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# **What Do Statistics Tell Us About Steroids?**

**Symposium On Statistics and  
Operations Research in Baseball**

**New York, NY**

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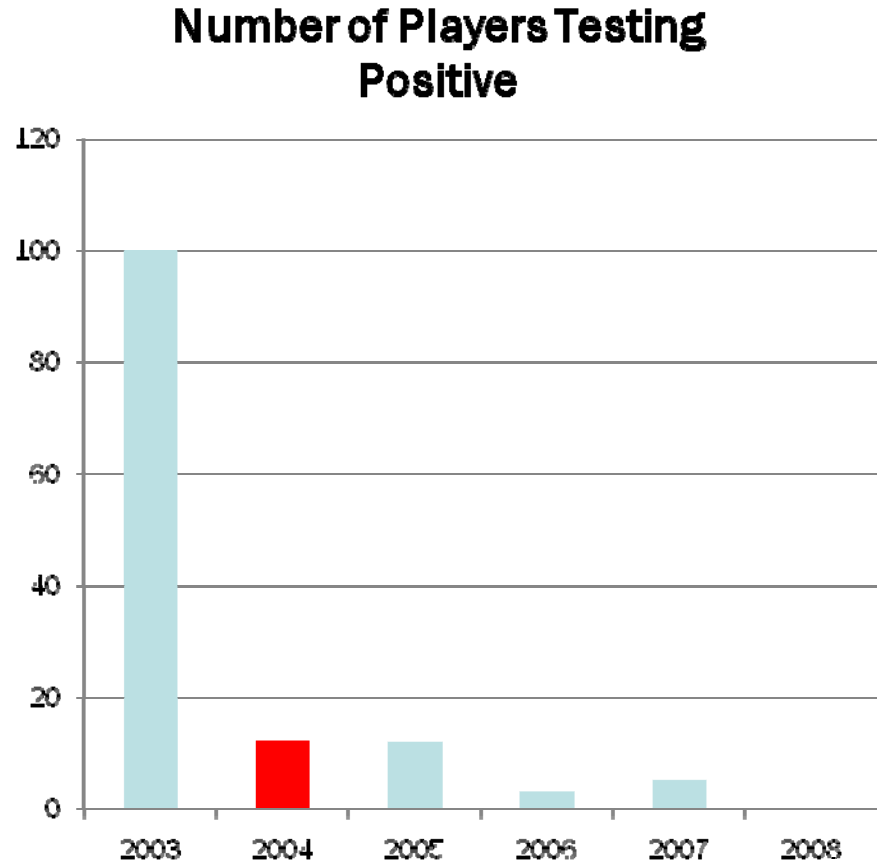
# What Do Statistics Tell Us About Steroids?

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- **When Were/Are Steroids Used?**
- **Where Are Steroids Used?**
- **Who Is Using Steroids?**
- **How Do Steroids Affect Performance?**
- **Why Do Players Use Steroids?**

