

Major league baseball career length in the 20th century

William D. Witnauer · Richard G. Rogers · Jarron M. Saint Onge

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Abstract The sport of baseball has used statistics to enhance understanding for fans for over a century, yet there is limited data on player careers. This study fills that void by examining the careers of baseball players over the last century. Between 1902 and 1993, 5,989 position players started their careers and played 33,272 person years of major league baseball. A rookie position player can expect to play 5.6 years; one in five position players will have only a single-year career, and at every point of a player's career, the chance of exiting is at least 11%. Position players who start younger and begin their careers in more recent decades all have longer and more stable careers; nevertheless, baseball careers are not compressed versions of normal careers, but are substantially skewed toward early exit.

Keywords Baseball · Major league · Life tables · Demographic techniques

Introduction

Although baseball has long been considered “the” American pastime, little is known about the career prospects of the individuals who play the game. This is surprising given the detailed historical data on baseball players and the large number of working life tables for various occupations. We use life tables to examine a number of factors, including period/era played and player's age at the start of his career, that influence the career length of approximately 6,000 major league baseball position players over the last century.

W. D. Witnauer
86 Castle Ct, Amherst, NY 14226, USA

R. G. Rogers (✉) · J. M. Saint Onge
Population Program and Department of Sociology, University of Colorado, Boulder,
CO 80309-0484, USA
e-mail: Richard.Rogers@colorado.edu

An understanding of the factors affecting career longevity and performance within the workforce is useful in modeling the effects of demographic changes on various labor force outcomes. The ability to become and remain employed and succeed in the labor force confers economic, social, physical, and psychological rewards. For example, compared to individuals who are not in the labor force, employed individuals with high-level occupational status generally live longer and healthier lives (Monson 1986; Preston and Taubman 1994; Rosenberg et al. 1993; Rogers et al. 2000; Sorlie and Rogot 1990). Individuals enter and exit the labor force and undergo various transitions throughout their careers. There is a long and rich demographic history of examining working life tables at the national level by sex and race, and among specific occupations and industries, including laborers in the construction industry, salaried workers in the automobile industry, and priests and other religious officials within the church (Siegel, 2002). The examination of factors that influence careers—including baseball—will therefore inform broader demographic, economic, and sociological concerns.

Several characteristics distinguish professional sports careers from most other careers. Notably, players know (but do not necessarily accept) that the role is temporary, exit is often involuntary, and the elite status conferred by the role is difficult to achieve after leaving the role (Drahota and Eitzen 1998). The odds of becoming a professional athlete are low, and even after a rigorous selection process, a major league career may be brief (Coakley 1994; Figler 1981; Guttmann 1988). Just two of 10,000 males aged 15 to 39 reach professional athlete status (Leonard 1996). The odds are better for high school athletes: the odds of a high school baseball player entering the major leagues are 0.002, roughly the same for football players and two times better than for basketball players (Leonard 1996). Whereas a career in professional baseball is prestigious in itself, some players garner more prestige than others. Therefore, an examination of the factors that affect these players will also provide information regarding more routine careers.

It is difficult to determine accurate baseball career lengths because many researchers have calculated simple averages, and have based their estimates on selected years, players, or subsamples of all baseball players. Jiobu (1988) found the median career length of major league baseball players to be 11.8 years for blacks, and 10.0 years for both whites and Latinos. Schulz et al. (1994) found that about 55% of all major league players who played in 1965 had ten-year careers. These astonishingly high averages are due partly to the fact that Jiobu (1988) included only individuals who played in at least 50 games, and Schulz et al. (1994) did not adjust for the increased number of opportunities created in the expansions of 1961, 1962, 1969, and to some extent 1977. Thus, these estimates may inflate the actual years of expected play.

Baseball careers are not normally distributed. Instead, the careers are skewed, with many players experiencing one or two years of play, and a rarefied few enjoying 20 or more years of play. Rosenberg (1980) used life tables to examine two five-year cohorts of baseball players, one from the early 1950s and one from the early 1960s. He found that there was a significant difference between median and mean career length, showing that the few long careers skewed the numerous shorter careers. In comparing the two decades, he found a significant increase in the percentage of players playing more than four years.

Important to this study is the comprehension of how age can affect career longevity. Younger players may enjoy longer careers than older players because they possess the requisite athletic skills and abilities, and because of the physical demands of the sport, which may decline with age. But individuals who prematurely enter the major leagues may place themselves at a career disadvantage, especially relative to slightly older players who may benefit from more time to obtain additional coaching, develop their strength and skills, and acquire experience and maturity (Jiobu 1988). Furthermore, it is unclear how much a one-year delay in starting play affects total career length, valuable information for both players and teams.

