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Historical trends in height, weight, and body mass: Data from U.S. Major League Baseball players, 1869–1983

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Abstract

We employ a unique dataset of Major League Baseball (MLB) players – a select, healthy population – to examine trends in height, weight, and body mass in birth cohorts from 1869 to 1983. Over that 115-year time period, U.S. born MLB players have gained, on average, approximately 3 in. (7.6 cm) in height and 27.0 lb (12.2 kg) in weight, which has contributed a 1.6-unit increase in the body mass index. Where comparable data are available, U.S. born MLB players are about 2.0 in. (5.1 cm) taller and 20.0 lb (9.1 kg) heavier but substantially less obese than males in the general U.S. population. But both groups exhibit similar height and weight trends; the majority of height and weight gains take place in cohorts that were born prior to World War II, followed by slower gains and occasional declines in height and weight for cohorts born in 1939 and later.

Keywords

Height; Weight; Body mass index (BMI); Baseball

1. Introduction

Anthropometric measurements are key markers of a population's health that are especially valuable when they are observed over long spans of time (Fogel, 1993; Tanner, 1992).

Historical trends in height, weight, and body mass have been documented in many studies (Damon, 1968; Dorn et al., 1997; Flegal et al., 1988; Fogel, 1993; Gregg et al., 2005; Hauspie et al., 1997; Karpinos, 1958; Komlos, 1987; Murata and Hibi, 1992; Tanner, 1987, 1992). We add to this literature by using a unique dataset for Major League Baseball (MLB) players to examine trends in height, weight, and body mass index (BMI) over the last century.

Although MLB data have some limitations, they can complement other historical data on anthropometry in the U.S. First, they provide annual information on height and weight for cohorts born between 1863 and 1983, and allow us to calculate BMI values for periods that are not readily available in other datasets. MLB players are not specifically selected for height or weight, come from both cities and rural areas in all U.S. regions, and are ethnically diverse, with large numbers of both African Americans and Latinos (Lapchick and Matthews, 1999). Finally, MLB players – who have high levels of physical training, newly gained affluence, and social status – represent a very healthy, select subpopulation (Abel and Kruger, 2005; Saint

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Onge et al., 2008; Waterbor et al., 1988), and their anthropometric trends may shed insight into future potential gains for the general population under certain conditions.

2. Major League Baseball player data

Our data come from *Total Baseball*, the official encyclopedia of MLB (Thorn et al., 2004), and include 6,772 position players (non-pitchers) who debuted in the Major League between 1902 and 2003, with birth years ranging from 1863 to 1983.¹ Although it is unlikely that players are specifically selected for height and weight, healthy individuals may self-select into MLB and teams select players based on speed, power, physical fitness, and agility—factors that may be correlated with anthropometry. Indeed, we specifically excluded pitchers because they are likely to be selected on pitching speed; arm length is directly correlated with height and is a significant predictor of pitching speed (Fleisig et al., 1999).

Height and weight are measured in inches and pounds, respectively, and are usually ascertained at time of debut, through official team rosters, although the weights may be updated by *Total Baseball* during long careers or for obvious weight changes. But weight updates are rare due to the short careers among MLB players (Witnauer et al., 2007). Following the World Health Organization (1997), BMI is calculated as $703 \times (\text{weight in pounds} / \text{height in inches}^2)$.

3. Results

Table 1, panel A shows that the mean height is 71.6 in. (181.9 cm), the mean weight is 181.3 lb (82.2 kg), and the mean BMI is 24.8. The average player debuts at age 23.7, when most men have achieved their peak height. Less than 4% of the players are under the age of 20 and less than 2% are over the age of 30 (analyses not shown). Panel B reveals that 89% of the players are U.S.-born with a fairly even distribution across the census regions; the rest of the players originate from various countries with the largest groups from the Dominican Republic (2.9%) and Puerto Rico (2.2%) (analyses not shown). Fifty-four percent of the players have BMIs of 25 or less and only 1.5% have BMIs of 29 or greater.

Table 2 presents coefficients from the ordinary least squares regression models. These models predict height, weight, and body mass, conditional on year of birth, divided by 10; region of birth, specified as U.S. or foreign born and by U.S. census regions; and age of debut, centered at the mean age of the sample. Model 1 shows that the mean height increases by 0.32 in. (0.81 cm) each decade, over the 115-year period, with controls for region of birth and age of debut. On average, U.S.-born players are 0.85 in. (2.2 cm) taller than foreign-born players. The intercept shows that players who were born in 1869, foreign born, and aged 23.7 years had a predicted height of 68.9 in. (175.1 cm). Model 2 indicates that players born in the Northeast are 0.32 in. (0.81 cm) shorter than those who were born in the South. Model 3 excludes foreign-born players and documents the same relationship between the year of birth and height that was found in Model 2.

