



Comparative all-cause and cause-specific mortality for National Basketball Association players, 1970-2012

Peer review status:

No

Corresponding Author:

Dr. Robert J Reynolds,
Research Scientist and Consultant, Mortality Research & Consulting, Inc. - United States of America

Submitting Author:

Dr. Robert J Reynolds,
Research Scientist and Consultant, Mortality Research & Consulting, Inc. - United States of America

Article ID: WMC005464

Article Type: Research articles

Submitted on: 28-May-2018, 11:30:10 AM GMT **Published on:** 28-May-2018, 11:30:34 AM GMT

Article URL: http://www.webmedcentral.com/article_view/5464

Subject Categories: SPORTS MEDICINE

Keywords: NBA, basketball, athletes, mortality, death, cardiovascular, cancer

How to cite the article: Reynolds RJ. Comparative all-cause and cause-specific mortality for National Basketball Association players, 1970-2012. WebmedCentral SPORTS MEDICINE 2018;9(5):WMC005464

Copyright: This is an open-access article distributed under the terms of the [Creative Commons Attribution License \(CC-BY\)](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Source(s) of Funding:

No funding

Competing Interests:

No competing interests

Comparative all-cause and cause-specific mortality for National Basketball Association players, 1970-2012

Author(s): Reynolds RJ

Abstract

Prior reports of the mortality experience of professional basketball players have suggested that players in the National Basketball Association have mortality rates lower than those of the US general population. Here we analyze NBA player vital data between 1970 and 2012 to provide all-cause and cause-specific standardized mortality ratios comparing players to the US general population.

More than 2,800 NBA basketball players contributed more than 67,000 person-years of observation time and 255 deaths. The players were 70% black, of typically large stature at debut, and debuted at 23 years of age on average. Players were found to be at half the risk of the general population from death by all causes. Cardiovascular disease was the most frequent cause of death, followed by cancers and other natural causes. For the entire 1970-2012 period, NBA players experienced approximately 55% the mortality as would be expected in the US general population due to CVD and cancer, and only 44% (95% CI=34-55) the expected mortality for other natural causes. The SMR for death by external causes was 37 (95% CI=25-52).

Results presented here confirm that NBA players are at much lower risk of age-specific mortality than the US general population in general and for specific causes. As NBA players are a highly selected occupational cohort the data here may help inform investigations in other areas of public health.

Introduction

Players in the National Basketball Association (NBA) have several attributes that predict lower mortality rates than are observed in the United States (US) general population. NBA players are generally in peak physical condition and are contractually obligated to keep themselves in shape. Additionally, NBA player contracts prohibit the use of various banned substances (Anti-Drug Program), and a number of risky activities (e.g., sky-diving, motorcycle riding, fighting). NBA players also have access to

team-funded quality health insurance and health care. Finally, the demands of the profession ensure ongoing high levels of physical activity on a regular basis.¹

Unsurprisingly, then, NBA players have been reported to be at lower mortality risk in comparison to both the general population and insured lives.²⁻³ Fafian (1997) reported that, in comparison to the general population in periods between 1955 and 1994, NBA players had between 30% and 85% the risk of dying for the general population, and 88% the risk of dying in comparison to insured lives.² Lawler et al. (2012) examined the mortality of NBA players using a combination of Kaplan-Meier analysis, Cox proportional hazard models, and life table analysis.³ They concluded that the median survival time for NBA players exceeded that of general population matched controls by 4 years, and that the life expectancy of basketball players exceeds that of the general population by 5 years. However, Lawler et al. began their survival analysis (life table analyses and survival curves) at birth, meaning that the analysis suffers from immortal time bias.⁴ This bias is present when intervals of guaranteed survival are differentially included in life expectancy calculations, such as the time period before debut in professional sports. Thus, the better median survival time and life expectancy for NBA players reported by Lawler et al. are somewhat exaggerated.

