Dying to Win? Olympic Gold Medals and Longevity*

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Abstract

This paper compares mortality between Gold and Silver medalists in Olympic Track and Field to study how achievement influences health. Contrary to conventional wisdom, winners die over one year earlier than losers. Data on pre-Olympic performances and each athlete's career length suggest that selection is unlikely to explain the results. There is suggestive evidence that income may be one mechanism: losers pursued higher-paying occupations than winners after the Olympics according to individual Census records. How people respond to success or failure in pivotal life events may produce long-lasting consequences for health.

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I. Introduction

From prom queen to the Bates Clark Medal, contests for position are ubiquitous in social and professional settings (Hirsch 1977; Frank 1985). This paper studies how winning competition for major awards and recognition—which I label "achievement"—affects health. Disentangling the relationship between achievement and health is challenging because several channels may operate simultaneously. First, winning can directly expand income opportunities or other real resources that impact health. Second, achievement may produce psychological effects on health, such as through changes in stress. Third, the pursuit of victory may harm health: time spent working may crowd out labor inputs to health like exercise, or conspicuous consumption may displace inputs purchased in the market like medical care. Fourth, winning may affect future motivation and thereby influence real resources and health. Finally, an omitted variable, such as latent ability, could independently determine both achievement and health.

In this paper, I compare mortality between Gold and Silver medalists in Olympic Track and Field between 1896 and 1948 to overcome these empirical challenges and make progress on this question. While the setting is highly specific, its institutional features provide advantages that help to cleanly identify achievement and distinguish between the channels listed above. Track and Field includes events in running, jumping, and throwing that use only time or distance to objectively measure performance. In each event, the order of finishers creates a clear and undisputed ranking, even though the differences between competitors may be just fractions of a second. The stakes of such competition are high, with an Olympic victory representing the pinnacle of accomplishment in the sport and carrying global recognition.

Conditional on reaching the Olympic final, randomness plays a large role in deciding the difference between winners and losers. The Olympic Gold medalist is determined on a single day every four years. As I later document, the athlete with the best performance in the year before the Olympics often fails to win the Olympic final. In roughly half of cases, Gold medalists were ranked better than Silver medalists before the Olympics, and in the other half of cases they were ranked worse.

Competitors in this setting are physically similar in terms of their baseline health, which might be expected given their participation in the Olympic final. Gold medalists were just as likely as Silver medalists to have held a World Record before the Olympics. Since athletes are young during Olympic competition, there is also less concern that results are biased by reverse causality in which health determines status. However, performance-enhancing drugs (PEDs) complicate this relationship to the extent that PEDs influence both health and the chance of winning. Since it is difficult to determine which athletes use PEDs, I restrict my analysis to the period 1896 to 1948, when there was less suspicion or evidence of PEDs in Olympic competition.[1]

Also, during this period, athletes did not receive financial compensation tied to their performance. The prevailing system of amateurism prevented professional athletes from competing in the Olympics until the 1980s. Most Olympians held other occupations while training, unlike today.

Matching data on Olympic finishing order with each athlete's date of birth and death, I document that Gold medalists die over one year earlier than Silver medalists. I estimate survival models that control for observables like height, country, event, and year of birth, which may be correlated with both finishing place and longevity. I find similar patterns if I expand the sample to include other Olympic finalists, which also increases the precision of the estimates. One might be concerned the earlier death of winners is driven by selection, in which Gold medalists invest more time or effort training that harms health. I find no evidence of selection using supplementary data on the history of each athlete's performances; Gold medalists did not compete for longer periods of time, and pre-Olympic rankings were similar

[1]The International Olympic Commission first produced a list of banned substances in 1968. Some athletes experimented with substances to improve performance that also had health effects in the early 1900s, although doping strategies were not yet advanced. For example, George Hicks won the 1904 marathon after consuming raw egg, Strychnine (a poison that also functioned as a stimulant), and brandy. Drugs yielding significant performance benefits like anabolic, androgenic steroids were not used until the 1950s and amphetamines not until the 1960s (Wadler 1998, WADA 2010).

to Silver medalists.

To explore potential channels between winning and mortality, I analyze Census records and newspaper coverage for U.S. athletes. There is suggestive evidence that income earned later in life may partly explain the earlier deaths of winners. I collect data on earnings and occupational choices for athletes appearing in the 1940 U.S. Census, which was the first Census to record income. Compared to Gold medalists, losing athletes earned higher incomes and were more likely to enter professional occupations after the Olympics. On average, losers earn 16 percent more than winners, and income is highly correlated with lifespan within the sample. I also link athletes appearing in the 1940 Census to their family's earlier records in the 1910, 1920, and 1930 Censuses to test for balance in parental earnings during the athlete's childhood. I fail to reject the null of no difference in mean parental earnings between winners and losers, using imputed earnings estimates by occupation. Occupational sorting after Olympic competition is thus not explained by differences in parental occupations.

A second hypothesis is that fame may induce risky lifestyle decisions, such as substance use, that directly harm health (Epstein and Epstein 2013). While information on such behavior is unobserved, I explore this channel by analyzing textual data on newspaper coverage, which serves as a proxy for fame. Newspapers wrote more than twice as many stories about Gold medalists than Silver medalists, but the quantity of newspaper coverage is not correlated with lifespan within this sample. There may be other ways in which fame influences health, but differences in newspaper coverage do not account for the higher mortality rates of winners. The evidence using Census and newspaper coverage should be interpreted as suggestive given the data limitations, but is consistent with relative rank influencing future motivation. The data does not allow me to distinguish, however, whether losing motivates or winning leads to "resting on one's laurels."[2]

The results of this paper challenge conventional wisdom and the conclusions from

[2] Some studies find concerns over relative rank increase future effort (Blanes i Vidal and Nossol 2011; Tran and Zeckhauser 2012), while other research finds the opposite effect (Barankay 2012a,b). Borjas and Doran (2015) show mathematicians who win the Fields Medal are less productive after the Prize than contenders who fail to win, with half of the productivity decline explained by experimentation outside their field.

existing studies that achievement necessarily improves health. Previous research has shown winning a Nobel Prize (Rablen and Oswald, 2008) and election to the Major League Baseball Hall of Fame (Becker, Chay and Swaminathan, 2007) are associated with a longer life. Patterns are mixed in the case of winning an Oscar or Emmy (Redelmeier and Singh 2001; Sylvestre, Huszti and Hanley 2006; Han, Small, Foster and Patel 2011; Link, Carpiano and Weden 2013).[3] Yet institutional features of these settings raise questions of how to interpret the findings. For one, there may be unobserved heterogeneity in health before awards are determined. For example, the physical attributes of Oscar nominees may differ in ways that affect their health, and bias may stem from correlation with the likelihood of winning an Oscar. People may also undertake different lifestyle decisions, follow different diets, and value their health in unobserved ways. Second, these contests judge performance over a long time frame. Baseball players are assessed over their entire career. The duration of such assessment increases the chance that the factors that lead to success are correlated with mortality prospects. There is also scope for subjectivity in assigning these awards, and it is reasonable to believe that a person's response to the award may depend on whether the win was viewed as deserving or not.[4] Moreover, actors, baseball players, and academics are professionals who can be financially compensated for their efforts. Higher income associated with achievement may thus confound comparisons of longevity between winners and losers. The setting of Olympic Track and Field circumvents these challenges and also permits a direct test of selection on baseline health using data on past athletic performances.

It is important to distinguish the concept of achievement from status, which is often more broadly defined based on income, education, or occupation. There is a large literature on the gradient between health and status (Smith 1999, 2004; Evans et al. 2012), which documents a positive association. The Whitehall studies of British civil servants provide

[3] Olenski et al. (2015) show elected Presidents die younger than their defeated opponents, but are clear to acknowledge that the treatment effect (holding elected office) captures the strenuous activity associated with the particular job, rather than the effect of winning an award.

[4] The Nobel Committee's decisions are often controversial, and in some cases, the research is later overturned. One notable example was awarding the Prize in Medicine to Johannes Fibiger in 1926 for cancer research in worms that was disproven a decade later (Stolley and Lasky 1992).

epidemiological evidence of a positive relationship between occupational status and health in an employment setting (Marmot et al., 1991), but endogenous selection into jobs suggests causality does not run from status to health (Chandra and Vogl, 2010; Case and Paxson, 2011). This paper's focus on achievement is narrower than status, but the concept of relative rank is common to both. The importance of relative rank has been highlighted in both economic theory and applied work (Duesenberry 1949; Frank 1985; Easterlin 1995; Bagwell and Bernheim 1996; Postlewaite 1998; Luttmer 2005; Rayo and Becker 2007; Moldovanu et al. 2007; Heffetz and Frank 2011; Kuziemko et al. 2014).

The paper proceeds as follows. Section II describes the setting and data, Section III discusses methods, and Section IV presents results. Tests for selection on health are presented in Section V. Section VI analyzes potential mechanisms using Census data and newspaper coverage. Section VII briefly concludes.

II. Setting and Data

I focus on the setting of Olympic Track and Field for several reasons. It is the oldest sport in which performance is objectively measured.[5,6] The sport is common throughout the world. Fewer nations and fewer athletes have competed in Olympic Swimming or Cycling than in Track and Field, particularly during the first half of the twentieth century. Compared to other sports, there were fewer institutional barriers that prevented minorities from competing in Track and Field, making athletes more representative of the population (King 2007; Draper 2016). The Olympics has always been the premiere stage of competition for Track and Field athletes. The World Championships in Track and Field is recent by comparison, beginning

[5] I do not examine sports in which performance is determined partially by subjective evaluation (e.g., Gymnastics) because it is unclear what the treatment is; if an athlete loses but was viewed as performing better than the winner, receiving the award is confounded with a subjective assessment of whether the athlete deserved to win. That is a different question than this paper seeks to answer, and would require information about whether achievements were wrongly awarded. By definition, classifying such "wrong" decisions is subject to disagreement.

[6] The only sport for the first 13 of the ancient Olympic Games that began in 776 BC was a 1-stadium length sprint—called the "stadion"—measuring 192 meters (Perrottet, 2004).

in 1983, and remains less important than the Olympics. I analyze male athletes only since women were not allowed to compete in Olympic Track and Field until 1928, with some events limited to men until the 1990s.

The data includes the order of finish in the Olympic final for each event, the country the athlete competed for, and athlete's birth and death dates, collected from a request to the Olympic Studies Center of the International Olympic Committee and the site Olympedia.org. I focus on comparing Gold to Silver medalists, with some analyses also comparing Gold to other Olympic finalists. For most athletes, the data also includes height (measured in centimeters) and weight (measured in kilograms) at the time of the Olympic Games. Appendix Table A.2 lists the number of observations per country to provide a sense of the geographical composition of the sample. I calculate lifespan as the number of days between the athlete's dates of death and birth.

I classify "high ability" athletes as those who held a World record before their first Olympic competition. Ability may be positively correlated with both winning and latent health. An advantage of this metric is that it is clearly defined.[7] The results are similar if I instead define high ability athletes as those ever holding two or more World Records, including records set after the Olympic Games. A rationale for using multiple World Records as the threshold for high ability is in case athletic performances from the tails of the distribution are due to random variation.