Career longevity is linked to age and job performance. The effect of age on performance follows a general trend: productivity tends to increase at a rapid rate until a peak age of productivity is reached, after which productivity diminishes gradually (Lehman 1953; Schulz and Curnow 1988; Simonton 1990). The age of peak performance varies, and it depends on the career choice and the field of creative output (Lehman 1953). The age of peak performance in professional baseball tends to be earlier than the average career, which is understandable given the physical demands and coordination required to play professional sports (Schulz et al. 1994).

For different ages there are different performance expectations, and failure to meet these expectations will likely end a career (Faulkner 1975; McPhearson 1980). In the minor leagues, it is easier to determine the future of baseball players at performance extremes: exceptional players are promoted to higher leagues and sub-par players are dropped from the team. Players near the margins may linger at the same level, too good to let go but not good enough to promote (Spurr and Barber 1994). Schulz et al. (1994) analyzed 388 baseball players active in 1965 “to determine the age of peak performance for skills required to play baseball, to derive age-performance curves for athletic productivity, and to assess the magnitude of individual differences among elite and less able players” (p. 274). They examined starting age, exit age, and ability relative to career length. They found that the age of peak performance was between ages 27 and 30 and that star players peaked earlier and maintained their peak performance longer. But their sample was small and biased: they included players with career lengths of over ten years and selected players from a single year, 1965, partly on the grounds that “major changes in the game were unlikely to complicate the interpretation of performance data” (p. 275). We argue the opposite: careers are likely to be longer for players who played in 1965 or more recently because of the effects of league expansion throughout the decade. Furthermore, it is important to examine different eras to determine the period effects on career expectancies.

Several researchers have examined withdrawal rates among baseball players. Rosenberg (1980) found the 1950s cohort first-year withdrawal rate (26.7%) to be nine percentage points greater than the 1960s cohort withdrawal rate (17.6%). Whereas the exit rates are generally higher in the 1950s, both cohorts show a similar pattern of high exit rates in year one, followed by a steady decrease to a nadir around 10% in year five, and then steady increases to year 10, with an exponential increase thereafter. Although this study provides valuable information, the size of the cohorts is small (each under 650). Moreover, Rosenberg proffers no explanations for the differences between the decades, though it seems obvious

that the league expansion from 16 to 24 teams during the 1960s diluted the labor pool and likely extended careers in the later cohort.

Ballplayers leave the game for a wide variety of reasons, including retirement, other career opportunities, injuries, drug and alcohol abuse, gambling problems, and death. Many players wish to continue to play because they love the game; some, because of low levels of education and little job experience, may lack alternate career choices (Rosenberg 1980). Because of the required time, energy, and focus, it is nearly impossible to develop a career outside of sports while actively playing ball (McPhearson 1980). Historically, salaries were insufficient to afford players comfortable early retirement. Rosenberg (1980) foresaw the increase in salaries and predicted that this increase would lead to better post-baseball adjustments and more athletes who “quit while they are ahead.” Higher salaries afford individuals the opportunity to comfortably retire from baseball, even at early ages.

Many professional athletes retire because of injuries. Overfield (1989) established that eight twentieth-century players had their careers significantly altered after being struck by a pitch. One study of 511 retired baseball players demonstrated that 45.2% indicated forced retirement (Lerch 1979). This number seems surprisingly low, considering the numerous anecdotal accounts in the baseball literature and other role exit studies that show leaving the status of professional athlete as undesirable and difficult. For instance, following a 24-year career, Pete Rose stated, “I would walk through hell in a gasoline suit to keep playing baseball” (Lahman 1999: 2505).

And there are more unfortunate reasons why some players’ careers are cut short. After extensive archival research on players from 1900 through 1992, Gutman (1992) cites 20 sex scandals, numerous gambling malefactions, 31 players banned for life, 63 players who were “named, arrested, treated or have admitted to having used cocaine” (p. 109), and numerous drinking problems. One player died of on-field injuries, eighteen died within 12 months of having played, four active players had been murdered, and five had committed suicide.

Of course, some baseball players fare quite well upon retirement. Talamani (1989) found that after retirement from major league baseball, 74% of players held “high prestige” jobs, including some in business, finance, and politics, and that 42% still had jobs associated with the sports world. This is a clearly positive depiction of life after baseball, but included only players whose addresses were known and who were employed, which likely biases Talamani (1989) studies. Those accomplishments are all the more impressive once one considers that in 2004, only 42 major league baseball players, or 5.6% of the league, had earned college degrees (Shea 2004).

Baseball has witnessed both expansions and contractions during the last century, changes that have affected players’ career prospects. For this study, we examine the Early, Golden, and Modern eras (for similar coding, see Thorn et al. 2004). In the Early Era, between 1902 and 1945, baseball emerged as a popular fan sport.¹ There were 16 teams in the American and National Leagues combined, plus the

¹ Although *Total Baseball* begins the early era in 1901, we chose to use 1902 to add an extra year of stability to our data.