No analysis of NBA player mortality has provided cause-specific comparative analysis. While one study reported on the frequency of causes of death for players who died while still active in the NBA, it reported neither relative risks nor data on mortality for retired players.⁵

We present here the results of a study of the mortality of all US-born NBA players joining the NBA between 1949 and 2011, in which we compare mortality rates of NBA players to those of the US general population. We examine specific causes of death among NBA players, again comparing NBA death rates with those in the general population for specific causes.

Methods

Study Population and Data Sources

The study population comprised all US-born Black and White professional basketball players who began their careers in the NBA any time after its inception in 1949 through December 31, 2011. The NBA has maintained biographical and game data on players since 1949. The basketball database used in this research was compiled by one of the authors (JG) for the Association for Professional Basketball Research (APBR). The database is available from the APBR website.⁶

The database contains comprehensive information about players from the NBA and from six pre-NBA professional basketball leagues: the BAA, the American Basketball Association (ABA), the NBL, the American Basketball League (ABL), the Professional Basketball League of America (PBLA), and the National Professional Basketball League (NPBL). The database was constructed by first abstracting demographic information from the second and third editions of the Official NBA Encyclopedia for every player who played in the NBA, BAA, and ABA.⁷⁻⁸ The database was subsequently updated with additional information from The Official NBA Register.⁹ Data pertaining to players from the NBL were extracted from The Sports Encyclopedia.¹⁰ Information for players from the ABL, the PBLA and the NPBL were added from monographs published by basketball historian Roger Meyer.¹¹

In order to have a cohort of players selected through a more or less homogeneous process, we focused on players who began their careers in the NBA. We therefore excluded players who began their professional basketball careers prior to 1949, leaving an all-NBA cohort for our analyses.

Information about player deaths is obtained annually from online searches of newspaper obituaries and periodic searches of the Social Security Death Index, which also confirms the details of previously reported deaths. Any player deaths reported in the news media are continually recorded as discovered.

To confirm the date and cause of death for players known to have died, we conducted a search of the National Death Index (NDI). The NDI is a resource for public health researchers, maintained by the National Center for Health Statistics (NCHS) at the Centers for Disease Control (CDC). It allows researchers to obtain death status and cause of death information for deaths of US citizens occurring within the United States.¹²

Â

General Population Mortality Rates

Â Race- and age-specific general population mortality rates for males in the period 1970-2010 were downloaded from the compressed mortality files available through the CDC Wide-ranging Online Data for Epidemiologic Research (WONDER) database.¹³⁻¹⁵ The mortality files are produced by the NCHS and, like the NDI, are based on mortality information collected by state registries and provided to the National Vital Statistics System.

Â

Study Period

The study period spanned from January 1, 1970 to December 31, 2012. We chose the start of 1970 because cause-specific mortality rates were unavailable for years before 1968. However, the exclusion of years earlier than 1970 did not result in the loss of much information, as there was comparatively little follow-up and few deaths between 1946 and 1969.

Â

Standardized Mortality Ratios

To compare mortality between NBA players and the US general population we calculated standardized mortality ratios (SMRs).Â We did this by summing deaths and follow-up time in 5-year age groups and within each decade (and partial decade) from 1950 to 2011. Time at risk for each player within each age group and decade was determined based on the player's debut date in the NBA and the end of follow-up (either the ballplayer's date of death or the end of the study period, December 31, 2011). The expected number of deaths for each age and decade were determined by multiplying the age-group, race-, and decade-specific general population mortality rate by the NBA exposure time specific to that race, age group and decade. The resulting numbers of expected deaths were then summed across age groups within each decade. The decade-specific standardized mortality ratio was computed as the ratio of the observed numbers of deaths to the expected number in that decade. We determined confidence intervals for the SMRs based on the assumption that the observed numbers of deaths follow a Poisson distribution in each period. We also summed observed and expected deaths across all decades to obtain an overall SMR for the entire study period.

Â

Human Subjects Protection

This research was conducted under a protocol which was reviewed by Solutions IRB, an independent

Institutional Review Board. The protocol was deemed exempt from full review because (a) the study uses publicly available data on basketball players; (b) we were not attempting to contact the basketball players under study or their families; and (c) the study represented minimal risk.

