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# Mortality of major league baseball players from Canada, Latin America, and the Caribbean

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ABSTRACT

Professional baseball players have lower mortality rates than the US general population, but whether this is true of foreign-born players is not known. Using data on ballplayers from six nations, we compare mortality rates with those of US players via standardized mortality ratios. After controlling for confounders, four countries had statistically insignificant SMRs while two nations had significantly elevated SMRs. In the two nations with elevated SMRs, low average ages at death and high crime rates suggest the increased mortality may be linked to violent crime. A full understanding of the causes of disparity in mortality will require further research.

**Keywords:** baseball, international, mortality, standardized mortality ratios, life expectancy

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## Introduction

It is well-established that professional athletes live longer than matched controls in the general population.[1-3] Major League Baseball (MLB) players in particular have been studied repeatedly and found to have lower mortality rates at all ages and in nearly all decades of the 20th Century.[1-2]

Life expectancies also vary widely across nations. For example, as of 2009, the life expectancy at birth in the US was 79 years.[4] More than 30 nations had life expectancies greater than the US, and the life expectancy at birth of the nations of the world ranged from as low as 47 years to as high as 83 years.[4]

Though played only in the US and Canada, MLB is truly an international sport, historically comprising players from more than 50 nations. An unanswered question is what effect playing professional sports in the US may have on the mortality rates of athletes from other countries. Baseball players from nations with substantially different general population mortality rates may in turn be subject to greater or lesser mortality than their MLB counterparts from the US. Such enduring differences would suggest that the variation in international mortality may have more to do with stable characteristics of populations (such as genetics or macro-culture) and less to do with modifiable environmental, political, and socio-economic factors (such as individual lifestyle or micro-culture). It is also possible that differences in international mortality stem almost exclusively from these modifiable factors, in which case, to the extent their lives are made homogeneous with lives of US-born citizens by the experience of playing in the Majors, baseball players from other nations would have essentially equivalent mortality rates to players from the US.

To investigate this question, we analyzed data from the six best-represented foreign nations in MLB: Canada, Cuba, Dominican Republic, Mexico, Puerto Rico, and Venezuela.

## Methods

*Source Data:* The MLB data were provided by the Baseball Almanac (www.baseball-almanac.com). The Baseball Almanac is a complete collection of biographical and performance data for all Major League ballplayers since 1871. The database is regularly updated and draws on the work of the Biographical Research Committee at the Society for American Baseball Research. Staffed by approximately 100 volunteers, the committee's purpose is to maintain accurate biographical data on Major League ballplayers, including date and place of birth and death. The committee researches player deaths using the Social Security Death Index, news media reports, and contact with surviving family members.

From the biographical portion of the database we extracted the date and place of birth, date of debut in the Majors, and date of death (where applicable) for all MLB players. From the performance data, we extracted the fielding positions and number of games played at those positions for each player.

*Study Population*: Our study population was the set of players born in the six countries of interest, who debuted in the Major Leagues between January 1, 1900 and December 31, 1999, and who were still alive as of January 1, 1950. We chose this period because the inclusion of players from other nations in the Major Leagues is a relatively new phenomenon with most of the six nations under study entering the Majors in the 1930s or later. Limiting the data to players alive as of 1950 and later provided enough information to draw meaningful conclusions for all six nations. In order to form the comparison group for these players, we analogously selected all US-born players from the same period who were alive as of 1950.

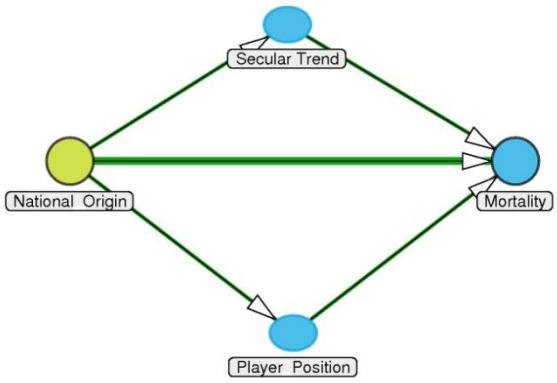
The period of follow-up for each player was the time from the individual player's debut in the Majors to either his date of death or the end of the study period, whichever came first. The starting date for players who debuted before 1950 was January 1, 1950. Players who died after December 31, 1999 were considered alive at the end of the study period for purposes of analysis.

In accordance with Federal Regulations on the protection of human subjects in medical research, this study was exempt from institutional review as all data used here are publicly available and no contact was attempted or made with study subjects during the course of the study.