I impose several sample restrictions to cleanly focus on the relationship between Olympic performance and lifespan. I exclude athletes with recorded deaths due to war because this cause is arguably exogenous and unrelated to behavior. The site Olympedia.org maintains a list of such deaths. Some athletes also may have died from non-biological causes, such as car accidents. It is not possible to determine whether such deaths are random or due to risky behavior. To be conservative, my main sample does not exclude deaths due to accidental causes. Robustness tests in Appendix Table B.1 exclude athletes who died

[7] The personal bests of each athlete over their career could be another way to control for ability, but these are highly collinear with the athlete's year of birth since each event's top performances improve over time.

before age 40 to assess the sensitivity of the results to potential outliers. The estimates are more precise when excluding deaths before 40, suggesting they likely represent noise rather than behavior. I drop athletes whose date of death is missing (1 Gold medalist and 1 Silver medalist) since I am unable to verify their death.

My main analysis concentrates on athletes who finish in the top two in a single Olympic Games and single event, which constitutes the majority of Olympic finalists. If athletes compete in multiple Games, it is not clear how an athlete values each performance relative to the other. Since over three-quarters of the sample compete in a single Olympics, focusing on these athletes provides a standard perspective. The results are robust to including athletes who compete in multiple Olympic Games, as shown in Appendix Table B.2, using either the best rank from their first Olympic Games or across Olympic Games.[8] After these restrictions, the final sample of Gold and Silver medalists includes 186 athletes with complete dates of birth, death, and finishing place. Including third (Bronze medalists) and fourth place finishers increases the sample size to 393 athletes and including all finalists increases the sample size to 654 athletes.

Table I presents descriptive statistics of the sample. The average age at death is 74 years, ranging between 23 to over 100. Observable characteristics such as year of birth, age at Olympic competition, height, weight, and ability (as measured by setting a World Record before the Olympics) are balanced between winners and losers as shown in Table II.[9] To preview the main results, Figure I first provides non-parametric, unconditional estimates of lifespan. The Kaplan-Meier survival curves plot the share of Gold and Silver medalists alive at each age. On average, Gold medalists die 1.4 years earlier than Silver medalists, which is given by the difference in the areas between the two curves. By age 80, approximately half of Silver medalists remain alive compared to a third of Gold medalists.

[8] One might argue that anything that occurs after the first Games represents an outcome, and so the rank from the athlete's first Olympics is the appropriate one to use.

[9] The proportion of athletes in each event are not equal because some Gold medalists are not matched to a Silver medalist in the same event and year, and vice versa due to the sample restrictions.

III. Methods

The primary identification strategy compares longevity between winners and losers in each event and year of the Olympics. The hazard models outlined below include indicators for losing, event, and year to exploit within-event-year variation in lifespan, as well as the athlete's year of birth. Some models also include an indicator for ability, defined as holding a World Record before the Olympics, as described in Section II. This specification does not control for country, since the coefficient on losing would then be identified by pairs of winners and losers in the same event and year who also competed for the same country, and there are few such cases. As an alternative identification strategy that controls for differences between countries, I compare the longevity of winners and losers within countries and broad event classes, for which similar events are grouped into sprints, middle distance, distance, throws, field, or racewalk as shown in Appendix Table A.2. I aggregate individual events in this specification since including fixed effects for both countries and events may create an incidental parameters problem in non-linear models.[10] Some specifications also control for height to capture heterogeneity in body types within event classes.[11] These models also condition on ability and year of birth as in the main specification. As shown in Section IV, the results are broadly similar under both identification strategies. I focus on models using within-event-year identification since that comparison more directly represents the cutoff between winning and losing.

I model lifespan using parametric and semi-parametric hazard models. The first model is the standard Cox proportional hazards model:

$$\lambda = \lambda_0(t)\exp(x'\beta) \tag{1}$$

[10] The estimates are nonetheless similar if I include indicators for individual events rather than the broader event classes.

[11] Medical research links height to an earlier death due to biological factors, such as reduced cell replication and lower cancer incidence (Samaras 2012). The results are not sensitive to including weight, which is highly correlated with height, or body mass index. I include height alone to avoid potential collinearity problems.

where the hazard of death λ depends on an unspecified baseline hazard $\lambda_0(t)$ and an exponential function of observables. The explanatory variable of interest is an indicator of whether the athlete lost the Olympic final, defined as finishing as any place other than first. To allow for unobserved heterogeneity, I also estimate a mixed proportional hazards (MPH) model that specifies a Gompertz distribution for the baseline hazard[12] and individual-level unobserved heterogeneity (frailty) that follows a Gamma distribution:

$$\lambda = \nu_i \lambda(t) \exp(x'\beta) \tag{2}$$

where ν_i captures individual-level unobserved heterogeneity as a multiplicative effect on the hazard rate. The estimates are robust to estimating these parametric and semi-parametric survival models that make different assumptions about unobserved heterogeneity.[13]

Finally, the main analyses do not cluster standard errors for the reasons discussed in Abadie et al. (2017). The treatment (winning or losing) is at the individual level, and as described in detail in Section V, can be interpreted as close to randomly assigned. To nevertheless test robustness, Appendix Table B.3 presents models that cluster standard errors by event and year, and shows the precision changes only slightly in doing so.

IV. Results

Table III presents the regression results of the survival models of lifespan described above. For ease of interpretation, coefficient estimates are exponentiated and represent hazard ratios, with robust standard errors in parentheses and p-values from the test that the associated

[12]The Gompertz distribution has been the workhorse of actuarial science to model mortality since the distribution provides a simple analytic formula for survival based on the observation from many settings that mortality rises exponentially with age (Olshansky and Carnes, 1997).

[13]As additional specifications to explore robustness, I also estimate survival models with shared frailty by country and the increasingly mixed proportional hazards model of Frijters et al. (2011). This specification models unobserved individual heterogeneity as a random walk, rather than assuming heterogeneity is constant over time, and yields similar results.

hazard ratio equals 1 in brackets. The first two columns present Cox proportional hazard models that include event and year fixed effects. Columns 3 and 4 present Gompertz models with unobserved heterogeneity. Gold medalists represent the omitted finishing place. The hazard estimate of 0.691 in Column 1 indicates 69.1 percent as many Silver medalists are expected to die at any point compared to Gold medalists. The coefficient estimates are similar across models, with the estimate on losing being statistically distinguishable from 1 (the p-values range between 0.037 and 0.068). As shown in Appendix Table B.4, the results are robust to defining lifespan as the number of years between date of death and the Olympic Games, rather than date of birth.

Comparing Silver to Gold medalists arguably presents the sharpest cut-off between winning and losing, but the results also hold when including other Olympic finalists who also lost. Table IV displays results that compare the longevity of Gold medalists to that of Silver medalists, Bronze medalists, and 4th place finishers (Columns 1 to 4) or to all other finalists (Columns 5 to 8). Again, losing is associated with a lower hazard of death, and the estimates are slightly higher (closer to 1) than the main results in magnitude. The larger sample sizes increase the precision of the estimates.[14]

The estimates are also close in magnitude, but sometimes slightly less precise, when using within-country variation rather than within-event-year variation for identification. Table V presents results that include country fixed effects and compares Gold vs. Silver medalists (Columns 1 to 4) and Gold vs. Silver, Bronze, and 4th place finishers (Columns 5 to 8). The estimated hazard ratios range between 0.719 and 0.766, largely in line with the results from Tables III and IV. Without year effects, the athlete's year of birth is now statistically significant in these specifications.

One might expect the association between winning and mortality to be stronger in Olympic Games that were more highly publicized. To test this hypothesis, I run regressions

[14] The mixed proportional hazards model failed to converge for some regressions, and so Gompertz regression models without unobserved heterogeneity are instead presented in those cases (Columns 4, 7, and 8).

that split the sample into two halves before and after 1924. Table VI shows the main results are driven by later Olympic Games, which received greater coverage through print media, radio, and television. The 1924 Paris Games were the first to be broadcast on radio, and the 1936 Berlin Games were the first to be televised, for example.[15] In the later period, 41.4 percent of Silver medalists are expected to die relative to Gold medalists at any given time (Column 3). The estimated hazard ratio on losing from the earlier period is still below 1 but not statistically significant.

V. Tests of Selection

This section provides evidence that the correlation between lifespan and Olympic finish is unlikely due to selection. Specifically, one might be concerned that Gold medalists spend more time or effort training than Silver medalists and other finalists. Such additional training might directly harm health or crowd out other activities that benefit health. For example, perhaps Gold medalists have longer athletic careers, and therefore delay or avoid the pursuit of high-paying professional careers that require advanced training or time investments. Such behavior is not perfectly observed, but using data on historical performances of each athlete can be used to assess the possibility of selection. I compile data from the top 100 performances globally in each event and year going back to 1911, as obtained from the site Track and Field Statistics. Using this comprehensive list of historical performances, I test whether (1) Gold medalists competed for the same number of years as Silver medalists, and (2) the best performances of Gold medalists were equal to those of Silver medalists before the Olympics.

I examine both the total career length and the number of years competing after the Olympics. The length of each athlete's career is measured as the number of years in which

[15] The Olympics received more news coverage in later years. Performing a search for articles with the word "Olympics" on the New York Times site during the entire year of an Olympic Games reveals the following counts: 1896: 81, 1900: 36, 1904: 201, 1908: 204, 1912: 533, 1920: 323, 1924: 1,170, 1928: 1,190, 1932: 1,490, 1936: 1,450, 1948: 695. It is not clear why the number of articles drops off in 1948, but one possibility is greater coverage on television and radio. There is a similar pattern in coverage using nationwide results from the website newspaperarchive.com.

they appear in a top 100 list. Though it is possible an athlete may have competed for longer and been ranked outside the top 100 in a given year, this condition captures the number of years when their performances ranked at a reasonably high level. Table VII presents statistics on career lengths and pre-Olympic rankings for Gold and Silver medalists, with Gold and Silver medalists are matched to the same event and year in Columns 1 and 2 ("matched pairs") and all athletes in Columns 3 and 4. Gold and Silver medalists each compete for roughly six years, on average (Table VII, Panel A). Differences in mean career lengths are not statistically significant.[16] The average differences in the number of years competing after their first Olympic Games between Gold medalists are also small and not statistically significant (Table VII, Panel B).

To compare whether the performances of winners and losers were similar before the Olympics, I construct a ranking of the top performers in the 24 months before the opening ceremonies of that particular Olympics. A 24-month window provides a sufficiently long period to rank nearly all athletes while still capturing performances recent to the Olympic Games. Using an 18-month or 36-month window yields similar results. Only the best performance of an athlete counts towards the ranking.[17] The assumption is that an athlete's expected finish is based on him running, jumping, or throwing his best in recent years and all other competitors doing the same.[18]

Pre-Olympic performances were similar between Gold and Silver medalists matched to the same event and year. In 52 percent of cases, Gold medalists were ranked higher than Silver medalists leading up to the Olympics. The other 48 percent of the time, Silver medalists ranked higher than Gold medalists. This approximate 50-50 split provides support

[16] There are also not statistically significant differences between the career lengths of Gold medalists and 3rd or 4th place finishers or between Gold medalists and all other finalists.

[17] In calculating the pre-Olympic rankings for the 100-meter and 1500-meter runs, I also consider times posted in the 100-yard and mile runs, respectively, since the distances are close. I multiple mile times by 0.9259 to convert to 1500-meter times and multiply 100-yard times by 1.1 to convert to 100-meter times. These conversions are consistent with the scoring metrics of the International Association of Athletics Federations.