Federal League, which existed for two years, 1914 and 1915, and consisted of eight teams that competed against the National and American leagues. World War I may have affected players starting in this era. In the first half of this era, there was a comparative paucity of home runs hit, owing largely to the dominance of pitching and the character of the ball itself. The second half of the era was the time when Babe Ruth and Lou Gehrig played most of their careers. There were still only 16 teams in the league, but the ball was made “livelier” so that home runs increased, and with them, fan attendance. Baseball was extremely stable in terms of rules, teams, and image. World War II affected the end of this era. During the war years, many players were drafted into military service, which shortened or ended their major league careers but provided opportunities for other individuals to play.

During the Golden Age (1946–1968), players returned from the war and baseball returned to prewar standards.² This era also included the beginning of team expansion. Players who started in this era had their careers significantly influenced by the expansion of baseball in 1961 (two teams), and 1962 (two teams). The major leagues became racially integrated during the Golden Age, in part through the recruiting of players from the Negro Leagues, beginning with Jackie Robinson in 1947 (Tygiel 2004). Gates Brown, who signed with the Detroit Tigers in 1965, was the last player to leave the Negro leagues for the major leagues.

The Modern Era (1969–2003) is characterized by rule changes, free agency, additional league expansion, and an increased recruitment of foreign players. Rule changes included a reduced strike zone, lowered mound, and the addition of the designated hitter in 1973. Following a movement by the players’ union in 1974, the players were permitted to negotiate moves between teams. Free agency, which allows for long-term guaranteed contracts and allows a player to sell himself to anyone who is willing to pay him, surely enabled some players to extend their careers. Also during this era, the league further expanded by adding four teams in 1969, two teams in 1977, and two more teams in 1993 and 1998. This era has also increasingly witnessed a player pool expansion with foreign-born players from around the world, especially from Latin American countries (with players including Hall of Famers Rod Carew and Roberto Clemente) and more recent expansion from Asia. Compared to the U.S. population, major league baseball is increasingly diverse; between 1971 and 1985, Jiobu (1988) found that 25.0% of the players were black (compared to 11.7% nationally), 14.3% were Hispanic (compared to 6.4% nationally), and 60.7% were white.

Aims

Drawing from previous research, we have formulated three aims regarding the career patterns of position players. First, we empirically determine the average career length of major league baseball players through life table methods. Next, we examine how age of entry affects longevity. There are two possible outcomes.

² The Korean War created a similar but smaller effect. Hall of fame member Ted Williams exemplifies this: he lost all or part of five seasons when he enlisted in both World War II and the Korean War.

Most likely, players who start at younger ages will enjoy longer careers because they may have demonstrated promise early on; may have faster reaction time, speed, and muscle mass; may be less prone to injury; and if injured, may recover more quickly (see Shulz et al. 1994). Alternatively, older players may have more time to develop their skills and use their experience and maturity to translate into longer careers (Jiobu 1988). Finally, we examine how era influences career length. Eras with fewer teams and lower salaries may have more players who will witness shorter careers than eras with league expansion, free agency, and high salaries.

Data and methods

Typical studies of baseball players analyze cross-sectional data or examine a small cohort from one era. Such data sets may obscure trends that evolve over longer periods and among larger cohorts. Moreover, many analytical techniques are not particularly well-suited for establishing the length of a player's career. We use life table analyses to determine players' careers, an especially useful technique to produce our results. Furthermore, our data provide a more comprehensive analysis of trends over time by including every player who started his career between 1902 and 1993.

The data for this study were created from the bibliographic listings of every major league baseball player compiled in *Total Baseball* (Thorn et al. 2004), which is more current and complete than similar sources such as the *Baseball Encyclopedia*. Statistics on baseball players have been well maintained since the inception of the game in the nineteenth century, and the records in *Total Baseball* are the product of over forty years of in-depth historical research. *Total Baseball* includes a wealth of information, including the year a player's career started, the year his career ended, total years/seasons played, year of birth, and year of death. From this information, we calculated starting age in the major leagues, career span, and era played for position players. We excluded pitchers because they occupy a unique position and because they are especially prone to injury (Okrent 1999).

Baseball statistics remain remarkably stable. For instance, in 1876, the number of official fielding statistics recorded was six; today it is still six, except for catchers, who also have the category of passed balls (Thorn et al. 1999b). Nevertheless, some information is not reported, is misrecorded, or is inconsistent because different statistical measures are used at different times. For instance, at various times, sacrifices have been counted as hits or at bats, or have not been counted at all; today, they are counted as a separate category. There was also a time when a walk was counted as a hit and batters routinely batted over 0.400 (Thorn et al. 1999b). Further bedeviling comparisons are the changes made to the game. For example, a "livelier" ball was introduced in 1920, and the pitcher's mound was lowered in 1969, both of which affected statistics.

