of the Results. This is the sample we analyze in the quantile regression.

The estimates of the Bayesian regression models are visualized in Figure 3. Each model fits its own coefficients predicting a particular quantile. The left panel shows the effect of age as estimated by the spline term. Figure 3 shows weakly positive, monotonic relationships between age and notablity with slight deviations from linearity. The right panel gives coefficients for the 27 Club, estimating how much more notable are those who died at 27 compared to other ages. The 50th and 80th percentiles do not estimate significant
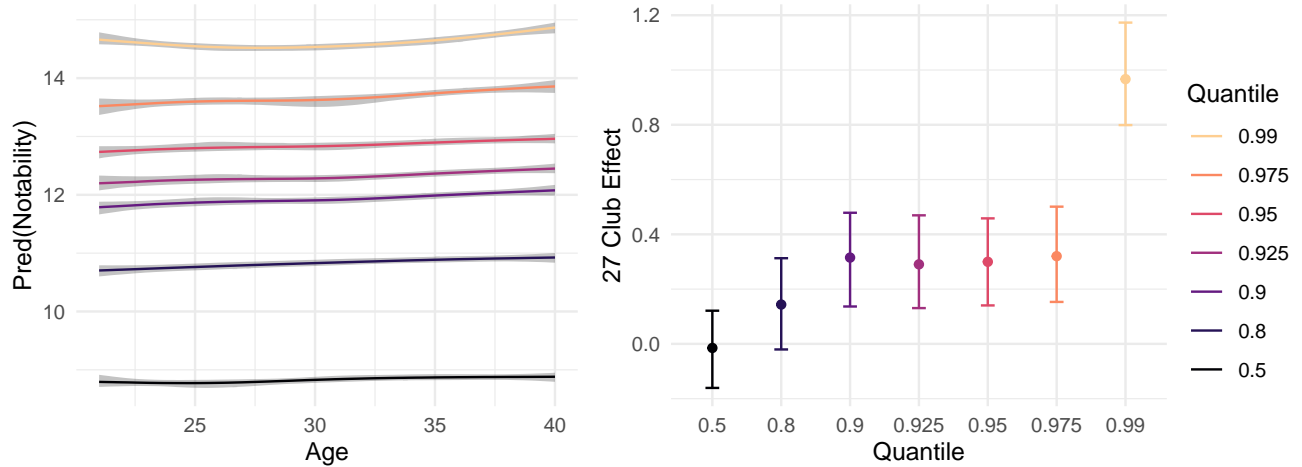
Figure 3: Estimates from Bayesian quantile regression models for 7 quantiles. Left: Estimated ln(notability) for each quantile with the spline fit for age. Right: Coefficient for the 27 Club effect for each quantile with 95% CI.

coefficients. However, the 90th through 97.5th show consistently positive effects around 0.3. The most famous persons show a much larger effect. The 99th percentile model estimates a full order of magnitude increase in notability for the 27 Club.

Given the 27 Club Wikipedia page(s) containing links to noted club members, it is possible that the increased notability of the 27 year-olds on Wikipedia is entirely attributable to clicks originating from such pages. Were this the case, it would be dubious to state that death at 27 confers greater notability, and thus we could not support our claim that the myth has a real effect. In other words, if the 27 Club effect we find is caused by the 27 Club pages, we have learned something about Wikipedia, but fallen short of the Thomas Theorem: we haven't demonstrated that the 27 Club effect extends into the world beyond this one page.

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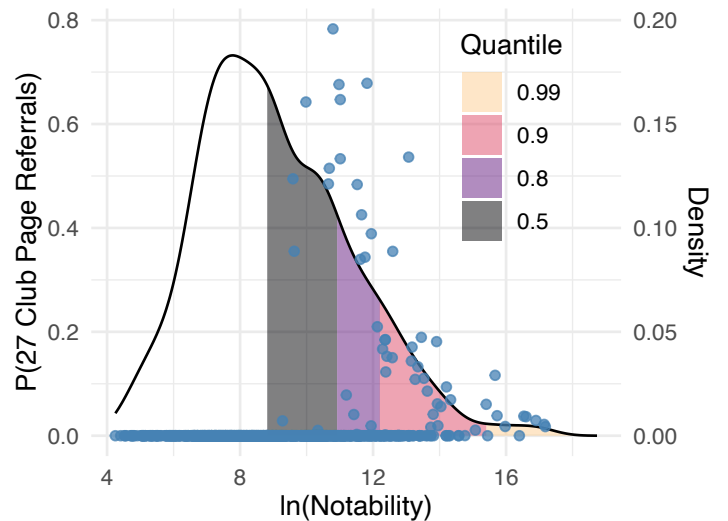