*Causal Model:* Our causal model for this study is shown in Figure 1 as a directed acyclic graph (DAG), drawn using the DAGitty software (www.dagitty.net). We have assumed a simple model in which there is a direct effect of the exposure (national origin) on the outcome (mortality). There is also an indirect effect of national origin on mortality by way of player position and an indirect effect of national origin on mortality by way of secular trend. According to this DAG, the effect of both secular trend and player position must be controlled in order to correctly estimate the direct effect of national origin on mortality.

To control for secular trend, data were stratified by decade. We chose to include secular trend in our causal model because previous research demonstrates that mortality rates for US-born baseball players have fallen over time.[1-2] The pathway from national origin to secular trend in the DAG reflects the idea that changes

**Figure 1.Causal model for the relationship between national origin and mortality for Major League Baseball players.**




in the mortality rates over time may be different for different nations. The node for secular trend can be thought of as a collection of unmeasured time-varying confounders. By controlling for these unmeasured time-varying confounders, we aim to increase the precision of our estimated effect of national origin on mortality.

We also controlled for fielding position. A given player's position was defined to be the position at which the player played the greatest number of games during his career.

We elected to include player position in our causal model because each fielding position demands a slightly different set of physical skills resulting in players of different body type, athletic ability, and physical fitness demands (e.g., it is highly unlikely that a center fielder will be overweight, whereas a pitcher may well be). If fielding positions are preferentially recruited from specific nations, this could confound the relationship between national origin and mortality.

*Hypotheses:* We hypothesized that mortality rates for ballplayers from a given nation would compare with those of US ballplayers in the same way as general population rates in the given nation compare with US general population rates. Therefore, based on the rank order of life expectancies published by the World Health Organization[4], we specifically hypothesized that players from Canada would have lower mortality rates than players from the US (SMR < 1.0), players from Cuba and Puerto Rico would have mortality rates similar to US players (SMR ≈ 1.0), and players from the remaining nations would have mortality rates greater in magnitude than those of US players (SMR > 1.0).

*Statistical Methods:*To compare mortality rates between each of the six nations and the US, we computed SMRs

and 95% confidence intervals, controlling for age in five-year intervals, and decade and player position as outlined above. The procedure was, in brief:

1. We summed the person-years at risk and the number of deaths for all players, separately by age group, nation, player position, and decade.
2. Next, we computed the mortality rates for the US players by dividing the number of observed deaths by the accrued person-years for each age group, player position, and decade. These age-, position-, and time-specific mortality rates were then used to calculate the expected numbers of deaths for the other nations.
3. Within each age × position × time stratum, the expected counts of deaths for the six nations under study were the products of the mortality rates of the US players for a stratum and the accrued person-years of time at risk from each country for that stratum.
4. The observed and expected counts of deaths were summed across strata for each nation.
5. SMRs were calculated as the ratio of the counts of observed deaths in the MLB cohort to the expected number from step 4.
5. Finally, we computed 95% confidence intervals around the SMR by assuming the observed counts of deaths derived from a Poisson distribution.

All analyses were completed using SAS version 9.1 and Microsoft Excel 2007.

**Results And Discussion**

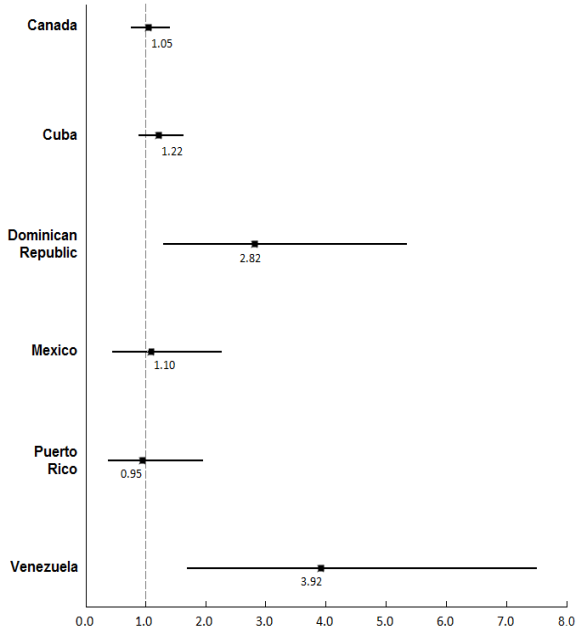
Table 1 displays the distribution of players, person-years, and deaths by nations, as well as the mean age at death for each. The 917 players from the six nations under study contributed a total of 16,678.6 person-years of follow-up with a total of 118 deaths in the period. While the Dominican Republic had the most non-US players in the study, the most non-US person-years were accrued by Cuba, followed by Puerto Rico, and then the Dominican Republic. Canada and Cuba were nearly tied for the most deaths with 44 and 43, respectively, and in distant third place was the Dominican Republic with 9 deaths.