[18] I only observe the top 100 performances by event and year, rather than the full history of each athlete's performances. With the full history, another approach would be to construct distributions of expected finish.

to the assumptions that Gold and Silver medalists are comparable in terms of prior athletic training and fitness and that chance plays a pivotal role in assigning Olympic victory. As shown in Panel C of Table VII, the average rankings of Gold medalists and Silver medalists were nearly equal—9.6 vs. 9.8—and not statistically distinguishable. When including unmatched athletes, the average differences are larger but still modest—8.8 vs. 13.7—and also not statistically different. A larger share of Gold medalists was ranked within the top 3, 5, or 10 compared to Silver medalists (Table VII, Panel D).

These small differences in pre-Olympic rank also do not explain the variation between winning and lifespan. Figure II plots lifespan against pre-Olympic rank for all Gold and Silver medalists. There is a clustering of athletes ranking within the top 10 and with wide variation in lifespan. The minority of athletes ranked outside the top 25 before the Olympics are more likely to earn Silver than Gold, and also tend to die at older ages—possible evidence of selection. Table VIII presents Cox regressions that include pre-Olympic rank as an additional control variable. Column 1 reports the specification without pre-Olympic rank for reference.[19] The magnitude of the coefficient estimate on losing changes little and remains statistically significant upon adding the athlete's pre-Olympic rank in Column 2. Consistent with the scatterplot, the estimated hazard of death is smaller for lower-ranked athletes, driven by those who were ranked outside the top 25. If the sample is restricted to the majority of athletes ranked within the top 25, pre-Olympic rank does not predict lifespan and the coefficient estimate on losing retains its magnitude and statistical significance. The athlete's pre-Olympic rank also adds modest explanatory power. The third row from the bottom of Table VIII presents the share of explained variation, similar to an R^2 from a linear regression, as developed by Royston (2006).[20] In the baseline model, 19.6 percent of the variation in lifespan is explained by finishing place and other observables. Including the pre-Olympic rank increases this share to 24.3 percent. If pre-Olympic ranking represents a measure of

[19] This is a subsample of that presented in Table II because rankings are not available for all events in all years.

[20] As Royston (2006) describes, this statistic is a modification of that proposed by Nagelkerke (1991) based on the likelihood ratio statistic.

physical health or effort invested in training before the Olympics, then winners and losers largely appear similar along this dimension, except for a minority of Silver medalists.

Another interpretation of the patterns between pre-Olympic ranking and lifespan relates to how performance compares to expectations. Expectations are central to the model of reference-dependent preferences of Koszegi and Rabin (2006). An athlete's pre-Olympic rank may serve as a reference point in this setting given the objective nature of competition. Studies in psychology have examined the facial expressions of Olympic medalists as shown on television to study their reaction soon after the event, arguing that an athlete's (ex-ante) expectations affect their perception of their actual performance ex-post (Medvec et al., 1995; McGraw et al., 2005). If pre-Olympic rank is taken as a measure of expected finish, then some Silver medalists from the lower-end of the distribution of rankings greatly out-perform expectations. In using data on pre-Olympic performance, however, there is no apparent way to distinguish expectations from effort spent training. Nonetheless, the correlation between losing and a longer lifespan does not appear to be explained by either (1) how Olympic performance compares to expectations, or by (2) selection in which winners invest more time and effort in training.

VI. Potential Mechanisms

Having established the results are unlikely driven by selection, this section discusses potential explanations for why winners die earlier than losers. One possibility is that achievement affects future motivation and subsequent career choices: Gold medalists may have pursued different occupations and earned different incomes than Silver medalists after the Olympics. Evidence from field experiments is mixed on whether information about rankings is motivating or discouraging; some research suggests peer comparisons improve future performance (Blanes i Vidal and Nossol 2011; Tran and Zeckhauser 2012), while other studies find informing employees of their relative rank reduces future effort (Barankay

2012a,b). Borjas and Doran (2015) show mathematicians who win the Fields Medal are less productive after the Prize than contenders who fail to win, with half the drop in productivity explained by experimentation outside their field. A second possible explanation is that the fame associated with winning leads people to engage in risky behavior (e.g., smoking, drinking, etc.) that shortens lifespan. A key empirical challenge to assess both mechanisms is that many important life decisions that occur after the Olympics are unobserved. This section uses data from the U.S. Census and newspaper coverage to explore these possible explanations. The results should be interpreted as suggestive evidence given the data limitations.[21]

Both channels—future motivation and risky behavior—are consistent with the model of Rayo and Becker (2007a,b), in which reference points based on habit formation and peer comparisons affect hedonic utility. In their model, agents compare their current economic conditions or performance to a time-varying benchmark, which may depend on personal history, expectations, and the success of one's peers. Agents make input choices (e.g., how hard to work, lifestyle decisions) that affect the probability that performance ("output") exceeds the benchmark. The difference between the agent's performance and his benchmark determines hedonic utility.[22] Habit formation and peer comparisons lead the benchmark to shift over time, and agents may fully adjust to their new reference point quickly or they may habituate only partially and do so gradually. The speed of habituation affects how the agent views his current position compared to past achievements. In the Olympic setting, winning Gold delivers an immediate utility gain, but this benefit may be short-lived as athletes then have their remaining lives to lead and careers to pursue. If habituation to the new reference point is slow, winners may still be comparing themselves to the pinnacle of their

[21] Other mechanisms are possible too, although these two appear the most obvious and plausible. Consider mean reversion, for example. For mean reversion to explain the relationship between losing and lifespan, performance would have to correlate contemporaneously with mortality risk. It seems possible that performance could correlate with other measures of current health, such as VO_2max, but unlikely it would correlate with long-term health outcomes like mortality.

[22] Rayo and Becker are interested in modeling happiness as an evolutionary tool, in which "nature" is the principal that designs happiness functions to maximize output.

athletic career. This shortfall between their reference point and their current condition may induce risky lifestyle choices in an attempt to reach similar utility levels or may affect future motivation to pursue success in professional settings. I focus on these two channels since they can be empirically examined, but acknowledge others may exist as well. For example, perhaps achievement increases stress if winners feel continued pressure to succeed.[23]

A. Occupational Choices and Earnings

If income is a mechanism between achievement and health, it is likely not due to earnings directly received from the Olympics. Amateurism prevailed until the 1980s, and the International Olympic Committee strictly enforced this regulation. Most notably, Jim Thorpe—the legendary multi-sport athlete—was stripped of his 1912 Olympic Gold medals for earning money to play minor league baseball in 1909 and 1910 (Flatters, 2000). Most athletes held other occupations while training between Olympic Games.[24] An illuminating account of what could be expected financially after the Olympics comes from the autobiography of Mel Sheppard, a Gold medalist in the 1908 Games. Sheppard describes the parting words he and his Track and Field teammates received from President Theodore Roosevelt after returning from the Olympics during a visit to the White House: "I'm going to give you lads the same friendly bit of advice I gave to my Rough Riders. Remember you're heroes for ten days—when that time's up, drop the hero business and go to work" (Sheppard, 1924, p52). The Gold medal itself was worth a modest amount in terms of metallic content.[25]

[23]Biological studies document that, under certain conditions, the highest-ranking animals experience the greatest psychosocial stress as measured by cortisol levels, while under other conditions, the lowest-ranking animals experience more stress (Sapolsky 2005; Tung et al. 2012). Chronic stress and compromised immunity increase susceptibility to disease (Sapolsky 2004).

[24]For example, Hannes Koheleman—a Gold medalist distance runner—laid bricks in construction (see The New York Times, "Hannes Kolehmainen, Marathon Champion, is Now U.S. Citizen," January 15, 1921) and Charlie Paddock—a Silver medalist sprinter—worked for a newspaper (see Dallas Morning News, "Obituary: Paddock, Charles William." July 23, 1943).

[25]Before 1912, the gold in the winner's medal was worth about $350 adjusting for inflation and the commodity prices of the year it was awarded (The Economist, 2012). After 1912, gold was no longer used and the winner's medal was made mostly of silver and copper, making it worth even less.

While financial rewards from competition were limited, athletes may have pursued various occupations after their athletic career ended, and income from these life decisions may be important to health. To study this channel, I collect data from the 1940 Census for the sub-sample of U.S. athletes. I use the genealogy site Ancestry.com to collect Census records from individual athletes, which become available 72 years after the survey. Details about the Census and the procedure to retrieve individual records from Ancestry are reported in Appendix C. The 1940 Census was the first to record both 3-digit occupation codes and income at the individual level (previous Censuses only reported occupation). The 1940 Census also lists information on home ownership, labor supply, race, marital status, and education.

Data on occupational choices and average annual earnings in the U.S. sub-sample is presented in Table IX. Occupations are grouped into categories following the Census classifications described in Appendix C. At the high end of the earnings distribution, professional workers earned the most money, followed by proprietors, managers, and officials. At the bottom of the income distribution were farmers and laborers. Silver medalists entered occupations that paid more than occupations chosen by Gold medalists (Panel A). The large majority of Silver medalists—70 percent—were classified as professional workers (Panel A, Column 3), compared to 20 percent of Gold medalists (Panel A, Column 1). Gold medalists were instead more likely to be classified as proprietors, managers, and officials, semiprofessional workers, and salesmen. In this sub-sample, the average earnings of Silver medalists were 16 percent higher than Gold medalists ($2,546 vs. $2,198, $p = 0.052$) based on differences in occupational choices (Panel B, Columns 2,4). The difference in mean earnings also holds in comparing winners to Silver medalists, Bronze medalists, and 4th place finishers (Panel B, Columns 5-6); these losing athletes earned 11 percent more than Gold medalists ($2,442 vs. $2,198, $p = 0.077$).

While losers earned more than winners after the Olympics, it is possible that an athlete's occupational choices and earnings were influenced by those of his parents. I investigate whether parental earnings differ systematically across Silver and Gold medalists, which could constitute a source of omitted variable bias since living standards in childhood may correlate with mortality. To study each athlete's family history, I link athlete's to earlier Census records and collect their parent's occupations recorded in the 1910, 1920, and 1930 Censuses, when the athletes were in childhood.[26] Earnings are imputed by occupation after translating to 1940 occupation codes. In the few cases in which a parent held multiple occupations over different waves of the Census, I calculate the average of the two earnings estimates. The difference in parental earnings between Gold and Silver medalists is small and not statistically different from zero ($1,948 vs. $1,908, $p = 0.843$) as shown in Panel C, Column 4. The same holds in comparing Gold medalists to the group of 2nd to 4th place finishers ($1,948 vs. $1,967, $p = 0.916$). Failing to reject the null hypothesis that parental earnings are equal between winners and losers can be interpreted as another test of balance between the two groups. Observing balance in parental incomes is not surprising given the evidence from Section V that Gold and Silver medalists are close to randomly assigned.