Figure 4: Scatterplot demonstrates the proportion of page visits via a 27 club page by notability (natural log) for all 944 persons who died at 27 in our data set. Kernel density shows the distribution of notability for 27 Club members. Shaded regions indicate the boundaries of several quantiles fit in the regression model in Figure 3.
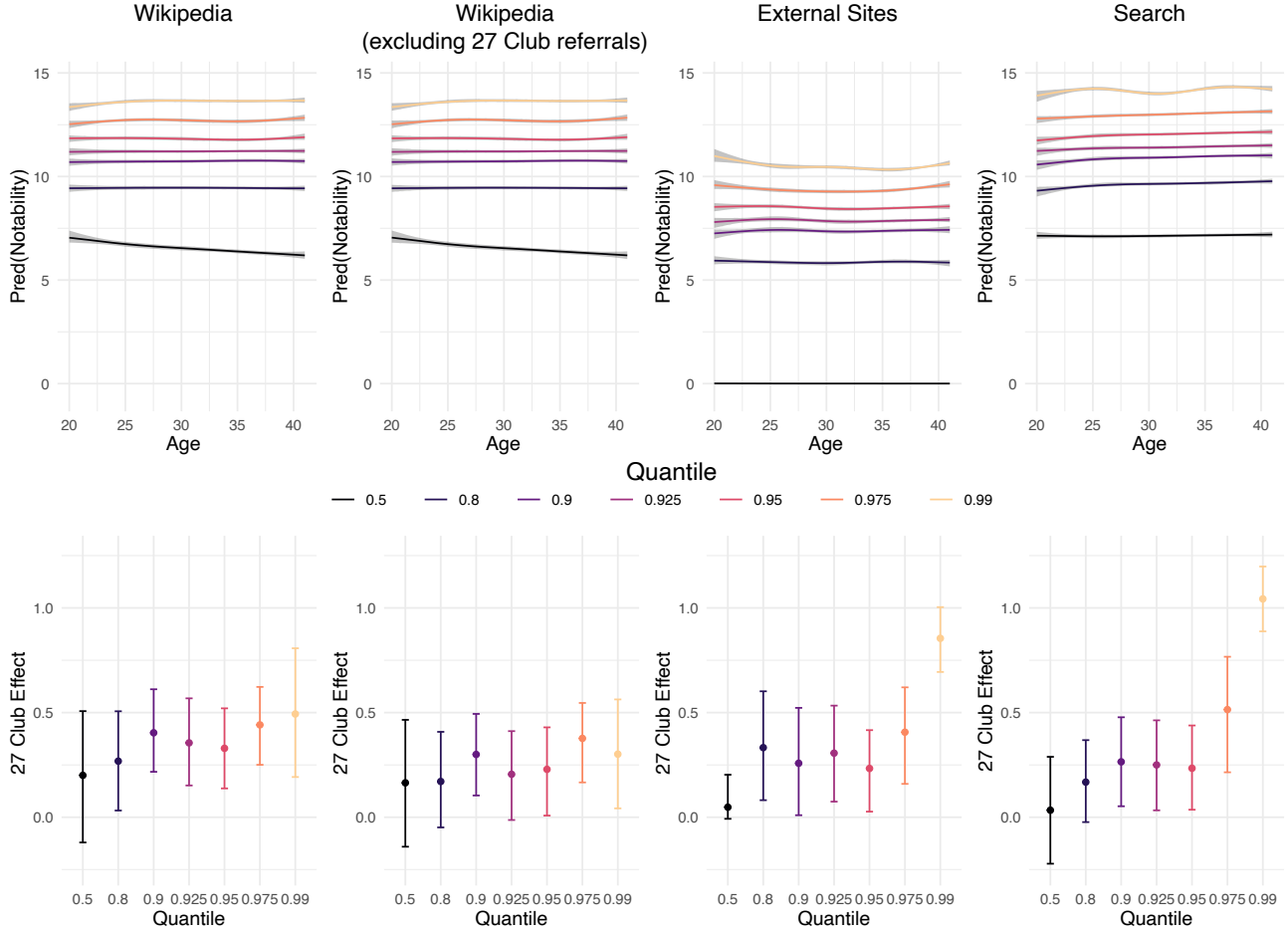
Figure 5: Estimates from quantile regression models on various measures of notability calculated from Wikipedia Clickstream data. As in Figure 3 the data include all 20-40 year olds in our data set. Top row: Estimated ln(notability) for each quantile with the spline fit for age. Bottom row: Coefficients for the 27 Club effect for each quantile with 95% CI. Note that CIs may be asymmetric due to the nature of Bayesian estimation.