To ensure accurate statistics and comparable information with comparisons over time, we limited our data set to the years 1902–2003, thus avoiding the late-nineteenth century period when numerous "major leagues" existed, the number of teams fluctuated, and each league had different rules and different record keeping, complicating comparisons across even one year. In analyzing data on major league

position players, we adjust for left and right censoring. We deal with left censoring by selecting players who began their careers in 1902 or later. Although we have data through 2003, players who began their careers recently may not have had time to complete their careers. Therefore, we adjust for right censoring by selecting players who began their careers in 1993 or earlier. We choose this upper limit so that very few players in the study would have indeterminate career lengths. Of the 552 players who debuted in 1993, 96% had completed their careers by the end of the year 2003. Of the remaining 21 individuals who continued to play past the year 2003, each was assigned a career length of 10 years. An additional 61 players who began their careers prior to 1993 have undetermined career lengths as of 2003. In this case, each player was given a career length of the time of debut until the censoring in 2003. For example, Barry Bonds debuted in 1986 and is still playing after 20 seasons. But because of censoring, he has a career length of 18 years in this analysis. This small number of right-censored players has a slight dampening effect on the career expectancies over eras and an exceptionally small effect on the overall career expectancies for years of play that are 10 years or higher. Nonetheless, the career expectancies for the modern era are conservatively estimated and are slightly lower than they would be if we had complete information.

Defining the first year of play presents a challenge. Selecting individuals who have played in at least one major league game may be too liberal because it includes too many marginal minor league players who may have been called up for a “cup of coffee” at the end of the season when teams can expand their rosters from 25 to 40 players. Such an expansion represents a way for the major league teams to promote, try out, or reward minor league players. Including the relatively large number of potentially marginal minor league players to play in the last month of the major league season will artificially amplify the number of single-year careers and first-year exits, and thus dampen the total expected career years. Thus, we exclude 618 players who were solely called up for a “cup of coffee”—those with debut dates of September 1 or later who are on the roster for the single month or less—but include players with late debut dates who continue to play for at least another year.³ In this study, all references to year refer to starting year. Thus, the Early Era, defined as 1902 to 1945, refers to all players who started their careers during this time.

Career length reflects the number of years when a player played in at least one game.⁴ Even a player who simply pinch-hits once is considered to have played a

³ Excluding players who came up to the major league solely for a “cup of coffee” produces 5,989 players beginning their first year of play, a total career expectancy of 5.3 years for those in their first year of play, and an exit rate in the first year of play of .20. The more liberal inclusion of those players who came up for a cup of coffee produces more players during the first year of play (6,607), a lower comparable career expectancy (5.2 years), and a substantially higher first year exit rate (0.26).

⁴ We examine players’ years of play based on a unistate life table model and do not distinguish between consecutive and nonconsecutive years of play. Out of the 5,989 players we analyze, 66.1% played in consecutive years. Nonconsecutive year play may be due to players moving between the majors and minors, disability, poor health, alcohol or drug problems, or other personal problems. For players who played multiple years, our data allow us to determine multiple entries and exits, but we do not have information about activities during these gaps. If data were available, researchers could also present multistate analyses to estimate transitions from one state to others (e.g., from the major leagues to the minor leagues, disability, retirement, or death).

year, but a player could be on a team roster for a significant portion of a year and not be counted if he did not appear in a game. All years played reflect only years played in major league baseball; no data from the minor leagues are included. The Federal League, however, is included, as it is considered a major league by *Total Baseball* and the National Baseball Hall of Fame (Thorn et al. 1999a). It should also be noted that years are measured as integers rather than fractions.

Life table methodology

We employ life table analysis to show the average number of years a player can expect to play, and the probability at any given point of ending a career (see Kintner 2004 for a useful review). “The life table shows the proportion of a population or sample who survive at specific durations after exposure to an event risk” (Smith 1992: 73). Life tables have been used to study a variety of issues including working, retired, married, and disability-free lives (Gendell 1998; Pollard et al. 1990), and thus are well-suited to depict the careers of baseball players.