Models 4–6 predict weight in pounds. Model 4 predicts that the mean weight increases by 2.73 lb (1.24 kg) per decade, and that U.S.-born players weight 9.4 lb (4.3 kg) more than foreign-born players. Model 5 indicates no significant weight differences among U.S. regions. The relationship between birth cohort and weight increases slightly when excluding foreign-born players in Model 6. Model 7 shows that the mean body mass increases by 0.15 units per decade, with higher body masses among U.S.-born players. Players who were born in the Northeast

¹We include all position players who have played one or more games in the major leagues and who were not included solely in late season roster expansions.

²Separate analysis (not shown) examined the year of debut rather than the year of birth and found identical results for all coefficients – including the change per decade – to the second decimal place.

have body masses that are 0.12 units higher than those who were born in the South (Model 8), and the coefficient for the year of birth is slightly larger when excluding foreign-born players from the sample (Model 9).²

Fig. 1 presents the mean height and the bootstrapped confidence interval for 5-year birth cohorts, ranging from 1869–1873 to 1979–1983. We focus on trends for U.S.-born players because their experiences may be most comparable to the populations documented in other data sources, but for comparative purposes we also present trends for foreign-born players. There was little evidence of systematic changes in height for those born between 1869 and 1898, but there were substantial increases in height for those born between 1899 and 1938 when the mean height increased from 70.5 in. (179.1 cm) to 72.5 in. (184.2 cm). Players who were born during or immediately after World War II – including the 1939–1943 and 1944–1948 cohorts – had somewhat lower heights than those born in 1934–1938. Beginning in the 1949–1953 birth cohort, players exhibited slow but steady increases in height, with evidence of somewhat faster increases for those born in 1974 or later. The mean height of foreign-born players is typically lower than the U.S.-born players, although there is variation in earlier birth cohorts due to small numbers of foreign-born players.

Fig. 2 shows trends in weight for 5-year birth cohorts. Among U.S.-born players, weight increased from 168.8 lb (76.6 kg) for those born in 1869–1873 to 195.7 lb (88.8 kg) for those born in 1979–1983. As with height, weight increased most quickly for players born between 1899 and 1938, followed by a plateau for players born between 1939 and 1958. The plateau in weight that began with players born during World War II lasted longer than the plateau in height that began at the same time. But beginning with players born in 1959–1963, weight began to increase dramatically among U.S.-born players. Foreign-born players averaged lower weights than U.S.-born players throughout the 115-year period examined here.

Fig. 3 shows the cumulative distribution of body mass (rounded to the nearest BMI unit) for U.S.-born players, by birth cohort, on the left axis. Over the 115-year period, the percentage of players with body masses of 23 or less declined substantially and the percentages of players who had body masses of 24 or 25 declined slightly. But the percentage of players with body masses of 26 or higher increased markedly over the period examined. The solid and dashed lines show the mean body mass for U.S.- and foreign-born players, respectively (see the right axis). The mean body mass for U.S.-born players increased over the study period. Starting with the 1924–1928 cohort, foreign-born players averaged lower body masses than U.S.-born players.

4. Conclusion

MLB players – one of the most physically fit subpopulations (Saint Onge et al., 2008) – experienced height, weight, and BMI increases over the 20th century and enjoy greater average heights than most subpopulations. Fogel et al. (1983) found an average height beginning with the American Revolution until World War II of approximately 68.0 in. (172.7 cm), whereas we document mean heights of 70.4–72.1 in. (178.8–183.1 cm) for players born prior to World War II. Other research shows that the average height of U.S. males aged 20–29 in 1960–2002 ranged from 68.9 to 69.6 in. (175.0 and 176.8 cm) (Ogden et al., 2004). Stoudt et al. (1965) found that the 1931 U.S. birth cohort had an average height of 69.1 in. (175.5 cm) between 1960 and 1962. In comparison, MLB players who were born between 1929 and 1933 had an average height of 72.1 in. (183.1 cm).