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Stigmergic and non-stigmergic evidence of the 27 Club effect. One component of our theory of the reification of the 27 Club myth is that the increased fame of 27 Club members is partly propelled by stigmergy. Recall stigmergy occurs when individual agents leave signals in the environment for subsequent agents to follow. Stigmergy is most obviously at play in the existence of the 27 Club page, but can be observed through other links to 27 Club members, both within Wikipedia and across the Web. On the other hand, page visits to 27 Club members that occur through search engines, and thus originate without a direct pathway, represent a measure of notability through non-stigmergic means.

The Wikipedia Clickstream data allow for multiple perspectives of where stigmergy is at play in the 27 Club phenomenon. Figure 5 repeats the Bayesian quantile regression design using slightly different flavors of the dependent variable, our measures of notability. Here

the sample is the same as above, but the page views data comprise only the 11 languages in the Wikipedia Clickstream data set.

27 Club effects can be seen across all metrics of notability. Referrals from other Wikipedia pages measure stigmergic attention through Wikipedia links. Contrary to the main analysis on the full data set, we see that the 27 Club Wikipedia page accounts for a substantial portion of the 27 Club effect: when comparing notability including referrals from the 27 Club page to those excluding them, the coefficients diminish moderately. The stigmergic boost in notability of 27 Club members can also be see in referrals from external websites. While these may originate with articles referencing the 27 Club, they exclude the 27 Club Wikipedia page.

Non-stigmergic effects of the 27 Club are demonstrated by quantile regression of page visits originating from search engines. Here we see yet the largest 27 Club effect in the uppermost echelons of notability and similar moderate effects at and above the 90th percentile. The large effect at the 99th percentile compensates for the considerable drop in page visits from Wikipedia when we exclude 27 Club referrals.

These results demonstrate 27 Club effects across the Internet by both stigmergic and non-stigmergic means. While the 27 Club pages do confer considerable increases to notability of those listed, across Wikipedia there is evidence of a 27 Club effect beyond the 27 Club page. Further, we see the 27 Club phenomenon through search engine referrals. As many search queries are inspired by events, thoughts, and interactions offline, this provides strong evidence that a 27 Club effect exists in the cultural milieu outside the Web itself.

Path dependence in the 27 Club myth: The original 27 Club deaths were an unlikely event. Finally, we argue that the origin of the 27 Club was an unlikely occurrence, and thus the effect we observe in the prior analysis is path dependent. To test this, we fit a Bayesian count model (zero-inflated Poisson) for multiple famous deaths at each year-age during a 2-year period. Again, we estimate a smooth term for age. We restrict the data to the 99.9th percentile, or 1.5 million annual visits. Brian Jones, the least famous of the original four, averaged 1.8 million visits. This model, visualized in Figure 6, estimates 3 deaths at 27 have a mean probability of 4.45×10^{-5}. 4 deaths are far less probable at 7.26×10^{-7} (95% CI $= [1.63 \times 10^{-6}, 2.61 \times 10^{-7}]$). Thus we estimate a 2-year period with 4 deaths at age 27 to be roughly a 1 in 100,000 event. This is a crude estimate, but it nevertheless gives a sense for the improbability of the 27 Club's origin, and in turn part of the event's mystique.
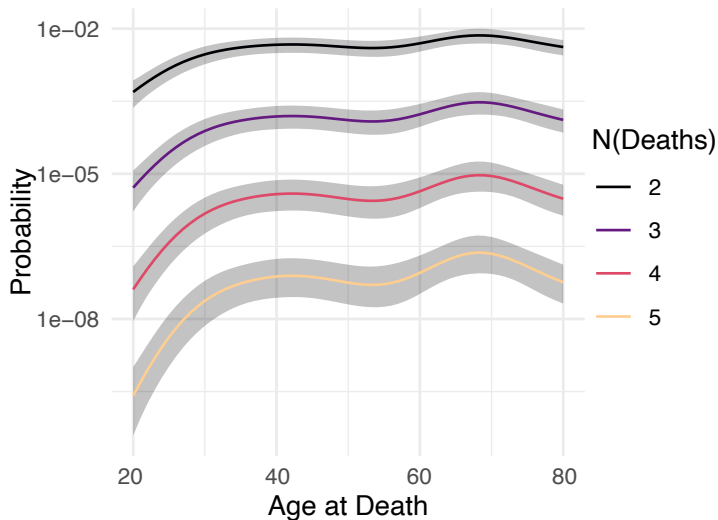

Figure 6: Probability of N deaths at a single year-age in a 2-year period with 95% CI.