While we calculate l_x (number of players at beginning of the interval), d_x (number of players exiting during the interval), q_x (proportion exiting during the interval: d_x / l_x), L_x (the average player years in the given interval: $(l_x + l_{x+1})/2$), T_x (player years in current and subsequent intervals:

$$T_x = \sum_{y=x}^{y=w} L_y,$$

where w is the last year of play in the career table), and e_x (average remaining career years: T_x / l_x) life table values, we focus on e_x and q_x (see Kintner 2004 for further discussion of the life table calculations). The e_x is the career expectancy at the beginning of the career year interval. Thus, upon entry into major league baseball, e_0 indicates the average length of a player’s total career. The q_x is the proportion of players who play in year x but whose careers do not continue on to the next, or career year $x + 1$. This is the exit rate: the probability that the player’s career will end during that career year. The life tables calculated in this study are complete (single-year) rather than abridged (5-year) life tables. This allows the few higher cases to exert greater influence on the data than if they were aggregated into a category. Even though the complete range of career years may not be presented in various tables, the numbers are derived from a complete life table.

Results

Table 1 shows the complete life table for all major league position players who began their careers between 1902 and 1993. The l_x column shows the number of baseball players who began a year of play. Between 1902 and 1993, 5,989 position players began their first year of major league baseball. Within the first year, 1,181 players (d_0), or 20% (q_0), left baseball, leaving 4,808 to continue play in their second year. Over the course of the twentieth century, major league players played

Table 1 Career expectancies for major league position baseball players, 1902–2003

Year of play	Career Length x to $x + 1$	Numbers of players at beginning of interval l_x	Number exiting during interval d_x	Proportion exiting during interval q_x	Player years in interval L_x	Player years in this and all subsequent intervals T_x	Average remaining career years e_x
1st	0–1	5989	1181	0.20	5398.5	33271.5	5.6
2nd	1–2	4808	887	0.18	4364.5	27873.0	5.8
3rd	2–3	3921	576	0.15	3633.0	23508.5	6.0
4th	3–4	3345	428	0.13	3131.0	19875.5	5.9
5th	4–5	2917	311	0.11	2761.5	16744.5	5.7
6th	5–6	2606	328	0.13	2442.0	13983.0	5.4
7th	6–7	2278	256	0.11	2150.0	11541.0	5.1
8th	7–8	2022	262	0.13	1891.0	9391.0	4.6
9th	8–9	1760	276	0.16	1622.0	7500.0	4.3
10th	9–10	1484	239	0.16	1364.5	5878.0	4.0
11th	10–11	1245	252	0.20	1119.0	4513.5	3.6
12th	11–12	993	219	0.22	883.5	3394.5	3.4
13th	12–13	774	175	0.23	686.5	2511.0	3.2
14th	13–14	599	122	0.20	538.0	1824.5	3.0
15th	14–15	477	130	0.27	412.0	1286.5	2.7
16th	15–16	347	86	0.25	304.0	874.5	2.5
17th	16–17	261	86	0.33	218.0	570.5	2.2
18th	17–18	175	68	0.39	141.0	352.5	2.0
19th	18–19	107	42	0.39	86.0	211.5	2.0
20th	19–20	65	23	0.35	53.5	125.5	1.9
21th	20–21	42	13	0.31	35.5	72.0	1.7
22th	21–22	29	15	0.52	21.5	36.5	1.3
23th	22–23	14	8	0.57	10.0	15.0	1.1
24th	23–24	6	4	0.67	4.0	5.0	0.8
25th	24–25	2	2	1.00	1.0	1.0	0.5

Source: Derived from *Total Baseball*, 8th edition, 2004

for 33,272 career years (T_0). On average, a rookie can expect to play professional ball for 5.6 years (e_0).

The first year of play is quite competitive, with one-fifth of the players exiting. Fewer than half of all rookies stay in the game long enough to see their fifth year of play. And only about 1% of players have careers of 20 or more years. Further, only two players in the twentieth century—Eddie Collins and Rickey Henderson—stayed in the game long enough to see their 25th year of play.

After the first year, the probability of ending a career (q_x) steadily decreases for the next two career years, then levels off at 11 to 13% for career years 4 through 8. This is the most stable point in a player's career. Career years 9 through 19 see a slow and steady rise in the probability of a player ending a career, and for every year after year 16, there is at least a 31% chance of ending a career in that year.

The career expectancy, e_0 , is 5.6 years for all players who reach the major leagues. The high dropout rate in the first two years leads to an increase in career expectancy in career years two and three. Year three has the highest career expectancy at 6.0 years: a position player who makes it to his third year can expect to play a total of 8.0 years in major league baseball. The e_x slowly decreases for every subsequent career year after year three. Yet a position player who makes it to his fourteenth season can still expect to play three additional seasons. But only 10% of players make it to career year 14.