Results

Cohort characteristics are displayed in Table 1. The study cohort included 2,821 basketball players, 70% of whom were Black and 30% of whom were White. Players averaged 1.98 m in height and 94 kilograms in weight, with an average body mass index (BMI) of 23.9 kg/m². The average age at entry into the NBA for all players was 23.1 years (SD=1.7 years). The average age at death for players who died was 61.9 years (SD=15.5 years), while the average age of survivors at the end of the study was 47.6 years (SD=15.4 years). There was a total of 67,185 person-years of following up and 255 deaths among NBA players during the study period, for a crude death rate of 3.8 deaths per 1000 person-years.

Table 2 displays the SMRs and 95% confidence intervals for NBA players in comparison to the general population of the US, for all causes of death. In all periods NBA players had statistically significantly lower mortality rates than their counterparts in the general population, with SMRs ranging from a low of 30 to a high of 58. For the overall period NBA players were at half the risk of death as was the general population.

Table 3 breaks down the causes of death for the 255 players who died in the study period. Cancer and cardiovascular disease (CVD) were the most common categories of cause of death in almost every period, with CVD being the most common category of death overall, with a total of 90 of the 255 deaths (35%). Cancers accounted for 65 of the 255 deaths (25%), external causes (homicide, suicide, accidents) for 32 deaths (13%), and all other natural causes for 68 deaths overall (27%). The numbers of deaths increased in every decade as the players continued to age.

Table 4 reports SMRs specific to the cause of death groups in Table 3. NBA players were at reduced mortality risk for each of the natural cause of death groups for the overall 1970-2012 period, inclusive of cancer, CVD, and all other natural causes. The SMRs for these causes in the whole study period were approximately 50, though the statistical significance varied by decade. Overall, most SMRs showed

significant reductions in risk from the various natural causes of death for NBA players, and those that did not were still directionally pointed towards reduced risk.

Basketball players were also at reduced risk of death by external causes in most periods and overall. Notably, the 1980-1989 and 2010-2012 periods reflected fewer deaths than expected, but the confidence intervals in these periods included 100. The overall SMR for external causes over the 1970-2012 period was 37 (95% CI=25-52), suggesting basketball players were only at about 40% the risk of dying from causes such as homicide, suicide, and accidents as were members of the general population.

Discussion

It is perhaps no surprise that the results of this investigation have demonstrated greatly reduced mortality risk for US-born Black and White NBA players between 1970 and 2012. For all causes combined and over the entire study period, NBA players were at only half the risk of death as the general population. Decomposing this by cause revealed that NBA players were, at most, at half the risk of death from the major cause-of-death groups considered here: cancers, CVD, other natural causes, and external causes.

The natural-cause SMR results observed here are consistent with the phenomenon known as the Healthy Worker Effect (HWE).¹⁵⁻¹⁶ The HWE is a type of selection and survivor bias wherein only healthy people obtain and retain long-term employment. This has the effect of making the mortality rates of working populations consistently lower than those of the general population. In the case of NBA players, the HWE would be anticipated to have a large effect, as NBA players are extremely physically fit. Indeed, the low values of SMRs for NBA players are consistent with a strong HWE. As noted in the introduction, other forces are at work in the case of NBA players to accentuate this HWE, including a relatively high socio-economic status and access to high quality health insurance and health care.

The SMR for CVD was the overall lowest of the natural causes of death. This is unsurprising as basketball is a sport that requires high levels of cardiovascular fitness. NBA games have four 12-minute quarters, during which time players are in near-constant motion, mostly jogging or sprinting, and of course the players participate in what are likely longer practices that are likewise demanding relative to cardio-respiratory function. The cardio-endurance required for this is

protective against ischemic heart disease and stroke, two of the major causes of death in the CVD category. It is unclear how far past a player's date of retirement from the NBA this protective effect may last, and mortality risk from CVD is undoubtedly dependent on post-career fitness levels as well. Future research into NBA players and CVD should focus on factors such as age at debut, career length, and age at retirement as risk factors for death by CVD.