Discussion

Our investigation shows that the 27 Club is a real phenomenon: those who died at 27 are more famous than we should expect by chance, and that benefit to notability increases with notability itself. While the Thomas Theorem explains the consequences of cultural beliefs, it does not account for their origins. Drawing on sociological theories of diffusion [4, 7, 6, 18], we characterize the process of mythmaking and its cultural consequence as "memetic reification". Social contagion theory accounts for the propagation of the belief or "meme" [2], and the Thomas Theorem describes the

downstream effects of the legend, its effect on reality, or reification. Further, the 27 Club effect is felt whether or not you are aware of it. The boost to 27 Club members' notability increases their visibility generally, forming a positive feedback loop. In this case, cumulative advantage occurs partly through stigmergy, whereby elevated visibility resulting from notability at earlier periods helps to grow and maintain fame during later periods, which can produce heavy-tailed distributions like we see in Wikipedia page visits [15, 17]. The stigmergic effect of the 27 Club is further inflated by the existence of the 27 Club Wikipedia page. The page's links to club members' pages provide a direct mechanism to boost our proxy for notability, Wikipedia page views, which undoubtedly raises awareness of members in our collective cultural imagination.

The final component of our theory of the formation of the 27 Club legend is path dependence. From a general systems perspective, path dependence occurs when a feature of the system that had no functional significance and/or resulted from chance predictably stabilizes or becomes emphasized over time [14, 16]. Path dependence is found in historical as well as biological and cultural evolutionary systems. In cultural evolution, this entails the emergence of a schema from an initial contingent event and can only be attributed retrospectively to that event.

In the case of the 27 Club, an improbable ($\sim$1 in 100,000), but ultimately influential event precipitated a cultural schema that allows people to attribute meaning and "explain" this unlikely event [8]. This schema is the 27 Club myth of elevated risk of death at 27. Initial belief in the myth is the result of over-generalization from the genuinely uncanny event. Early on, the myth spread only through narrative transmission. But gradually, a real 27 Club effect emerged: those who died at 27 truly were more visible. This was due in part to increased salience of their deaths (e.g., the 27 Club Wikipedia list), but also through downstream effects of inflated presence in the culture outside the context of 27 Club membership. Thus, as the 27 Club myth gave rise to a real, but distinct 27 Club effect, the effect itself serves to bolster the myth. While the elements of the origin of this particular phenomenon are especially tidy, the social forces and their interplay are more widely applicable in the development of not only folklore, but cultural patterns more generally.

Materials and Methods

We used the Notable Persons data set [13], augmented by additional data from the Wikimedia REST API and Wikipedia Clickstreams. Bayesian models were estimated using the `brms` package in R [5], with more information available in the Supporting Information. Code and data necessary for replication can be retrieved from https://osf.io/xtgfe/.

Acknowledgements

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Appendix

Definition of "Pop Musician"

Pop musicians were identified as the primary professions that appeared more than 100 times in the data set and were likely to ascribed to pop (including jazz) musicians: singer, music, guitar, bandleader, saxophonist, trumpet, drummer, jazz, bassist. Contrast this with other musical designations e.g., opera, composer, pianist, conductor, violinist.

Bayesian Quantile Regression Models

Models were computed using the `brms` package in R with Stan backend. Quantile regression was computed by estimating asymmetric Laplace likelihood, `asym_laplace`, for each quantile, τ. Age was measured as a pseudo-continuous variable, i.e., in exact days rather than exact years, in order to best approximate accumulation of notability outside a 27 Club effect. Cubic splines for age were fit using 5 knots. Early experiments with the number of knots, however, had only a marginal effect on the fits. We set naive priors for each term in the equation given by Equation 1. Betas were initialized with flat priors.

$$
\begin{aligned}
Q_{\text{fame}|X}(\tau) &= X\beta_\tau, \text{where } 20 \leq \text{age} \leq 40 \\
&= \beta_0 + \beta_1 27\text{Club} + s(\text{age}) + \epsilon.
\end{aligned}
\tag{1}
$$