Panel A in Table 2 examines the effects of starting age on the probability of ending a career, q_x , for different starting ages. The probability of ending a career after one year is just 10% for players starting at age 20, and steadily increases from 13% for players starting at age 21 to 36% for players starting at age 28. This trend continues in subsequent career years, with those starting at age 23 and under having occasional career years where the probability of ending a career is less than 10%, a rate not found in any career year for players starting at ages 24 and above. For example, of all players who started at age 22 and made it to the fourth year of play, only 8% will not make it to the fifth year of play; in comparison, of all players who started at age 25 and made it the fourth year of play, 19% will not make it to the fifth year of play. These results illustrate the importance of starting a career early, because the 25-year-old cohort are still under 30 at the end of their 4th year, have proven themselves in baseball for four years, but experience an exit rate that is double that of their counterparts who started three years younger.

Figure 1 presents survival curves by starting age, based on l_x values that are rescaled to initial values of 100. Individuals who start at earlier ages can expect to play for longer periods and to more gradually exit professional baseball. For example, fewer than half of 26-year-olds can expect to play for three years, whereas half of 24-year-olds can expect to play for 5 years, half of 22-year-olds can expect to play for 7 years, and half of 20-year-olds can expect to play for 10 years.

Table 2, Panel B shows career expectancy (e_x) for different starting ages. Upon entry into major league baseball, those players who start at age 20 can expect to play 9.1 years. As starting age increases, career expectancy decreases, down to 2.6 years for players who begin at age 28. This addresses the second aim, that players beginning at younger ages will enjoy longer careers. A year waited in starting a career will cost a player between 1.4 and 0.3 years in career length.

Table 3 reveals career expectancies and exit rates by era. The exit rates in Panel A show a trend toward more secure careers over time with slight exceptions in the later years of the Modern Era due to right censoring. The first career year exit rate decreases from 0.28 in the Early Era to only 0.10 in the Modern Era. The Early Era's exit rate is substantially higher in career year one, in part because the Federal League folded after only two years, forcing its players out of baseball. But even if we examine career years three and later, it still is apparent that players starting in the Early Era had shorter careers than those starting later.

Panel A shows a significant breakpoint between the Early and Golden Age eras. World War II shortened careers by recruiting players into the service, while giving others brief careers as temporary replacements for ballplayers that left for the war but then returned. The Golden Age Era benefited in part due to a period of

Table 2 The Effects of starting age on the risk of a career ending and on the average career years expected for major league position baseball players, 1902–2003

Year of play	Career length	Starting ages										All ages
		20	21	22	23	24	25	26	27	28		
A. Proportion of careers ending during interval												
1st	0–1	0.10	0.13	0.13	0.14	0.17	0.21	0.31	0.30	0.36	0.20	
2nd	1–2	0.09	0.13	0.12	0.15	0.15	0.28	0.30	0.37	0.35	0.18	
3rd	2–3	0.07	0.08	0.13	0.16	0.16	0.18	0.21	0.23	0.34	0.15	
4th	3–4	0.05	0.08	0.08	0.12	0.16	0.19	0.19	0.29	0.21	0.13	
5th	4–5	0.05	0.08	0.09	0.10	0.13	0.14	0.17	0.23	0.31	0.11	
6th	5–6	0.08	0.09	0.10	0.14	0.13	0.17	0.19	0.35	0.21	0.13	
7th	6–7	0.07	0.04	0.08	0.12	0.16	0.22	0.23	0.15	0.15	0.11	
8th	7–8	0.05	0.09	0.13	0.12	0.13	0.28	0.28	0.36	0.41	0.13	
9th	8–9	0.10	0.08	0.12	0.18	0.24	0.31	0.21	0.38	0.31	0.16	
10th	9–10	0.14	0.11	0.16	0.18	0.20	0.25	0.32	0.15	0.67	0.16	
11th	10–11	0.12	0.20	0.17	0.27	0.25	0.35	0.40	0.55	0.00	0.20	
12th	11–12	0.10	0.17	0.26	0.26	0.34	0.44	0.33	0.40	0.67	0.22	
B. Average career years remaining												
1st	0–1	9.06	7.66	6.82	5.88	5.27	3.96	3.34	2.83	2.55	5.56	
2nd	1–2	8.97	7.76	6.77	5.76	5.21	3.86	3.63	2.81	2.71	5.80	
3rd	2–3	8.82	7.86	6.66	5.65	5.07	4.17	3.99	3.16	2.88	6.00	
4th	3–4	8.45	7.53	6.55	5.60	4.94	3.99	3.90	2.94	3.09	5.94	
5th	4–5	7.90	7.17	6.11	5.30	4.76	3.82	3.69	2.94	2.79	5.74	
6th	5–6	7.28	6.72	5.64	4.84	4.38	3.39	3.36	2.67	2.83	5.37	
7th	6–7	6.87	6.33	5.20	4.53	3.97	2.97	3.01	2.83	2.46	5.07	
8th	7–8	6.34	5.61	4.62	4.07	3.66	2.65	2.76	2.26	1.82	4.64	
9th	8–9	5.63	5.08	4.24	3.55	3.14	2.50	2.64	2.26	1.73	4.26	
10th	9–10	5.21	4.48	3.76	3.22	3.02	2.39	2.23	2.35	1.28	3.96	
11th	10–11	4.95	3.97	3.40	2.83	2.68	2.01	2.03	1.68	1.83	3.63	
12th	11–12	4.56	3.83	2.99	2.67	2.46	1.81	2.06	2.10	0.83	3.42	