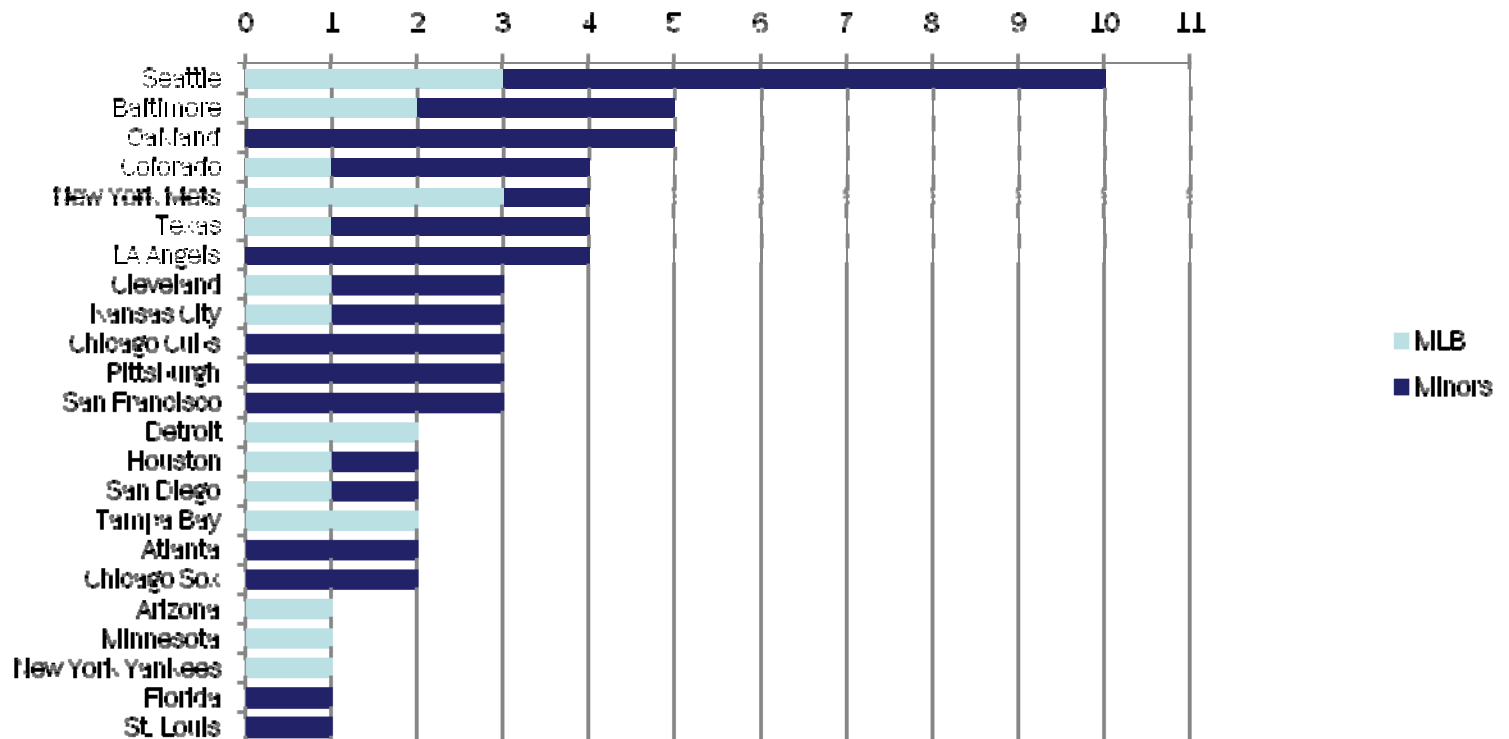
# When Were/Are Steroids Used?

- About 100 MLBers tested positive in 2003 under anonymous testing.
- The number dropped significantly in 2004, even before penalty regime was adopted (although those figures are disputed)
- No player suspended yet in 2008



# Where are Steroids Used?

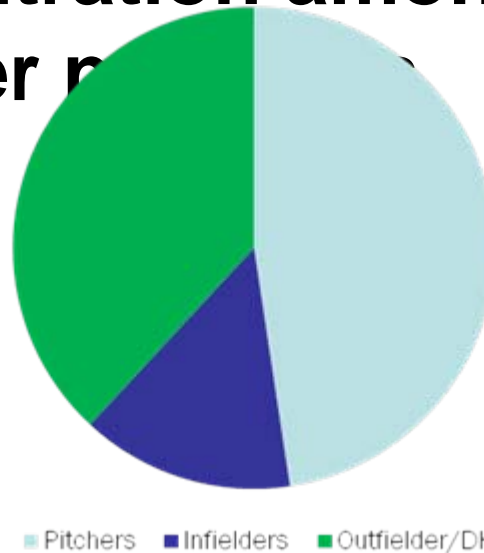
Number of Positive Steroids Tests by Organization



# Who Is Using Steroids?

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- Nearly as many pitchers suspended as hitters
- Some concentration among outfield/power players