These differences in mean earnings between winners and losers are similar after adjusting for year of birth, race, and event fixed effects, as shown in Table X (Columns 1 and 2). Silver medalists earn $367 more than Gold medalists in 1940 ($p = 0.036$) and the group of Silver, Bronze, and 4th place finalists earn $230 more ($p = 0.091$) conditional on these observables. Appendix Table B.5 shows that labor supply, home ownership, and marital status do not differ systematically between winners and losers. These patterns are consistent with relative rank influencing future motivation. The data, however, does not allow me to distinguish whether losing motivates or winning de-motivates.[27] Earnings are also positively correlated with lifespan in the sample (Table X, Columns 3 and 4). The estimated hazard ratios on earnings are below 1 and statistically significant.[28] Note these

[26]Specifically, I record the occupation of the household head.

[27]Winners enter higher-paying occupations compared to the average male (see Appendix C), but these two groups likely differ on many dimensions.

[28]Other estimates of the role of income on mortality vary widely based on age, the type of data, and nature of income, ranging from negative to larger than these estimates (Smith 1999; Ruhm 2000; Deaton and Paxson 2001; Deaton 2003; Snyder and Evans 2006; Cutler et al. 2011; Evans and Garthwaite 2015;

survival models exclude the indicator for losing since earnings would otherwise represent a "bad control" if losing were included in the regression.[29] The results are similar if earnings are measured in logs rather than levels (Appendix Table B.6).

The sorting of Silver medalists into higher-income, professional occupations suggests a possible link between achievement and the broader concept of status, which is often defined as occupational ranking.[30] The relationship between status and health has been difficult to analyze empirically due to the non-random assignment of occupations. The seminal epidemiological study on the subject is the Whitehall Study of British Civil Servants, which began in the 1960s and has demonstrated a marked social gradient in health across different ranks of government employees (Marmot et al., 1978, 1991, 2001; Marmot and Feeney, 1997). Case and Paxson (2011), however, find that current self-assessed health in the second Whitehall sample predicts future civil service grade, but current civil service grade does not predict future self-assessed health. Such selection problems present major challenges to research on the links between status and health (Chandra and Vogl, 2010).

B. Fame

Achievement, which may bring fame, could be detrimental to health if it encourages risky behavior. Such lifestyle decisions are unobserved among these athletes, but this section uses newspaper coverage as a proxy for fame to explore this mechanism.[31] Conversely, there are

Gelber et al. 2018).

[29] For the reasons explained by Angrist and Pischke (2009; 2014), one cannot give a causal interpretation to the losing coefficient after income is included in the regression since occupational choices represent an outcome (an endogenous control). It is also incorrect to include earnings to assess whether losing influences mortality through earnings, even if losing is randomly assigned, because conditioning on the outcome (earnings) changes the composition of winners and losers.

[30] Income and education, which are correlated with occupation, are also used to define status. See Smith (1999, 2004) and Evans et al. (2012) for reviews on the gradient between status and health.

[31] It is important to note that winners still live considerably longer than the average of the general population. Both in the U.S. and other countries, male life expectancy at age 25 (the average age of competition) was another 40 to 43 years in the early decades of the 20th century, yielding an expected lifespan of between 65 to 68 depending on the country and time period (Australian Institute of Health and Welfare 2017; U.S. National Center for Health Statistics 2016). Gold medalists in this sample lived to be 73, on average. Other research has also shown that the longevity of Olympic medalists is greater than the general population (Clarke et al. 2012). Of course, the relevant comparison for this study's question is that between winners

ways in which fame might be beneficial to health: though amateurism prevented athletes from receiving direct compensation for their performance, it is possible that athletes received non-monetary rewards, like housing, which could have first-order effects on longevity.

To study this mechanism, I collect text-based data on newspaper coverage of each athlete from the website newspaperarchive.com.[32] I focus on U.S. athletes because the site mainly includes U.S. newspapers. For each athlete, I search for stories containing their first and last name, the word "Olympics," the year they competed, and their event.[33] I record the number of news stories within two decades of the Olympic Games in which the athlete competed. The rationale for restricting coverage to this period is that any changes to living standards as a result of Olympic performance are likely to be reflected in coverage closer to the competition. For example, there was very little newspaper coverage of athletes competing in the first few Olympic Games, but much more coverage of these same athletes beginning in the 1960s after most had died.[34] In constructing counts of news stories, each story is given equal weight, rather than adjusted in some way for the scope of the paper's readership.

Not surprisingly, winners received more news coverage than losers as shown in Table XI. On average, Gold medalists appeared in 120 news stories during this period. Conditional on the athlete's year of birth and event, there were 40 fewer stories, on average, written about Silver medalists, although this difference is not statistically significant ($p = 0.182$).[35] There were 68 fewer stories written about losing athletes when Bronze medalists and 4th place finishers are also included as shown in Column 2 ($p < 0.001$). Columns 3 and 4 regress an indicator for whether the athlete was mentioned in over 50 stories (roughly the median) to examine non-linearities in coverage. The estimated probability of appearing in more

and losers, since Olympic medalists likely differ from the general population in many ways.

[32]Other research on news coverage has also used data from this source (Gentzkow et al. 2011).

[33]In case the athlete is known primarily by his nickname, I also include searches that replace the athlete's first name with the nickname reported on sportsreference.com. Also, since the long jump was historically called the "broad jump" during my sample, I search for this term in that event.

[34]The post-1950s coverage of athletes competing in the first modern Olympic Games in 1896 tends to recount the experience of these early athletes to establish the history of the Games.

[35]Without controlling for event effects, there were 54 more stories written about Gold medalists ($p = 0.033$).

than least 50 stories was 32.8 percentage points lower for Silver medalists compared to Gold medalists ($p = 0.008$) and 37.1 percentage points lower when also including Bronze medalists and 4th place finishers (column 4).

News coverage, however, is not strongly correlated with lifespan within the sample. The estimated hazard ratios on all news coverage variables exceed 1 but are not statistically significant (columns 5 to 8). Appendix Table B.7 presents regressions that measure the count of news stories in logs rather than levels and use different thresholds to define athletes with high amounts of news coverage. The results are qualitatively similar to Table XI, though in some lifespan regressions, the estimates are marginally significant at the 10 percent level. Overall, there does not appear to be strong support for media exposure as a channel between achievement and mortality among these athletes.

VII. Conclusion

This paper has compared the longevity of Olympic Track and Field athletes to investigate how achievement influences health. Perhaps counterintuitively, Gold medalists die over one year earlier than Silver medalists, on average. This result challenges conventional wisdom and the conclusions from existing studies that achievement improves health (Sylvestre, Huszti and Hanley 2006; Becker, Chay and Swaminathan 2007; Rablen and Oswald 2008). The institutional features of the Olympic setting—though highly stylized—allow the effect of achievement to be cleanly identified. The sharp cutoff between winning and losing in the Olympic final helps to reduce possible unobserved heterogeneity between athletes. Winners and losers are balanced on observables like height, ability, and age. There is no evidence that selection explains the empirical patterns: Gold medalists do not have longer athletic careers and pre-Olympic rankings were often similar to Silver medalists. Awarding winners appears close to random based on their past performances, likely because it is a physical contest held on a single day every four years. Specific features of the setting are also instrumental in isolating different channels between achievement and health. In particular, there is less concern about reverse causality here than in other contests, at least during the period before the rise of performance-enhancing drugs. The prevailing system of amateurism also prevented compensation to be earned directly from competition. Instead, relative rank constitutes the main reward.

Analysis of Census records and newspaper coverage sheds light on possible mechanisms, although data limitations imply such evidence should be interpreted as suggestive. There is empirical support for occupational choices after the Olympics as one potential channel between achievement and health. Based on individual records from the 1940 Census, Silver medalists pursued occupations that paid more money than those chosen by Gold medalists. Such occupational sorting does not appear to be explained by differences in parental occupations according to individual records from the 1910, 1920, and 1930 Censuses. Income is positively correlated with lifespan in the sample. The analysis of Census data is consistent with relative rank influencing motivation, though it cannot distinguish whether losing motivates or winning de-motivates. Note that if Gold medalists enjoyed more income-related opportunities from winning than Silver medalists, such benefits should reduce Gold medalists' mortality risks, not increase them. There is less evidence for newspaper coverage, which may proxy for fame, as a mechanism.

The study has several limitations. Many lifestyle decisions after the Olympics, such as alcohol and tobacco consumption, are unobserved in the data. Information on these factors would be important to analyze all mechanisms between winning and mortality. Also, data on each athlete's income after the Olympics is measured only once in 1940. Observing multiple years of earnings would provide a more complete picture, although lifetime earnings would be endogenous, by construction. The sample size is small for some analyses. Finally, the setting of Olympic Track and Field raises questions about external validity. Competition in the workplace generally involves monetary rewards, but concerns about relative position may constitute an important part of many contests (Frank and Cook 1995). Pivotal life events are often characterized by binary outcomes of success or failure. This paper's findings may be applicable more broadly insofar as competition for awards share these features.