**Table 1. Player Data by Nation, 1950-1999.**

| Nation | Players | Person-Years | Deaths | Age at Death Mean (SD) |
|---|---|---|---|---|
| Canada | 119 | 2,748.2 | 43 | 72.1 (12.6) |
| Cuba | 136 | 4,325.9 | 44 | 67.4 (11.4) |
| Dom Rep | 280 | 3,275.5 | 9 | 41.9 (10.5) |
| Mexico | 81 | 1,512.1 | 7 | 60.1 (20.4) |
| Puerto Rico | 185 | 3,405.9 | 7 | 46.1 (14.6) |
| Venezuela | 116 | 1,411.0 | 8 | 44.3 (13.9) |
| **TOTALS** | **917** | **16,678.6** | **118** | **63.9 (16.4)** |

Figure 2 shows the SMRs for the various nations in comparison with the US. The square points for each nation represent the point estimate for the SMR, and the lines extending to the left and right from the points represent the 95% confidence intervals around the point estimates. Those bands which cross the dashed vertical line indicate that the SMR cannot be said to be different from 1.0 with 95% confidence; whereas, any bands which do not cross the dashed line indicate that the SMR can be said to be different from 1.0 with 95% confidence.

**Figure 2. Standardized mortality ratios and 95% confidence intervals for international Major League Baseball players, 1950-1999.**




The figure shows that Canada, Cuba, Mexico, and Puerto Rico all have SMR point estimates close to unity and confidence intervals that include 1.0. On the other hand, the Dominican Republic and Venezuela both have SMRs well above 1.0 with confidence intervals that depart from unity.

The results of our analysis show that, after controlling for age, player position, and decade, the number of deaths experienced by baseball players from Canada, Cuba, Puerto Rico and Mexico are on par with those for players from the United States, while ballplayers from the Dominican Republic and Venezuela experienced a significantly greater number of deaths than expected.

For four of the six nations under study, the effect of playing Major League Baseball appeared to be a homogenizing one: once these players were removed from their nation of origin and given the same set of

circumstantial exposures as players from the US, their mortality experience was nearly identical. This would support a hypothesis that differences in mortality between nations are largely due to malleable factors such as personal income, access to healthcare, and lifestyle.

In contrast, the fact that the players from the Dominican Republic and Venezuela experienced significantly more deaths than expected was in keeping with our original hypotheses. This weighs in favor of the explanation that the differences in mortality between nations are due to immutable factors such as genetics and macro-cultural issues. For these players, there was no effect on mortality of coming to the United States or being a Major League Baseball player.

The causes of death for the ballplayers would be a useful addition to this study. If we were to calculate SMRs by cause of death, we might observe that the beneficial effect of participation in Major League Baseball is to specifically diminish the risk of death from natural causes while simultaneously increasing the risk of death from external causes (accidents and violence). In nations such as the Dominican Republic and Venezuela – where violent crime is rampant, especially that related to the kidnapping and murder of the wealthy[5-6] – this added risk of death from external causes may outweigh any benefits from lower risk of natural causes. The mean ages of death in Table 1 suggest that this may indeed be the case: in Venezuela and the Dominican Republic the mean age of death is in the early 40s, in comparison to the low 60s for Mexico, high 60s for Cuba, and high 70s for Canada. (Puerto Rico, which also had a mean age of death in the mid-40s, did not exhibit a statistically significant difference in deaths; however, Puerto Rico is also not known for excessive violence.) In most of the Western world, a young average age at death is often associated with a high rate of death from external causes.

Regardless of the true effects of playing MLB, the results of this study strongly suggest that the stable characteristics of populations and the modifiable characteristics of individuals may both contribute to the mortality rates of general populations, and thus account for the differences between nations. Future research focusing on the causes of death across analogous cohorts would be valuable, especially as the nation effect could be then treated as potentially multidimensional. Such detailed analyses would help unravel the mysteries of mortality rate disparities, which may offer paths for improvement in survival in all nations.

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