Count Models of Deaths per Year

Zero-inflated Poisson models were computed using the `brms` package in R with Stan backend. We fit a smooth term for integer age in years using the default settings and default priors `brms` for Equation 2.

$$
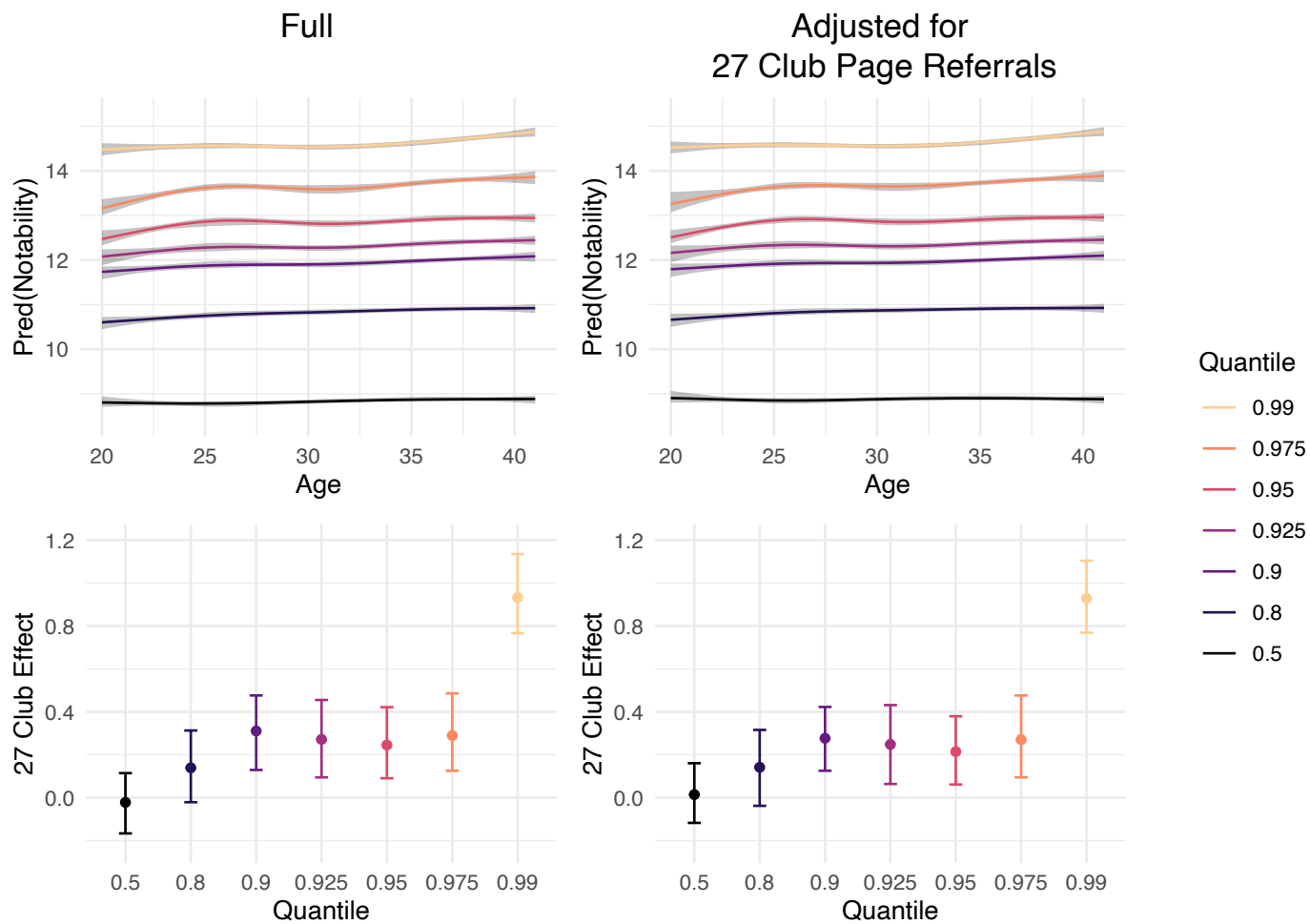N(deaths) = \beta_0 + s(\text{age}) + \epsilon.
\tag{2}
$$

Figure A1: Estimates from Bayesian quantile regression models for 7 quantiles as in Figure 3. Left: Results from Figure 3. Right: Quantile regression results adjusting for referrals from Wikipedia 27 Club pages in 8 languages.