A less expected result of our analysis was that NBA players were at only 37% the risk of dying from external causes as were general population controls. The risk of death from external causes for males in the US tends to peak around age 20, then continues to decline across the lifespan until approximately age 65. Contractual prohibitions against risky behaviors and drug use for active players may explain the reduced external-cause mortality risk for NBA players during this critical period of otherwise high risk. Elevation in socio-economic status, and, particularly for some Black players, removal from urban environments where the risk of death from violence and drug-related activities is particularly high may also explain the reduction in external-cause mortality to some degree. A more detailed analysis of external cause mortality as more data accumulate may shed further light on these possibilities.

While it is of little surprise that NBA players are at lower risk of mortality than the general population as a whole, the real utility of analyses such as these may be opportunity it provides to index NBA players' mortality risk against that of other highly selected and physically fit occupational cohorts. Such comparisons may help clarify the relative benefits (and risks) of different levels and types of physical activity, as well as those of good healthcare and high socio-economic status. Such comparisons could prove useful in fields beyond sports medicine such as occupational epidemiology or life insurance risk assessment.

References

1. National Basketball Players Association. Collective Bargaining Agreement, January 19, 2017. Available at <http://nbpa.com/wp-content/uploads/2016/02/2017-NBA-NBPA-Collective-Bargaining-Agreement.pdf>. Last accessed 29 April 2018.
2. Fafian Jr J. Mortality experience of National Basketball Association players. *North Am Actuar J*. 1997;1(4):45-8.
3. Lawler T, Lawler F, Gibson J, Murray R. Does the African-American-white mortality gap persist after playing professional basketball? A 59-year historical cohort study. *Ann Epidemiol*. 2012; 22(6):406-12.
4. Porta M. *Dictionary of Epidemiology*. 6th Ed.. New York: Oxford University Press; 2014.
5. Lemez S, Wattie N, Baker J. Early death in active professional athletes: trends and causes. *Scand J Med Sci Sports* 2016; 26:544-549.
6. Grasso, JG. NBA Biographical Database. Available at <http://www.apbr.org/> Last accessed October 23, 2013.
7. National Basketball Association. *The Official NBA Basketball Encyclopedia*. Second Edition. New York: Villard; 1989.
8. National Basketball Association. *The Official NBA Basketball Encyclopedia*. Third Edition. New York: Doubleday; 2000.
9. National Basketball Association. *Official NBA Guide and NBA Register*. Available at <http://www.nba.com/news/nba-register-and-nba-guide/>. Last accessed May 10, 2018.
10. Neft DS, Cohen RM. *The Sports Encyclopedia: Pro Basketball*. Fifth edition. New York: St. Martin's Press; 1991.
11. Meyer, R. *Historical Basketball Monograph Series*. Boxboro, Mass: Self-published, 2001.
12. National Center for Health Statistics, Centers for Disease Control. National Death Index. Available at <https://www.cdc.gov/nchs/ndi/index.htm>. Last accessed May 10, 2018.
13. Centers for Disease Control and Prevention, National Center for Health Statistics. Compressed Mortality File 1968-1978. Available at wonder.cdc.gov/cmfi-cd8.html. Last accessed May 8, 2018.
14. Centers for Disease Control and Prevention, National Center for Health Statistics. Compressed Mortality File 1979-1998. Available at wonder.cdc.gov/cmfi-cd9.html. Last accessed May 8, 2018.
15. Centers for Disease Control and Prevention, National Center for Health Statistics. Compressed Mortality File 1999-2016 on CDC WONDER Online Database, released December 2017. Available at wonder.cdc.gov/cmfi-cd10.html. Last accessed May 8, 2018.
16. Fox AJ, Collier FF. Low mortality rates in industrial cohort studies due to selection for work and survival in the industry. *British Journal of Preventive & Social Medicine*. 1976;30:225-230.

17. Checkoway H, Pearce N, Kriebel D. Research Methods in Epidemiology. 2nd Ed. New York: Oxford University Press; 2004.