Source: Derived from *Total Baseball*, 8th edition, 2004

expansion, which created more jobs, lowered selectivity, and extended the careers of average players. Panel B shows the same facts in the form of career expectancy. Examining the extremes we find that, upon entry into major league baseball, players in the Early Era could expect to play only 4.3 years, whereas those starting in the Modern era could expect to play 6.9 years.

Conclusions

The above results provide new information about the general patterns of baseball careers as well as addressing our three aims. We find that first-year players can expect to play for a total of 5.6 years. This career length is lower than the median

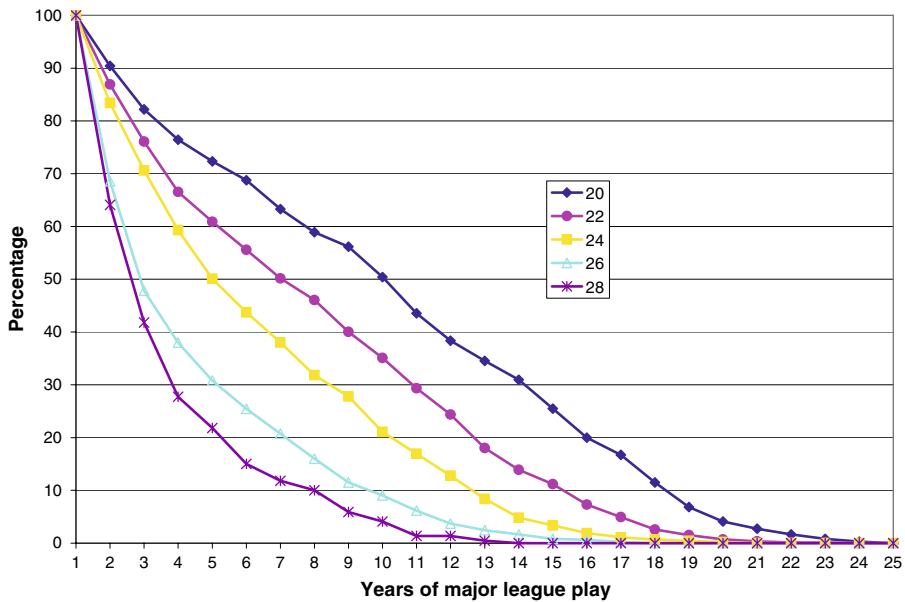


Fig. 1 Career survival curves by starting age, major league position baseball players, 1902–2003

survival time presented by Jiobu (1988) in large part because he selected players who had played in 50 games or more. Our results show that in general a first-year player in major league baseball can expect to play 5.6 years, but a third-year player can expect to play 6 additional years. This may seem counterintuitive: if a player ages a year, he ought to be one year closer to the end of his career. But every additional year a young player survives proves his worth and his potential value to his team, hence the fourth year player's improved prospects.

Similar to a “normal” career, baseball players who survive the initial years of experience are likely to have longer careers. This underscores the importance of performance in the first few years of a career to a long-term career as both typical jobs and professional baseball players are subject to specific performance criteria and are often contracted to performance reviews. Whereas a normal work career typically involves a gradual ascent followed by a slow decline, baseball careers are characterized by rapid ascent followed by rapid decline, or more accurately as an inevitably short time on a very slippery slope, thus demonstrating a compressed work career. The explanation lies in baseball's extremely high selectivity; with an exit probability of 20% in the first year and 11% or greater in every subsequent year.

Starting age is important, as stated in our second aim. Individuals who start professional baseball at age 20 can expect to play 9.1 years, whereas players starting at age 28 can expect to play just 2.6 years. Shulz et al. (1994) assert that the range of maximum performance is between 25 and 31 years of age. These results suggest that age affects career longevity. While both the starting age and the peak performance in a “normal” career may be older, it appears safe to assume that a similar window of success exists, and that maximum performance is reached by a certain age. It is

Table 3 The effects of era on the risk of a career ending and on the average career years expected for major league position baseball players, 1902–2003