Although MLB players are taller than the general U.S. population, the temporal trends among both populations are similar when comparable data are available. The height of MLB players increased most quickly between the 1899–1903 and 1934–1938 birth cohorts, with a gain of

2.0 in. (5.1 cm), a period that coincides with major improvements in nutrition and sanitation (Cutler and Miller, 2005). Similar to several other studies, we also find slower increases in height or stagnation for players born between World War II and the 1970s (Komlos and Baur, 2004; Komlos and Breitfelder, 2008; Komlos and Lauderdale, 2007; Rashad, 2008). Players born between 1949–1953 and 1979–1983 gained 1 in. (2.54 cm) in height—a slower rate of increase than was found among earlier birth cohorts. Although our data do not allow us to investigate the determinants of this slower increase, it may reflect broader patterns in U.S. health (see Komlos and Lauderdale, 2007), or it may result from the inclusion of slightly shorter African Americans following racial integration in MLB in 1946. The regressions reported in Table 2 indicate an average increase of 0.3 in. (0.78 cm) per decade from 1869 to 1983. Other advanced industrial countries – including England and Japan – have shown an average height increase of 0.79 in. (2 cm) with a range of 0.12–1.18 in. (0.3–3.0 cm) per decade beginning with the 1950s (Hauspie et al., 1997).

Similar to Komlos and Lauderdale (2007) we find signs of more rapid increases in height beginning with the 1969–1973 birth cohort. These gains may reflect larger U.S. trends or the lagged effects of free agency rules in 1976 in MLB that increased players' bargaining power and salaries.³ Changes in height may also be related to different strategies for playing the game over time, and thus, selection for different kinds of players. Further, consistent with Rashad (2008), who finds that Hispanics have lower average heights than non-Hispanics in recent cohorts, our results indicate that foreign-born players (the majority of whom are Hispanic) are persistently shorter than U.S.-born players.

In the U.S. population, older men account for the greatest weight gains over time, although males aged 20–29 also experienced an increase of 19.0 lb (8.6 kg) in average weight, from 163.9 to 183.4 lb (74.3–83.2 kg) between the 1960–1962 and 1999–2002 calendar periods (Flegal et al., 2002). In comparison, U.S.-born MLB players who were born in 1934–1938 and who would have been 25 years old between 1959 and 1963 had an average weight of 187.2 lb (84.9 kg), and U.S.-born players who were born in 1974–1978 and who would have been 25 years old between 1999 and 2003 had an average weight of 196.8 lb (89.3 kg), for an increase of only 9.6 lb (4.4 kg). Although U.S.-born MLB players are heavier than comparably aged U.S. males, their weight has increased at less than half the rate of U.S. males, potentially because of the relatively high baseline weights among MLB players who likely had better nutrition in the early part of the century and increased muscle mass in more recent years.

MLB players show slower increases in BMI than other populations (Helmchen and Henderson, 2004). Flegal (1996) finds that only 15.1% of men aged 20–29 had body masses that were greater than or equal to 25.0 and less than 30.0 between 1976 and 1980, but 19.4% had similar body masses between 1988 and 1991. In contrast, 55.9% of U.S. born MLB players who were born in 1949–1953 and who were aged 25 between 1974 and 1979 had body masses of 25 or more, a percentage that increased to 68.3% for those born in 1969–1973 and who were aged 25 between 1989 and 1993. But 23.7% of U.S. males aged 20–29 had BMIs greater or equal to 30.0 in 1999–2000 (Ogden et al., 2004), compared to just 1.9% of MLB players in the 1969–1973 birth cohort. The body mass index is often used as an indicator of adiposity. But among MLB players, the body mass index may imperfectly capture adiposity, and might reflect greater muscle masses that result from advantages in nutrition, sports medicine, and athletic training.

Compared to MLB players, professional football players in the U.S. are more likely to have heavier weights, professional basketball players are strongly selected for height, and both

³Greater bargaining power and salaries may have increased economic incentives and attracted a larger number of players, allowing teams to become even more selective when seeking players with high levels of fitness, speed, or coordination—factors that may be correlated with height. The data does not include MLB pitchers.

groups may face pressure to exaggerate their respective weights or heights to intimidate opposing teams. If success at baseball were strongly correlated with anthropometry, then MLB would select players of ideal weight and height, which would result in a plateau in height, weight, and body mass, or a narrowing of the 95% confidence intervals as teams find more players that have ideal anthropometric characteristics. Instead, the 95% confidence intervals for height and weight have not shown evidence of compression over time, and changes in height and weight among MLB players are remarkably similar to patterns among U.S. men.

Data from MLB players can complement other historical sources of anthropometric data in the U.S. that offer insight into other subpopulations. Baseball player data are advantageous because they are available for the full span of years for players born as early as 1869, and they come from a well-documented and very healthy subpopulation. MLB data are of interest to players and fans, but they are also a novel and important way to track anthropometry in the U.S. throughout history.

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Fig. 1.
Mean height by year of birth in 5-year intervals, Major League Baseball players, U.S., 1869–1983.

Fig. 2.
Mean weight by year of birth in 5-year intervals, Major League Baseball players, U.S., 1869–1983.

Fig. 3.
Cumulative percentage of body mass index (BMI) by year of birth in 5-year intervals, U.S. Major League Baseball players, U.S., 1869–1983.