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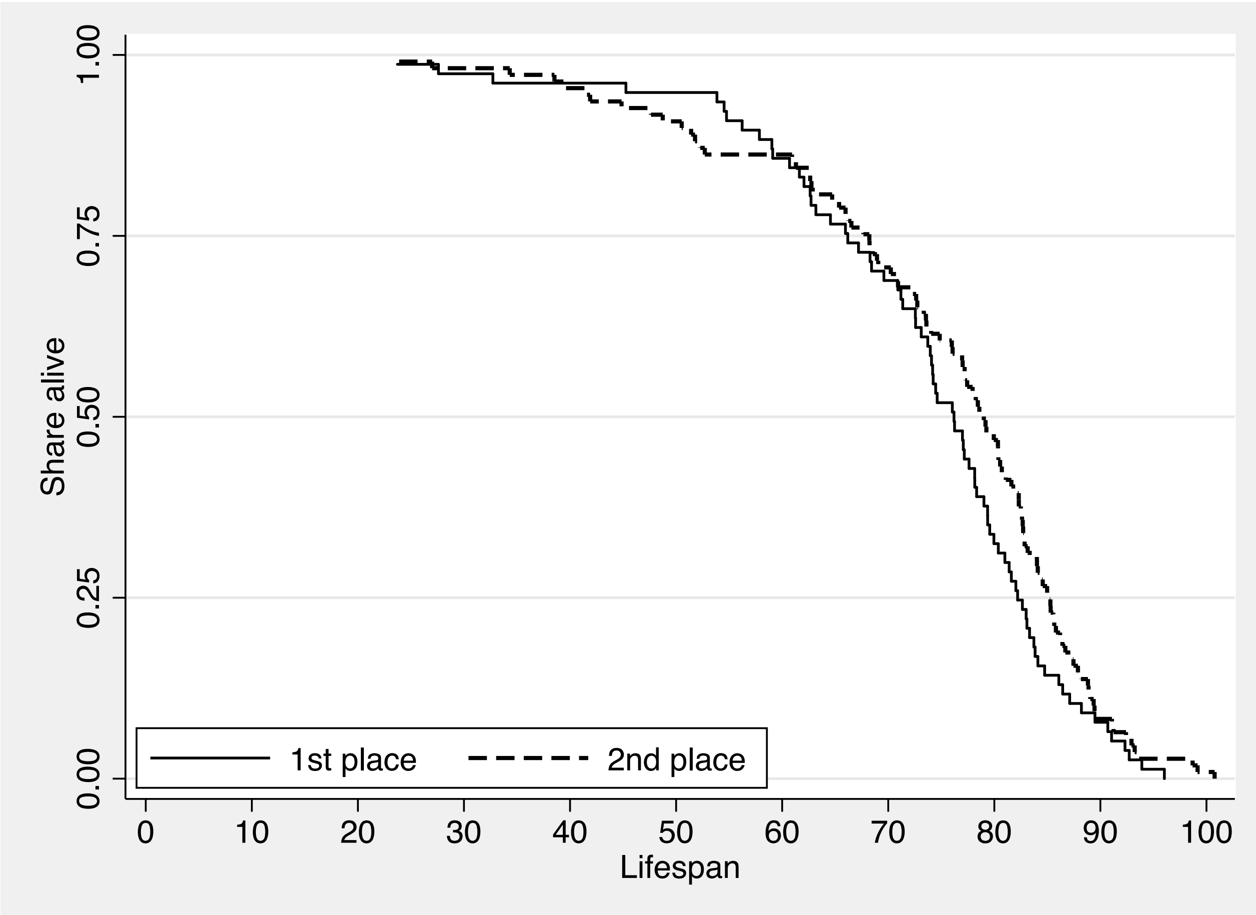
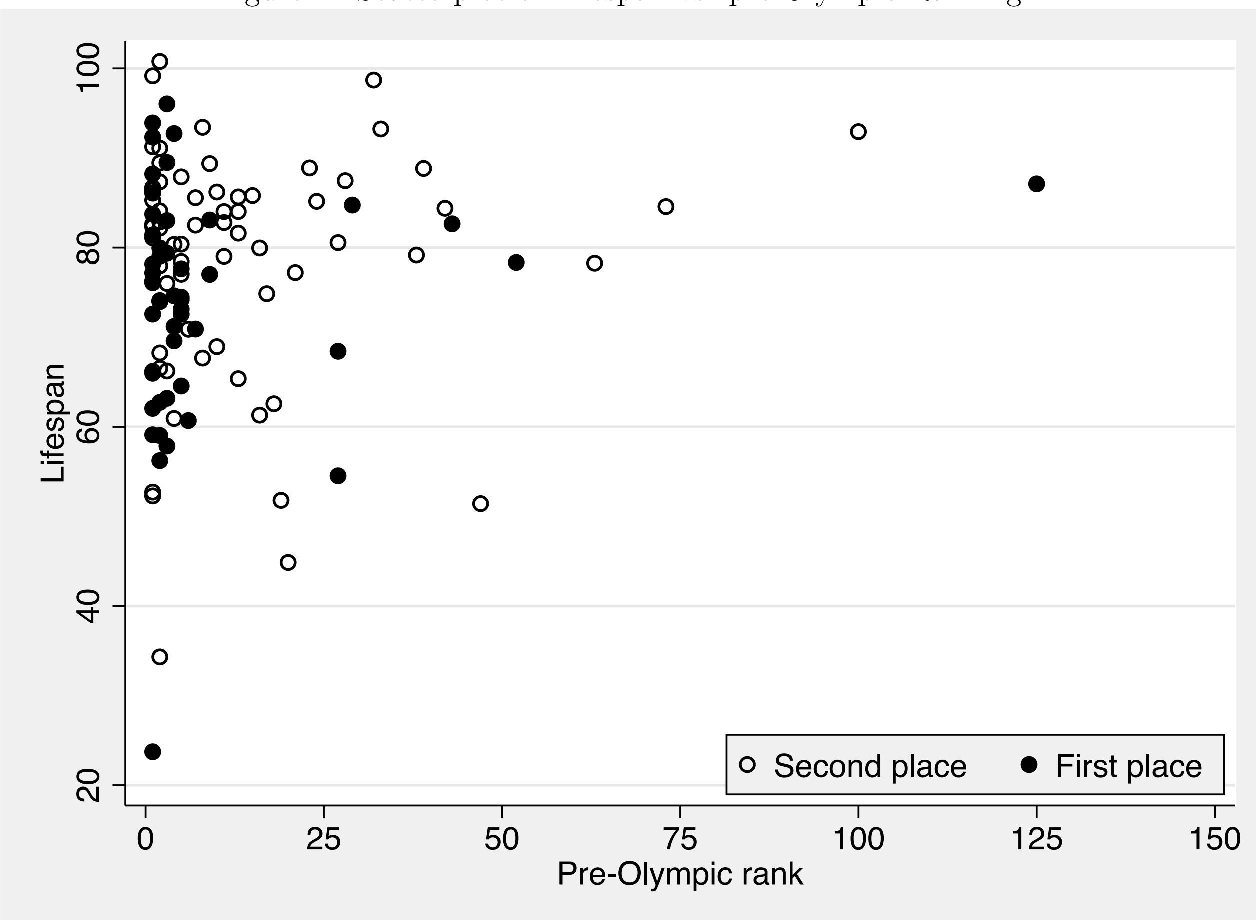
Figure I: Kaplan-Meier Survival Curves by Finishing Place



Note: This figure plots the proportion of athletes still alive at each age by Gold or Silver medal status in the main sample. The difference in area between the two curves is equivalent to the difference in lifespan. On average, Silver medalists live 1.4 years longer than Gold medalists based on the raw data.

Figure II: Scatterplot of Lifespan vs. pre-Olympic Ranking



Note: This figure plots the lifespan for each athlete in the sample (vertical axis) against the athlete's ranking based on his best performance in the 24-month period before the Olympics (horizontal axis). Silver medalists are indicated by hollow circles and Gold medalists are indicated by solid circles. Most Gold and Silver medalists were ranked within the top 10. Silver medalists were more likely than Gold medalists to be ranked outside the top 10, however. Athletes ranked outside the top 25 have a higher mean lifespan than those ranked within the top 25.

Table I: Descriptive Statistics

Variable	Mean	s.d.	Min	Max	N
Lifespan (years)	74.05	14.93	23.73	100.77	186
Age at Olympic Games (years)	24.32	3.41	18.77	38.37	186
Year of birth	1898.33	14.83	1869	1926	186
World Record holder	0.05	0.23	0	1	186
Height (cm)	180.66	7.07	160	195	145
Weight (kg)	74.82	11.73	51	110	142
Distance event	0.15	0.36	0	1	186
Middle-distance event	0.10	0.30	0	1	186
Sprints event	0.23	0.42	0	1	186
Field event	0.32	0.47	0	1	186
Throwing event	0.16	0.36	0	1	186

Note: This table displays statistics on lifespan and other observables for Gold and Silver medalists. The variable World Record holder is an indicator for whether the athlete had set a World Record prior to competing in his first Olympic Games. The final five rows of the table list indicators for separate classes of Track and Field events. See Appendix Table A.2 for a full list of individual events, which are used in the main analysis, corresponding to each event class.

Table II: Balance Tests

Variable	1st place mean (N=77)	2nd place mean (N=109)	Difference in means	p-value of difference
Year of birth	1897.8	1898.7	-0.99	0.655
Age at Olympic Games	24.4	24.3	0.12	0.813
World Record holder	0.05	0.06	-0.00	0.927
Height (cm)	181.42	180.05	1.37	0.247
Weight (kg)	75.59	74.22	1.37	0.491
Distance event	0.16	0.15	0.01	0.865
Middle-distance event	0.09	0.11	-0.02	0.671
Sprints event	0.25	0.22	0.03	0.672
Field event	0.35	0.29	0.06	0.410
Throwing event	0.13	0.17	-0.04	0.411

Note: This table displays means of year of birth, height, weight, the types of events, and the fraction of World Record holders for Gold and Silver medalists. The final column presents the p-value from the test that the means of the corresponding variable are equal between Gold and Silver medalists. The differences in means between groups are not statistically significant. Height data is available for 145 athletes. Weight data is available for 142 athletes. The other variables are available for 186 athletes.

Table III: Survival Regressions with Event and Year Fixed Effects

	Cox (1)	Cox (2)	Gompertz (3)	Gompertz (4)
Lose (1=yes, 0=no)	0.691	0.695	0.714	0.719
	(0.123)	(0.124)	(0.129)	(0.130)
	[0.037]	[0.041]	[0.062]	[0.068]
Year of birth	0.989	0.990	0.997	0.998
	(0.034)	(0.035)	(0.032)	(0.032)
	[0.746]	[0.781]	[0.917]	[0.957]
World Record holder (1=yes, 0=no)		0.810		0.789
		(0.247)		(0.297)
		[0.489]		[0.529]
Year effects	Yes	Yes	Yes	Yes
Individual event effects	Yes	Yes	Yes	Yes
Country effects	No	No	No	No
Event class effects	No	No	No	No
Unobserved heterogeneity	None	None	Gamma	Gamma
Observations	186	186	186	186
Log likelihood	-758.23	-758.07	82.79	83.00

Note: This table presents exponentiated coefficient estimates (hazard ratios) from survival model regressions. Losing is defined as finishing in second place. Columns 1 and 2 estimate Cox models. Columns 3 and 4 estimate Mixed Proportional Hazards (MPH) models that assume the hazard follows a Gompertz distribution and allows for individual heterogeneity with a Gamma distribution. The coefficient estimate below 1 on losing indicates the hazard of death is lower among Silver medalists than Gold medalists. Robust standard errors in parentheses; p-value of the test that the hazard ratio equals 1 in brackets.

Table IV: Survival Regressions Including Other Olympic Finalists

	Sample: 1st vs. 2nd - 4th places				Sample: 1st vs. 2nd - 8th places			
	Cox	Cox	Gompertz	Gompertz	Cox	Cox	Gompertz	Gompertz
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lose (1=yes, 0=no)	0.742	0.742	0.766	0.766	0.759	0.758	0.784	0.784
	(0.098)	(0.099)	(0.107)	(0.107)	(0.088)	(0.088)	(0.102)	(0.102)
	[0.024]	[0.025]	[0.058]	[0.057]	[0.017]	[0.017]	[0.061]	[0.061]
Year of birth	1.011	1.011	1.013	1.013	1.014	1.014	1.015	1.015
	(0.019)	(0.019)	(0.019)	(0.019)	(0.013)	(0.013)	(0.012)	(0.012)
	[0.564]	[0.546]	[0.514]	[0.507]	[0.253]	[0.247]	[0.215]	[0.216]
World Record holder		0.937		0.956		0.955		0.996
(1=yes, 0=no)		(0.297)		(0.285)		(0.270)		(0.241)
		[0.837]		[0.879]		[0.870]		[0.986]
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual event effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	No	No	No	No	No	No	No	No
Event class effects	No	No	No	No	No	No	No	No
Unobserved heterogeneity	None	None	Gamma	None	None	None	None	None
Observations	393	393	393	393	654	654	654	654
Log likelihood	-1926.85	-1926.83	130.52	130.53	-3541.83	-3541.81	184.66	184.66

Note: This table presents exponentiated coefficient estimates (hazard ratios) from survival regressions that include other finalists. Columns 1 to 4 present results that compare Gold medalists to places 2 through 4 and Columns 5 through 8 compare Gold medalists to places 2 through 8. Losing is defined as not winning the Gold medal. Some MPH models failed to converge, and so columns 4, 7, and 8 present results from Gompertz regressions without individual heterogeneity. In all models, the coefficient estimates are similar to the main results presented in Table III. Robust standard errors in parentheses; p-value of the test that the hazard ratio equals 1 in brackets.