Year of play	Career length	Early 1902–1945	Golden age 1946–1968	Modern 1969–2003
A. Proportion of careers ending during interval				
1st	0–1	0.28	0.14	0.10
2nd	1–2	0.25	0.14	0.13
3rd	2–3	0.19	0.12	0.12
4th	3–4	0.17	0.09	0.11
5th	4–5	0.14	0.09	0.09
6th	5–6	0.16	0.12	0.10
7th	6–7	0.14	0.12	0.09
8th	7–8	0.12	0.14	0.13
9th	8–9	0.17	0.15	0.15
10th	9–10	0.16	0.19	0.14
11th	10–11	0.21	0.18	0.21
12th	11–12	0.19	0.24	0.24
B. Average career years remaining				
1st	0–1	4.30	6.47	6.85
2nd	1–2	4.80	6.46	6.58
3rd	2–3	5.25	6.43	6.50
4th	3–4	5.34	6.25	6.33
5th	4–5	5.33	5.85	6.04
6th	5–6	5.11	5.38	5.58
7th	6–7	4.99	5.02	5.16
8th	7–8	4.70	4.64	4.61
9th	8–9	4.26	4.33	4.22
10th	9–10	4.03	3.99	3.89
11th	10–11	3.71	3.84	3.44
12th	11–12	3.54	3.55	3.24

Source: Derived from *Total Baseball*, 8th edition, 2004

likely that an individual who occupies a high status occupation at a young age possesses exceptional skills and acumen.

Performance and nonperformance factors affect career length. Some players with modest performance may be able to retain their jobs because their teams or employers are unwilling to pay the additional salary to replace them, or cannot compete with other teams or employers to attract more prominent players. In some instances, the marginal gains may not be worth the additional costs. Moreover, some personality characteristics—strong charisma, an affable personality, widespread name identification, an engaging and articulate manner, or veteran leadership—may counter lackluster performance and further a career. Some ballplayers may leave the sport because of personal problems, including injuries, gambling, sex scandals, drug or alcohol abuse, or death (see Gutman 1992). For instance, “Shoeless” Joe Jackson was banned for life after his thirteenth season for his alleged involvement in

the infamous Black Sox Scandal, but his 0.382 batting average his last year clearly shows he still had some good years remaining. Donnie Moore tragically killed himself in 1989, unable to shake the tormenting memories of a home run he gave up three years before. While these anecdotal accounts reflect a small proportion of the population of baseball players, they help illuminate the various reasons why careers end.

Following the third aim, economic downturns, wars, and league reductions can shorten baseball careers. For instance, George Stone once led the American league in hits, and in a different year led the league in batting average and slugging percentage, yet managed only a seven-year career in the Early Era. On the other hand, longer baseball careers can result from multiple factors, including league expansion and free agency. For example, Alex Trevino played for six teams in the Modern Era, was consistently below average for his position, and hit a total of 23 homeruns, but still managed to play 13 seasons. Additional factors—such as sports training, sports medicine, higher salaries, and lifestyle changes—may also help lengthen careers in more recent eras.

Exogenous economic and social factors contribute to career longevity. Economic downturns and changes in the economy including job availability and occupational demands are likely to affect career paths. The number of available positions affects the career of baseball players. Therefore, this research elucidates the importance of including period effects when examining career trajectories and the occupational positions that one occupies.

Increasingly long careers support the role exit studies of Drahota and Eitzen (1998), Lerch (1979, 1984), and others who say that the ending of the career is usually involuntary; players want to play as long as possible. Over time, average baseball salaries have increased faster than average adult male salaries and probably attract and retain more players. Baseball salaries have increased substantially over the last several decades, from a \$6,000 minimum and a \$19,000 mean salary in 1967 to a \$316,000 minimum and an approximately \$2.6 million mean salary in 2005 (Baseball 2006). Thus, high average salaries, along with high salary extremes can lure players, who then continue to play because of the lucrative pay. And higher salaries may allow individuals to retire from baseball and still maintain financial security without the need to seek additional remuneration from alternative sources.

Many players do quite well after retirement from baseball (Talamani 1989). Of course, some players attain relatively low levels of education, ignore the reality that being a major league baseball player is a temporary role (Drahota and Eitzen 1998), play professional ball for brief periods, and therefore experience difficult transitions into alternative careers, especially since they are oftentimes forced to compete with people younger and better trained than themselves. Previously, a player needed to have played five years or more to receive full benefits in the pension plan, which would cover only 43% of all position players. Recently, the players' union changed the pension plan to benefit all players who play at least one game (Bevis 1991).

Beyond the highlight reels and statistics, playing baseball is a career. This study employed demographic life table techniques to illuminate the effects of starting age and period effects on the careers of position players in major league baseball. Future research could expand our results by examining other professional sports careers

and by examining life expectancies of professional athletes. Overall, our results add insight into this unique career and inform subsequent workplace outcomes associated with occupational performance and career longevity.

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