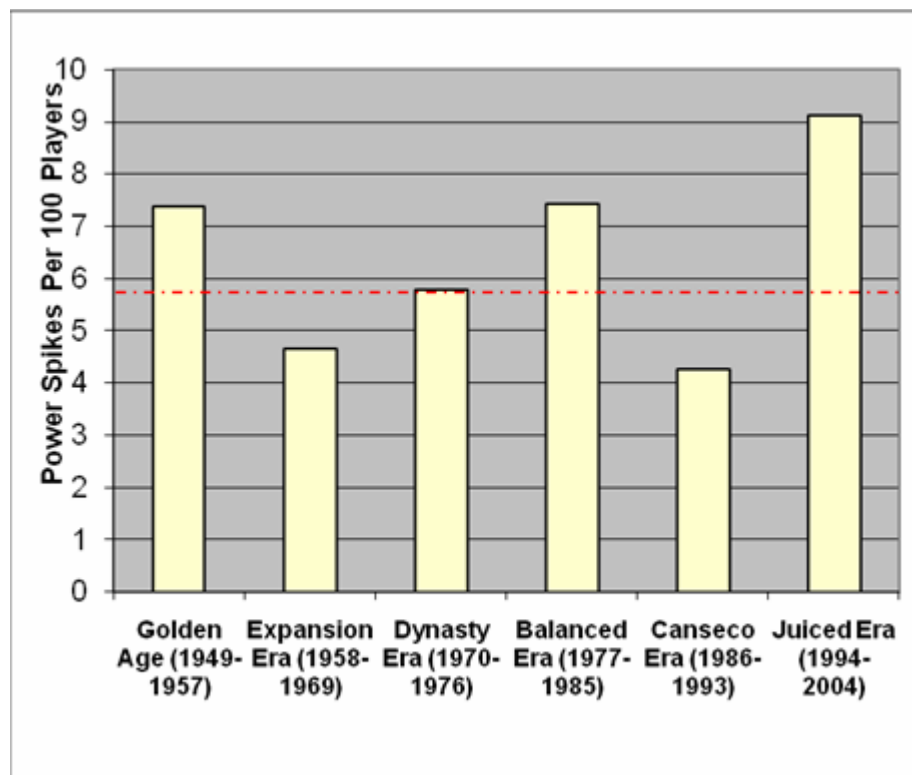
# Who Is Using Steroids?

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- **Most Players Who Have Used Steroids are NOT very good:**
    - Rafael Palmeiro remains only player suspended to have made more than one All-Star Team
    - Just one minor leaguer (Javier Herrera) was in **Baseball America** Top 100 at time of his suspension in 2005
    - No player who received an MVP, Cy Young Award or Rookie of the Year vote in 2007 has ever been suspended for steroids or mentioned in Mitchell Commission report
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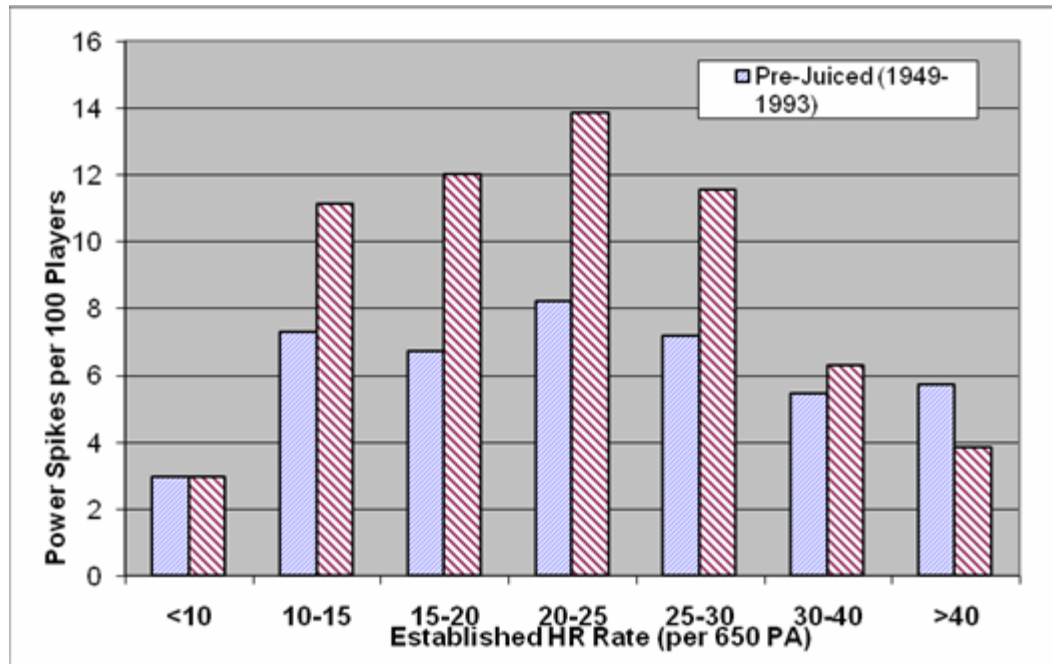
# Who Is Using Steroids?