Table V: Survival Regressions with Country Fixed Effects

	Sample: 1st vs. 2nd places				Sample: 1st vs. 2nd - 4th places			
	Cox	Cox	Gompertz	Gompertz	Cox	Cox	Gompertz	Gompertz
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lose (1=yes, 0=no)	0.766	0.719	0.764	0.721	0.736	0.706	0.755	0.725
	(0.131)	(0.140)	(0.130)	(0.139)	(0.098)	(0.106)	(0.096)	(0.103)
	[0.120]	[0.090]	[0.114]	[0.089]	[0.021]	[0.020]	[0.027]	[0.024]
Year of birth	0.976	0.976	0.977	0.977	0.982	0.984	0.983	0.985
	(0.007)	(0.008)	(0.006)	(0.008)	(0.004)	(0.006)	(0.004)	(0.005)
	[0.001]	[0.005]	[0.000]	[0.006]	[0.000]	[0.005]	[0.000]	[0.004]
Height (cm)		1.014		1.010		1.012		1.010
		(0.016)		(0.015)		(0.010)		(0.009)
		[0.388]		[0.505]		[0.223]		[0.264]
Year effects	No	No	No	No	No	No	No	No
Individual event effects	No	No	No	No	No	No	No	No
Country effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Event class effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Unobserved heterogeneity	None	None	Gamma	None	None	None	None	None
Observations	186	145	186	145	393	292	393	292
Log likelihood	-766.69	-561.16	74.22	55.92	-1929.51	-1352.96	128.93	95.09

Note: This table presents exponentiated coefficient estimates (hazard ratios) from survival model regressions with country fixed effects. All regressions also include indicators for event classes (sprints, middle distance, distance, throws, field, and racewalk), rather than individual events as in Table III. Appendix Table A.2 lists the grouping of individual events into event classes. Similar to Table III, the coefficient estimate below 1 on losing indicates the hazard of death is lower among Silver medalists than Gold medalists. Some models with unobserved heterogeneity failed to converge, and so columns 4, 7, and 8 present Gompertz models without unobserved heterogeneity. Robust standard errors in parentheses; p-value of the test that the hazard ratio equals 1 in brackets.

Table VI: Survival Regressions by Year of Olympic Games

	Years: 1896-1924		Years: 1928-1948	
	Cox	Gompertz	Cox	Gompertz
	(1)	(2)	(3)	(4)
Lose (1=yes, 0=no)	0.932	0.916	0.414	0.409
	(0.290)	(0.270)	(0.107)	(0.107)
	[0.821]	[0.767]	[0.001]	[0.001]
Year of birth	1.026	1.032	0.917	0.928
	(0.070)	(0.064)	(0.046)	(0.048)
	[0.708]	[0.616]	[0.085]	[0.143]
Year effects	Yes	Yes	Yes	Yes
Individual event effects	Yes	Yes	Yes	Yes
Country effects	No	No	No	No
Event class effects	No	No	No	No
Unobserved heterogeneity	None	Gamma	None	Gamma
Observations	86	86	100	100
Log likelihood	-270.42	41.42	-339.44	70.20

Note: This table presents exponentiated coefficient estimates (hazard ratios) from survival regressions for Gold and Silver medalists that split the sample by years 1896 to 1924 (columns 1 and 2) and years 1928 to 1948 (columns 3 and 4). The estimated hazard ratios on losing are smaller for the later period, which corresponded to greater media coverage of the Olympics. The estimated hazard ratios in the earlier period are not statistically distinguishable from 1. Robust standard errors in parentheses; p-value of the test that the hazard ratio equals 1 in brackets.

Table VII: Statistics of Career Lengths and pre-Olympic Rankings by Finishing Place

	Matched pairs		All	
	Gold	Silver	Gold	Silver
Panel A. Length of total athletic career				
Mean (years)	6.7	5.9	6.2	6.3
p-value of test of equality in means	[0.303]		[0.799]	
Panel B. Length of post-Olympic athletic career				
Mean (years)	2.7	2.5	2.5	3.0
p-value of test of equality in means	[0.776]		[0.328]	
Panel C. Means of pre-Olympic rankings				
Mean ranking before Olympics	9.6	9.8	8.8	13.7
p-value of test of equality in means	[0.966]		[0.173]	
Panel D. Percentiles of pre-Olympic rankings				
% Top 1 before Olympics	27.0	18.9	29.4	16.9
% Top 3 before Olympics	54.1	43.2	54.9	36.6
% Top 5 before Olympics	75.7	51.3	76.5	45.1
% Top 10 before Olympics	86.5	62.1	84.3	56.3
% Top 25 before Olympics	86.5	89.2	84.3	80.3
% Not ranked	2.7	5.4	3.9	4.2

Note: This table displays the average career length, average pre-Olympic rank, and percentiles of pre-Olympic rank for Gold and Silver medalists. Columns 1 and 2 include athletes matched to the same event and year ("matched pairs") and Columns 3 and 4 including all Gold and Silver medalists. Career lengths are calculated based on the number of unique years an athlete recorded a top-100 performance globally in his respective event. Pre-Olympic rankings are calculated based on the 24 months prior to the opening ceremony of each Olympics. Both the mean career length and pre-Olympic rankings are similar between Gold and Silver medalists, and the means are not statistically distinguishable. Yet Gold medalists were more likely to be ranked first, and within the top 3,5, and 10 before the Olympics. Roughly the same percent of Gold and Silver medalists ranked within the top 25.

Table VIII: Cox Regressions with pre-Olympic Rankings

	Subsample: pre-Olympic ranking data available (1)	Subsample: pre-Olympic ranking data available (2)	Subsample: ranked in the top 25 before Olympics (3)
Lose (1=yes, 0=no)	0.465	0.448	0.516
	(0.110)	(0.109)	(0.150)
	[0.001]	[0.001]	[0.023]
Pre-Olympic ranking		0.988	1.019
		(0.004)	(0.022)
		[0.005]	[0.370]
Year of birth	0.948	0.910	0.888
	(0.045)	(0.045)	(0.050)
	[0.260]	[0.056]	[0.035]
Year effects	Yes	Yes	Yes
Individual event effects	Yes	Yes	Yes
Country effects	No	No	No
Event class effects	No	No	No
Observations	116	116	99
Modified R^2 based on Royston (2006)	0.196	0.243	0.232
Log Likelihood	-416.57	-414.12	-339.17

Note: This table presents exponentiated coefficient estimates (hazard ratios) from Cox regressions that include variables measuring the athlete's pre-Olympic ranking. The first column replicates the specification from the main results in Table III on the sub-sample with available ranking data, estimating a hazard ratio of 0.465 on losing. Column 2 adds the athlete's pre-Olympic rank. A higher pre-Olympic rank (worse performance) is positively correlated with lifespan, but the effect of losing remains statistically significant and is of a similar magnitude to the estimate in Column 1. Column 3 restricts the sample to those ranked in the top-25 before the Olympics, and shows no correlation between pre-Olympic ranking and lifespan for this sub-sample. Robust standard errors in parentheses; p-value of the test that the hazard ratio equals 1 in brackets.

Table IX: Distribution of Occupations and Average Earnings by Finishing Place in U.S. Sub-Sample, 1940 dollars

	1st place N=24		2nd place N=30		2nd - 4th places N=74	
Occupation Category	Percent	Mean Earnings	Percent	Mean Earnings	Percent	Mean Earnings
Panel A. Occupations						
Professional Workers	20.8	2,290	70.0	2,815	45.9	2,821
Semiprofessional Workers	16.7	2,167	3.3	1,745	8.1	1,824
Proprietors, Managers, Officials (Except Farm)	29.2	2,568	10.0	2,576	21.6	2,551
Clerical and Kindred Workers	4.2	2,282	6.7	1,751	5.4	1,692
Salesmen	16.7	2,050	3.3	1,964	10.8	2,135
Craftsmen, Foremen, and Kindred Workers	8.3	1,503	0	-	2.7	2,011
Operatives and Kindred Workers	0	-	0	-	1.4	1,706
Farmers and Farm Managers	0	-	3.3	1,147	2.7	1,147
Laborers (Except Farm)	4.2	1,178	3.3	1,178	1.4	1,178
Panel B. Mean differences by finishing place						
Mean earnings		2,198		2,546		2,442
Difference from 1st place mean				348		244
p-value of difference				[0.052]		[0.077]
Panel C. Occupational earnings of parents						
Mean earnings of athlete's father		1,949		1,908		1,967
Difference from 1st place mean				-40.9		18.1
p-value of difference				[0.843]		[0.916]

Note: This table presents statistics on earnings by winners and 2nd-4th place finishers by occupational category in 1940 from the U.S. Census. The annual average earnings by category are constructed from finer 3-digit occupation codes as shown in Appendix C. Mean earnings by occupation are calculated from the IPUMS 1950 1% Census file, which excludes identifying information but provides 3-digit occupation codes and corresponding earnings for both wage and business/farm income. Earnings are deflated to 1940 U.S. dollars. Compared to Gold medalists, both 2nd place and 2nd-4th place finishers recorded occupations that paid higher incomes after the Olympics. Panel C shows there is no difference in parental earnings based on the occupation of the household head reported in the 1900-1930 Censuses. Data on parental earnings is available for 86 athletes.

Table X: OLS and Cox Regressions with Earnings Variables

	Dep var.: Earnings ($100s) OLS		Dep var.: Lifespan Cox	
	1st vs. 2nd place	1st vs. 2nd - 4th places	1st vs. 2nd place	1st vs. 2nd - 4th places
	(1)	(2)	(3)	(4)
Lose (1=yes, 0=no)	3.673	2.300		
	(1.706)	(1.347)		
	[0.036]	[0.091]		
Earnings ($100s), annual			0.963	0.979
			(0.013)	(0.007)
			[0.007]	[0.004]
Year of birth	-0.097	-0.097	0.971	0.988
	(0.103)	(0.067)	(0.021)	(0.014)
	[0.351]	[0.154]	[0.186]	[0.390]
Observations	54	98	54	98

Note: This table presents regressions using information on earnings collected from the 1940 Census. Columns 1 and 2 present OLS regressions of earnings on an indicator for losing. Earnings are measured in 1940 U.S. dollars. Second place finishers earn $367 more than winners, on average, based on their occupation reported on the 1940 Census (Column 1). The group of second to fourth place finishers earn $230 more than winners (Column 2). The regressions also include an indicator for white as reported on the Census. Columns 3 and 4 present exponentiated coefficient estimates (hazard ratios) from Cox regressions of lifespan that include earnings. Earnings are positively correlated with lifespan within the sample. The regressions also include an indicator for white, indicator for any non-wage income, and event effects. Robust standard errors in parentheses; p-value of the test that the coefficient equals 0 (columns 1-2) or that the hazard ratio equals 1 (columns 3-4) in brackets.