Table 1Descriptive statistics, Major League Baseball players, U.S. 1869–1983 ($N = 6772$)

	Mean	Median	Min	Max
Panel A: descriptive statistics				
Height (in.)	71.6	72.0	43.0	80
Weight (lb)	181.3	180.0	65.0	275
Body mass index	24.8	24.7	18.1	34.2
Year of debut	1954.3	1955	1902	2003
Year of birth	1930.1	1931	1869	1983
Age of debut	23.7	23.0	16.0	40
Panel B: percentage distributions				
Region of birth, %				
Foreign born				10.9
Northeast				19.7
Midwest				24.8
West				27.1
South				17.5
Height (in.), %				
in. ≤ 66				1.2
$66 < \text{in.} \leq 68$				6.0
$68 < \text{in.} \leq 70$				20.2
$70 < \text{in.} \leq 72$				39.1
$72 < \text{in.} \leq 74$				23.9
$74 < \text{in.} \leq 76$				8.3
$76 < \text{in.} \leq 78$				1.2
in. > 78				0.2
Weight (lb), %				
lb ≤ 145				1.2
$145 < \text{lb} \leq 160$				11.2
$160 < \text{lb} \leq 175$				30.9
$175 < \text{lb} \leq 190$				32.6
$190 < \text{lb} \leq 205$				16.3
$205 \leq \text{lb} \leq 220$				6.1
$220 < \text{lb} \leq 235$				1.5
lb > 235				0.4
Body mass index (BMI), %				
BMI ≤ 19				0.1
$19 < \text{BMI} \leq 21$				0.6
$21 \leq \text{BMI} \leq 23$				10.9
$23 < \text{BMI} \leq 25$				42.5
$25 \leq \text{BMI} \leq 27$				36.5
$27 < \text{BMI} \leq 29$				8.1
$29 \leq \text{BMI} \leq 31$				1.3
BMI > 31				0.2

Mean	Median	Min	Max
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Source: Sports Media Enterprises *Total Baseball, eighth edition*.

Table 2
Ordinary least squares regression (standard errors) for year of birth, Major League Baseball players, U.S. 1869–1983

	Height (in.)			Weight (lb)			Body mass index (BMI)		
	Model 1	Model 2	Model 3 ^a	Model 4	Model 5	Model 6 ^a	Model 7	Model 8	Model 9 ^a
Year of birth, 1869/10	0.32 ^{***} (0.01)	0.31 ^{***} (0.01)	0.31 ^{***} (0.01)	2.73 ^{***} (0.06)	2.74 ^{***} (0.07)	2.82 ^{***} (0.07)	0.15 ^{***} (0.01)	0.16 ^{***} (0.01)	0.17 ^{***} (0.01)
Region of birth									
U.S.	0.85 ^{***} (0.08)			9.42 ^{***} (0.63)			0.69 ^{***} (0.69)		
Foreign	Ref.	−0.90 ^{***} (0.09)	-	Ref.	−9.35 ^{***} (0.69)	-	Ref.	−0.64 ^{***} (0.07)	-
			-			-			-
Northeastern U.S.		−0.32 ^{***} (0.07)	−0.31 ^{***} (0.07)		−0.63 (0.57)	−0.52 (0.56)		0.12 [*] (0.06)	0.14 [*] (0.06)
Midwestern U.S.		−0.03 (0.07)	−0.02 (0.07)		0.71 (0.53)	0.82 (0.52)		0.11 (0.06)	0.12 [*] (0.05)
Western U.S.		0.00 (0.08)	0.00 (0.08)		0.09 (0.58)	−0.02 (0.57)		0.00 (0.06)	−0.01 (0.06)
Southern U.S.		Ref.	Ref.		Ref.	Ref.		Ref.	Ref.
Age at debut, 23.7	−0.02 [*] (0.01)	−0.02 [*] (0.01)	−0.02 [*] (0.01)	0.21 ^{***} (0.07)	0.20 ^{***} (0.07)	0.17 [*] (0.07)	0.04 ^{***} (0.01)	0.04 ^{***} (0.01)	0.04 ^{***} (0.01)
Intercept	68.92 ^{***} (0.10)	69.89 ^{***} (0.07)	69.86 ^{***} (0.08)	156.01 ^{***} (0.79)	165.35 ^{***} (0.56)	164.80 ^{***} (0.56)	23.24 ^{***} (0.08)	23.84 ^{***} (0.06)	23.78 ^{***} (0.06)
R ²	0.18	0.18	0.19	0.21	0.21	0.24	0.08	0.08	0.09

* $p \leq .05$;
** $p \leq .01$;
*** $p \leq .001$.
^aThese models exclude foreign-born players.