- Looking at “Power Spikes” (players increasing HR output abruptly) may tell us something:
  - Established major league vets 28+
  - Improves upon three-year average home run rate by ~10 HR per 650 PA



# Who Is Using Steroids?

- **Power Spikes have been most concentrated among middle-tier players:**



# How Do Steroids Affect Performance?

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- **Difficult to determine because a specific timeline is not available in most instances**
- ***BBTN* study of suspensions through 2005:**
  - **Batting Average, -10 points**
  - **OBP, -14 points**
  - **SLG, -6 points**
  - **ERA, +13 points**
- **Changes are barely statistically significant. However, it may be noteworthy that very few of the players suspended have had any success at all since 2005.**

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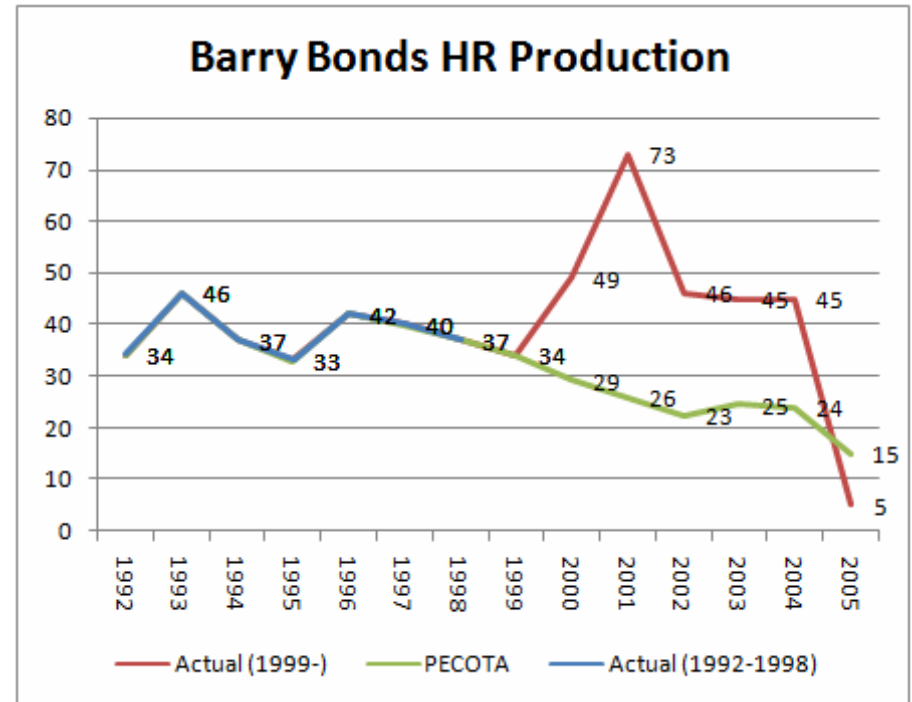
# How Do Steroids Affect Performance?

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- **Steroids affect performance differentially (Jason versus Jeremy Giambi)**
- **Generally, seems to be most benefit to players with power-hitters builds.**
- **Ball-flight studies suggest material impact (R.G. Tobin, Am. J. Physics):**
  - Medical studies of steroids suggest about a 10 percent increase in muscle mass
  - This would produce a 4 percent increase in ball speed
  - Could increase home run production 50-100 percent
  - Add 4-5 MPH for a pitcher

# How Do Steroids Affect Performance?

- Systems like PECOTA can be used, but suffer from reverse cherry-picking problem – generally tell us what we already know/suspect.
- However, Bonds and Clemens clearly belong in different



# Why Do Players Use Steroids?

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- **Incentives, Incentives, Incentives.** Players are rational and have responded rationally to new testing regime.
- **Two times in a players' career when marginal value of recent performance goes way up:**
  - On major league fringe
  - When due for free-agent contract, especially first major free agent contract
- **Teams encourage problems by (over)emphasizing recent performance as opposed to longer-term track record.**
- **Higher pay for minor leaguers, better pension programs might reduce problems.**