Table XI: OLS and Cox Regressions with News Coverage Variables

	Dep var.: Count of news stories OLS		Dep var.: $\mathbf{1}$(News stories > 50) OLS		Dep var.: Lifespan Cox			
	1st vs. 2nd place	1st vs. 2nd - 4th places	1st vs. 2nd place	1st vs. 2nd - 4th places	1st vs. 2nd place	1st vs. 2nd - 4th places	1st vs. 2nd place	1st vs. 2nd - 4th places
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lose (1=yes, 0=no)	-40.652	-68.784	-0.328	-0.371				
	(30.001)	(20.412)	(0.119)	(0.086)				
	[0.182]	[0.001]	[0.008]	[0.000]				
Count of news stories					1.002	1.002		
					(0.002)	(0.001)		
					[0.182]	[0.151]		
$\mathbf{1}$(News stories > 50)							1.598	1.263
							(0.543)	(0.294)
							[0.168]	[0.315]
Year of birth	5.032	3.764	0.027	0.022	0.980	0.980	0.978	0.983
	(1.367)	(0.786)	(0.005)	(0.004)	(0.016)	(0.011)	(0.017)	(0.011)
	[0.001]	[0.000]	[0.000]	[0.000]	[0.216]	[0.069]	[0.199]	[0.125]
Observations	73	133	73	133	73	133	73	133

Note: This table presents regressions using information on newspaper coverage of each athlete. Columns 1-4 present OLS regressions of coverage on an indicator for losing, with coverage defined either as a raw count of news stories (columns 1-2) or as an indicator for the count exceeding 50 (columns 3-4). Columns 5-8 present exponentiated coefficients (hazard ratios) from Cox regressions of lifespan that include news coverage as regressors. All regressions also include event effects. Winners receive more news coverage than losing athletes, although the difference in raw counts between Gold and Silver medalists is not statistically significant (column 1). Coverage is associated with higher mortality (columns 5-8), but the estimates are not statistically significant. Robust standard errors in parentheses; p-value of the test that the coefficient equals 0 (columns 1-4) or that the hazard ratio equals 1 (columns 5-8) in brackets.

Appendix A: Additional Information on Sample Composition [For Online Publication]

This appendix presents more information on the full list of events included in the analysis and on the composition of athletes by country. The number of athletes by country is presented in Table A.1. The first column presents total counts of Gold an Silver, the second column adds Bronze medalists and 4th place finishers, and the third column adds other finalists. The baseline sample of Gold and Silver medalists includes 186 athletes (142 of these have recorded data on height and weight collected from the site Olympedia.org). In both cases, the U.S. accounts for over half of the sample, with the remaining composed of athletes primarily from Western Europe, Scandinavia, and Canada.

Table A.2 lists each event, grouped into one of six mutually exclusive classes of events. Indicators for these six event classes are included in models that include country effects rather than event and year effects. Several individual events were discontinued or replaced in later years (e.g., 200m hurdles, 80m hurdles, 3200m and 4000m steeplechases, pentathlon). The Olympic program in Men's Track and Field has remained largely fixed since 1928. Events that are part of the current Olympic program in Track and Field are denoted with an asterisk in Table A.2.

Table A.1: Number of Observations by Country

Country	1st - 2nd places	1st - 4th places	1st - 8th places
Australasia (Australia and New Zealand)	5	8	15
Argentina	1	3	6
Austria	0	0	1
Belgium	1	3	5
Brazil	0	0	3
Canada	5	11	20
Cuba	0	1	1
Czechoslovakia	1	5	6
Denmark	0	3	7
Estonia	1	1	1
Finland	11	30	52
France	5	13	25
Great Britain	21	35	66
Germany	3	16	29
Greece	3	5	7
Haiti	1	1	1
Hungary	4	6	15
Ireland	0	1	1
Italy	3	10	16
Japan	2	4	8
Latvia	1	2	3
Netherlands	0	0	5
Norway	2	9	14
Poland	0	2	2
South Africa	3	3	10
Sri Lanka	1	1	1
Switzerland	2	3	7
Sweden	10	30	59
Turkey	0	1	1
USA	99	185	264
Yugoslavia	1	1	3
Total	186	393	654

Table A.2: Categorization of Individual Events into Event Classes

Sprints	Middle-distance	Distance	Throws	Field	Racewalk
100m*	800m*	3000m	56lb weight	Decathlon*	3000m walk
100m hurdles	1500m*	3000m steeplechase*	Discuss*	Heptathlon	3500m walk
110m hurdles*		3200m steeplechase	Discuss, ancient style	Pentathlon	10km walk
200m*		4000m steeplechase	Discuss, both hands	Triathlon (long jump, shot, 100y)	10 mile walk
200m hurdles		5000m*	Hammer*	High jump*	20km walk*
400m*		5 miles	Javelin*	High jump, standing	50km walk*
400m hurdles*		10000m*	Javelin, freestyle	Long jump*	
60m		Marathon*	Shot put*	Long jump, standing	
80m hurdles			Shot put, both hands	Pole Vault*	
				Triple jump*	
				Triple jump, standing	

Note: * denotes event is part of current Olympic program in Track and Field.

Appendix B: Robustness Tests [For Online Publication]

The correlation between lifespan and losing is robust to relaxing the sample restrictions and other extensions described in the main text. Table B.1 presents regression results that exclude any athletes who die before age 40, in addition to dying in war. Deaths before age 40 may represent noise rather than a response to winning or losing in the Olympic Games. The magnitudes of the coefficient estimates are larger (smaller hazard ratios) than the main results in Table III and are more precisely estimated. Similar results are obtained in using other age cutoffs, such as age 30 or 50. The main findings are also robust to including athletes who compete in multiple Olympic Games, using either the best finish from their first Olympics (when "treatment" is first assigned) or across all Olympic Games as shown in Table B.2. The estimates are closer to 1 and in some cases less precise than the main results in Table III, however. Table B.3 presents regressions that cluster standard errors on event and year. The precision of the estimates changes only slightly from the main results in Table III. The estimates are also robust to defining lifespan as the number of days alive after the athlete's first Olympic Games, rather than using the athlete's date of birth (Table B.4). Tables B.5-B.7 present results from supplementary analyses of mechanisms. Table B.5 shows there are not statistically significant differences in labor supply, home ownership, or marital status between winners and losers. Table B.6 replicates Table X with earnings reported in logs rather than levels. Table B.7 presents results with alternative measures of news coverage variables. Some news coverage variables are positively correlated with mortality at marginal significance levels, though only in the broader set of losing athletes that includes Bronze medalists and 4th place finishers.

Table B.1: Robustness Tests: Survival Regressions Excluding Deaths Before Age 40

	Cox	Cox	Gompertz	Gompertz
	(1)	(2)	(3)	(4)
Lose (1=yes, 0=no)	0.638	0.641	0.640	0.645
	(0.116)	(0.117)	(0.120)	(0.121)
	[0.013]	[0.015]	[0.017]	[0.019]
Year of birth	0.979	0.981	0.984	0.985
	(0.034)	(0.034)	(0.033)	(0.033)
	[0.548]	[0.577]	[0.615]	[0.654]
World Record holder		0.822		0.794
(1=yes, 0=no)		(0.258)		(0.304)
		[0.533]		[0.546]
Year effects	Yes	Yes	Yes	Yes
Individual event effects	Yes	Yes	Yes	Yes
Country effects	No	No	No	No
Event class effects	No	No	No	No
Unobserved heterogeneity	None	None	Gamma	Gamma
Observations	179	179	179	179
Log likelihood	-724.95	-724.82	108.35	108.54

Note: This table presents exponentiated coefficient estimates (hazard ratios) from survival model regressions. As a check that the main results are not driven by outliers, athletes who die before age 40 are excluded. Losing is defined as finishing in second place. Columns 1 and 2 estimate Cox models. Columns 3 and 4 estimate Mixed Proportional Hazards (MPH) models that assume the hazard follows a Gompertz distribution and allows for individual heterogeneity that follows a Gamma distribution. Compared to the main results in Table III, the estimates on losing are farther away than 1 and more precise, reinforcing the main results. Robust standard errors in parentheses; p-value of the test that the hazard ratio equals 1 in brackets.

Table B.2: Robustness Tests: Survival Regressions Including Multiple Olympic Games

	1st vs. 2nd places				1st vs. 2nd-4th places			
	Rank using best finish from:				Rank using best finish from:			
	first Olympic Games		any Olympic Games		first Olympic Games		any Olympic Games	
	Cox	Gompertz	Cox	Gompertz	Cox	Gompertz	Cox	Gompertz
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lose (1=yes, 0=no)	0.807	0.818	0.780	0.791	0.791	0.806	0.819	0.833
	(0.101)	(0.102)	(0.096)	(0.094)	(0.078)	(0.077)	(0.081)	(0.080)
	[0.086]	[0.106]	[0.044]	[0.049]	[0.017]	[0.024]	[0.045]	[0.057]
Year of birth	1.023	1.024	1.024	1.024	1.022	1.023	1.021	1.022
	(0.020)	(0.022)	(0.020)	(0.019)	(0.013)	(0.013)	(0.013)	(0.013)
	[0.236]	[0.279]	[0.230]	[0.195]	[0.090]	[0.068]	[0.106]	[0.080]
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual event effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	No	No	No	No	No	No	No	No
Event class effects	No	No	No	No	No	No	No	No
Unobserved heterogeneity	None	Gamma	None	None	None	Gamma	None	None
Observations	316	316	316	316	598	598	598	598
Log likelihood	-1468.71	124.36	-1468.14	124.89	-3189.06	192.07	-3189.78	191.47

Note: This table presents exponentiated coefficient estimates (hazard ratios) from survival model regressions. These samples include athletes competing in multiple Olympic Games, taking either their best finish from their first Olympics (columns 1,2, 5, and 6) or from their entire Olympic career (columns 3,4,7, and 8). The estimates are similar to the main results from Tables III and IV. Models presented in Columns 4 and 8 do not include unobserved heterogeneity because those models failed to converge. Robust standard errors in parentheses; p-value of the test that the hazard ratio equals 1 in brackets.

Table B.3: Robustness Tests: Regressions with Standard Errors Clustered on Event and Year

	Sample: 1st vs. 2nd places				Sample: 1st vs. 2nd - 4th places		Sample: 1st vs. 2nd - 8th places	
	Cox (1)	Gompertz (2)	Cox (3)	Gompertz (4)	Cox (5)	Gompertz (6)	Cox (7)	Gompertz (8)
Lose (1=yes, 0=no)	0.691	0.714	0.766	0.764	0.742	0.766	0.759	0.784
	(0.130)	(0.130)	(0.133)	(0.125)	(0.094)	(0.095)	(0.087)	(0.089)
	[0.049]	[0.064]	[0.126]	[0.099]	[0.019]	[0.032]	[0.016]	[0.032]
Year of birth	0.989	0.997	0.976	0.977	1.011	1.013	1.014	1.015
	(0.034)	(0.032)	(0.007)	(0.007)	(0.019)	(0.018)	(0.013)	(0.013)
	[0.740]	[0.915]	[0.001]	[0.000]	[0.576]	[0.485]	[0.281]	[0.227]
Year effects	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Individual event effects	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Country effects	No	No	Yes	Yes	No	No	No	No
Event class effects	No	No	Yes	Yes	No	No	No	No
Unobserved heterogeneity	None	Gamma	None	Gamma	None	None	None	None
Observations	186	186	186	186	393	393	654	654
Log likelihood	-758.23	82.79	-766.69	74.22	-1926.85	130.52	-3541.83	184.66

Note: This table presents exponentiated coefficient estimates (hazard ratios) from survival model regressions, with robust t-statistics clustered by event and year in parentheses. The precision of the estimates is similar to the main results from Tables III-V that do not cluster standard errors, and is only slightly changed by clustering. The estimates become slightly less precise in Columns 1-4 and slightly more precise in Columns 5-8. Robust standard errors in parentheses; p-value of the test that the hazard ratio equals 1 in brackets.

Table B.4: Robustness Tests: Lifespan Calculated as Days Alive post-Olympic Games

	Cox (1)	Cox (2)	Gompertz (3)	Gompertz (4)
Lose (1=yes, 0=no)	0.717	0.720	0.709	0.714
	(0.128)	(0.129)	(0.128)	(0.129)
	[0.063]	[0.067]	[0.057]	[0.062]
Year of birth	0.904	0.905	0.903	0.904
	(0.033)	(0.033)	(0.030)	(0.030)
	[0.006]	[0.006]	[0.002]	[0.003]
World Record holder (1=yes, 0=no)		0.836		0.809
		(0.259)		(0.305)
		[0.564]		[0.575]
Year effects	Yes	Yes	Yes	Yes
Individual event effects	Yes	Yes	Yes	Yes
Country effects	No	No	No	No
Event class effects	No	No	No	No
Unobserved heterogeneity	None	None	None	None
Observations	186	186	186	186
Log likelihood	-756.19	-756.08	-4.35	-4.19

Note: This table presents exponentiated coefficient estimates (hazard ratios) from survival model regressions, in which survival is calculated as the number of days alive after the athlete's first Olympic games rather than the athlete's date of birth. Columns 1 and 2 estimate Cox models. Columns 3 and 4 estimate survival models that assume a Gompertz distribution for the hazard. Models with unobserved heterogeneity failed to converge. The coefficient estimate below 1 on losing indicates the hazard of death is lower among Silver medalists than Gold medalists. Robust standard errors in parentheses; p-value of the test that the hazard ratio equals 1 in brackets.

Table B.5: Robustness Tests: OLS regressions of Other Census Variables

Panel A. 1st vs. 2nd place

	Weeks worked in 1939	Hours worked previous week	Home ownership (1=yes, 0=no)	Married in 1940 (1=yes, 0=no)
	(1)	(2)	(3)	(4)
Lose (1=yes, 0=no)	-2.627	-0.590	0.079	0.046
	(2.748)	(4.975)	(0.130)	(0.110)
	[0.344]	[0.906]	[0.548]	[0.677]
Observations	50	46	54	54
1st place mean	49.2	45.6	0.375	0.792

Panel B. 1st vs. 2nd - 4th places

	Weeks worked in 1939	Hours worked previous week	Home ownership (1=yes, 0=no)	Married in 1940 (1=yes, 0=no)
	(1)	(2)	(3)	(4)
Lose (1=yes, 0=no)	-0.985	-1.991	0.062	0.011
	(1.928)	(4.368)	(0.104)	(0.090)
	[0.611]	[0.650]	[0.550]	[0.907]
Observations	91	83	98	98
1st place mean	49.2	45.6	0.375	0.792

Note: This table presents results from OLS regressions of other Census variables on losing, also controlling for event effects and year of birth. Panel A includes Gold and Silver medalists. Panel B adds Bronze medalists and 4th place finishers to the group of losing athletes. Gold medalists report more weeks and hours worked, lower rates of home ownership, and lower rates of marriage than losing athletes, but differences are not statistically significant. Robust standard errors in parentheses; p-value of the test that the coefficient equals 0 in brackets.

Table B.6: OLS and Cox Regressions with Log Earnings

	Dep var.: Log earnings OLS		Dep var.: Lifespan Cox	
	1st vs. 2nd place (1)	1st vs. 2nd - 4th places (2)	1st vs. 2nd place (3)	1st vs. 2nd - 4th places (4)
Lose (1=yes, 0=no)	0.143	0.093		
	(0.074)	(0.059)		
	[0.057]	[0.117]		
Log earnings, annual			0.572	0.771
			(0.102)	(0.064)
			[0.002]	[0.002]
Year of birth	-0.004	-0.004	0.968	0.994
	(0.004)	(0.003)	(0.025)	(0.015)
	[0.351]	[0.154]	[0.201]	[0.675]
Observations	54	98	54	98

Note: This table presents regressions using information on earnings collected from the 1940 Census. Columns 1 and 2 present OLS regressions of log earnings on an indicator for losing. Second place finishers earn 14.3 percent more than winners, on average, based on their occupation reported on the 1940 Census (Column 1). The group of second to fourth place finishers earn 9.3 percent more than winners, though the result is not significant at conventional levels (Column 2). The regressions also include an indicator for white as reported on the Census. Columns 3 and 4 present exponentiated coefficient estimates (hazard ratios) from Cox regressions of lifespan that include earnings. Earnings are again positively correlated with lifespan within the sample. The regressions also include an indicator for white, indicator for any non-wage income, and event effects. Robust standard errors in parentheses; p-value of the test that the coefficient equals 0 (columns 1-2) or that the hazard ratio equals 1 (columns 3-4) in brackets.

Table B.7: OLS and Cox Regressions with Alternative News Coverage Variables

	1st vs. 2nd place	1st vs. 2nd - 4th places	1st vs. 2nd place	1st vs. 2nd - 4th places	1st vs. 2nd place	1st vs. 2nd - 4th places
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A. OLS regressions of newspaper coverage					
	Dep var.: Log count of news stories		Dep var.: **1**(News stories > 75)		Dep var.: **1**(News stories > 100)	
Lose (1=yes, 0=no)	-0.575	-1.056	-0.284	-0.346	-0.233	-0.314
	(0.428)	(0.350)	(0.117)	(0.088)	(0.111)	(0.085)
	[0.186]	[0.003]	[0.019]	[0.000]	[0.040]	[0.000]
	Panel B. Cox regressions of lifespan					
	(1)	(2)	(3)	(4)	(5)	(6)
Log count of news stories	1.158	1.093				
	(0.111)	(0.078)				
	[0.125]	[0.216]				
1(News stories > 75)			1.427	1.535		
			(0.476)	(0.399)		
			[0.286]	[0.099]		
1(News stories > 100)					1.584	1.544
					(0.593)	(0.394)
					[0.219]	[0.089]
Observations	73	133	73	133	73	133

Note: This table presents regressions using information on newspaper coverage of each athlete. Panel A presents OLS regressions of coverage on an indicator for losing, with coverage defined either as a raw count of news stories (Panel A, columns 1-2) or as an indicator for the count exceeding 50 or 100 (Panel B, columns 3-6). Panel B presents exponentiated coefficients (hazard ratios) from Cox regressions of lifespan that include news coverage as regressors. All regressions also include event effects. Winners receive more news coverage than losing athletes, although the difference in log stories between Gold and Silver medalists is not statistically significant. Coverage is associated with higher mortality (Panel B), although the estimates are either marginally significant at 10 percent or not statistically significant. Robust standard errors in parentheses; p-value of the test that the coefficient equals 0 (Panel A) or that the hazard ratio equals 1 (Panel B) in brackets.

Appendix C: Data Collection and Analysis of U.S. Census Surveys [For Online Publication]

This appendix describes the procedure for collecting Census records for each athlete. Individual Census records are made publicly available 72 years after each survey. The genealogy website Ancestry.com provides digitized Census records from each Census from 1850 through 1940, which can be used to identify specific people based on information recorded in the surveys. To retrieve the records for each U.S. athlete, I first searched using the athlete's name, year of birth, and state of birth. I also followed the "Suggested Hints" provided by Ancestry, which link to other Census records as well as other documents like birth, marriage, and death certificates and army registration cards. These hints are created through a machine learning process and through the family trees built by genealogical research that link historical records together. In some cases, the names on the original hand-written Census records are imprecise, leading to the digitized records to be misspelled and requiring additional strategies to search for athletes. For example, Ancestry's digitized records mistakenly list Edward Gourdin as Edward Gonodin, Robert Van Osdel as Robert Van Vadel, Leo Sexton as Leo Septon, and Raymond Barbuti as Raymond Barbutte. To locate athletes whose names do not appear on any of the search returns, I conduct a geographical search that starts with recent known street addresses from either 1930 Census records or army registration cards. The army registration cards also include the date of birth, rather than simply the year of birth as recorded in the Census records, which increases the likelihood of a match along with the athlete's name and place of birth. I then work backwards, manually combing through the the list of Census records from a specific geographical location to retrieve the records of athletes whose names have been misspelled. When street addresses are not available, I begin with all males born in the athlete's state of birth during a 1-year window (older and younger) around the athlete's year of birth.

This process retrieves 64 percent of U.S. athletes in the 1940 Census who competed between 1908 and 1936. Other studies in economic history that merge individual records across surveys by surname, year of birth, and place of birth, tend to have substantially lower match rates because they use much larger samples of Census data (see, for example, Abramitzky et al. 2012, 2014; Bleakley and Ferrie 2016). The higher rate obtained here is achieved by a detailed inspection for each athlete based not only on searching by name, but also on geographic and demographic information collected from other biographical sources to narrow the search process.

The 1940 Census includes variables for wage income earned in 1939 and whether any income was earned from supplemental sources (yes or no). The survey also collects the number of weeks worked in 1939, number of hours worked the prior week, whether the person owns their home or rents, and their stated occupation and industry of employment. The digitized records available on Ancestry include the name of the occupation but not the 3-digit occupation code used for classification, which are instead only listed on the hand-written sheets. I collect the 3-digit occupation codes for each athlete from their original Census records. The 1910, 1920, and 1930 Censuses include occupation and industry but not income. I link athletes to these earlier surveys to record the occupations of their parents.

Earnings by occupation are imputed using the average earnings in the 1% 1950 IPUMS Census file for males aged 20-64 in the labor force, weighted using the survey's person-level sample weights. The 1950 Census includes both wage income and income from business/farm activity. Income is averaged for each of the 235 different occupation codes in the 1940 Census classification, using an IPUMS crosswalk between occupation codes in 1940 and 1950. Table C.1 below lists the distribution of occupation categories that aggregate 3-digit occupation codes and mean estimated earnings among this group.

Table C.1: Distribution of Occupations among U.S. Males Aged 20-64 in Labor Force, 1940

Occupation Category	Percent
Professional Workers (Codes V00-V52)	4.0
Semiprofessional Workers (Codes V60-94)	0.8
Proprietors, Managers, Officials, Except Farm (Codes 100-156)	8.8
Clerical and Kindred Workers (Codes 200-266)	7.2
Salesmen (Codes 270-298)	5.8
Craftsmen, Foremen, and Kindred Workers (Codes 300-398)	14.8
Operatives and Kindred Workers (Codes 400-496)	17.0
Domestic Service Workers (Codes 500-520)	0.5
Protective Service Workers (Codes 600-614)	1.8
Service Workers, Except Domestic and Protective (Codes 700-798)	4.2
Farmers and Farm Managers (Codes 000-022)	14.1
Farm Laborers and Foremen (Codes 844-888)	7.5
Laborers, Except Farm (Codes 900-988)	13.5
Mean earnings ($)	1,699

Note: This table presents the distribution of occupations and mean earnings by occupation using data from the 1940 U.S. Census. Occupation codes are based on the 1940 classification and categorized by aggregating finer 3-digit codes presented in parentheses. Earnings are measured in 1940 dollars.