Pitching Statistics

Statistics

ERA - Earned Run Average
ERA+ - Adjusted Earned Run Average
RA/9 - Run Allowed Per 9 Innings
FIP - Fielding Independent Pitching
xFIP - Expected Fielding Independent Pitching
WHIP - Walks and Hits per Inning Pitched
Stuff+ (Fangraphs)
SIERA - Skill-Interactive Earned Run Average
WAR - Wins Above Replacement
Run Value - Run Value Added
wOBA - Weighted On-Base Average
xwOBA - Expected Weighted On-Base Average

Stat Variable Abbreviations

PA - Plate Appearances
IP - Innings Pitched
H - Hits
ER - Earned Runs
RA - Runs Allowed
K - Strikeouts
BB - Walks
HBP - Hit By Pitches
IBB - Intentional Walks
SF - Sacrifice Flies
1B - Singles
2B - Doubles
3B - Triples
HR - Home Runs
GB - Ground Balls
FB - Fly Balls
PU - Pop Ups
LA - Launch Angle
EV - Exit Velocity

ERA - Earned Run Average

Very Descriptive, Partially Predictive

Formula: $\frac{ER \times 9}{IP}$

2023 Average: 4.33

Most widely-used statistic to represent a pitcher's effectiveness (in addition to Wins/Losses). Gives the average number of **earned** runs given up in a full game by a given pitcher. Earned runs can be classified as runs that were not scored via an error, or at a game state in which an error continued an innings that would otherwise have been over.

ERA+ - Adjusted Earned Run Average

Descriptive (Slightly harder to conceptualize), Pretty Predictive

Formula: $\frac{League\ ERA}{ERA} \times \frac{\frac{Home\ Ballpark\ Runs}{Home\ Games}}{\frac{Road\ Ballpark\ Runs}{Road\ Games}} \times 100$

Average (Always): 100

An ERA that is adjusted for the different offensive environments that each park provides. Standardized to base 100 against the league average (100 is league average, 200 would be an .

RA/9 - Run Allowed Per 9 Innings

Descriptive, Barely Predictive

Formula: $\frac{RA \times 9}{IP}$

2023 Average: 4.61

Similar to ERA, except includes unearned runs (those "caused" by errors)
Gives the average number of runs given up in a full game by a given pitcher.

FIP - Fielding Independent Pitching

Predictive

Formula: $\frac{HR \times 13 + 3(BB + HBP) - 2 \times K}{IP} + FIP\ Constant$

2023 Average: 4.34

On the same scale as ERA for a given year–the FIP constant is what ensures that. A modified ERA-esque statistic that only accounts for outcomes that the pitcher can "control." Notably, all of the statistics not counted as "Balls in Play," and therefore not subject to fielding input of any kind.

xFIP - Expected Fielding Independent Pitching

Predictive

Formula: $\frac{\frac{Fly\ Balls}{League\ HR\ /\ Fly\ Balls} \times 13 + 3(BB + HBP) - 2 \times K}{IP} + FIP\ Constant$

2023 Average: 4.34

On the same scale as ERA (and FIP) for a given year–the FIP constant is what ensures that. This statistic goes even further than "normal" FIP and accounts slightly for ballpark dimensions, etc., using fly ball rate to predict league average number of homeruns for the number of fly balls allowed.

WHIP - Walks and Hits per Inning Pitched

Descriptive, Predictive

Formula: $\frac{BB + H}{IP}$

2023 Average: 1.313

A pitching equivalent of OBP. Measures the number of [non-error] baserunners that a pitcher allows per inning on average.

Stuff+

Fairly Descriptive, Very Predictive

Formula: *Proprietary Fangraphs Formula* - Includes velocity and movement values and differentials (vs. fastball) of a pitch/arsenal as well as spin rate, release angle, etc.

Average (Always): 100

A measure of how "good" a pitch is in terms of its component metrics. Notably, this does not account at all for the results, or even location/command, of a pitch, but instead looks at the numbers that make up the pitch. This statistic stabilizes really quickly and is often a very good predictor of itself.

SIERA - Skill-Interactive Earned Run Average

Predictive

Formula:

$$6.145 - \frac{16.986\,K}{PA} + \frac{11.434\,BB}{PA} - \frac{1.858\,(FB - FB - PU)}{PA} + \frac{2.7664\,SO}{PA}^{2} -$$

$$\left|\frac{GB - FB - PU}{PA}\right| \times \frac{6.664\,(GB - FB - PU)}{PA} + \frac{10.13\,K}{PA} \times \frac{GB - FB - PU}{PA} - \frac{5.195\,BB}{PA} \times \frac{GB - FB - PU}{PA}$$

Average (Always): 100

On the same **rough** scale as ERA. Similar to FIP, only includes outcomes that are independent of fielding. SIERA uses batted ball type, but not the fielding/baserunning result. In the same way that xFIP can be said to account for ballpark idiosyncrasies (in a rudimentary way), SIERA does the same in that it only takes into account the way the ball was hit, and does not directly take into account distance or the on-field result (i.e. Home Run).

WAR - Wins Above Replacement

Predictive

Formula: *Proprietary Fangraphs Formula & Proprietary Baseball-Reference Formula*

Average (Always): ≈ 1

Note that this is Wins Above **Replacement**, not Wins Abova Average. A replacement level is a league minimum salary or AAA player. WAR gives the amount of extra "Wins" a player's performance gives a team and includes many different result-based statistics.

Two Main Types of WAR:

fWAR - Fangraphs - 430 total WAR for pitchers per year

bWAR - Baseball Reference - 410 total WAR for pitchers per year

Notably, for fielding value/wins, Fangraphs uses Ultimate Zone Rating (UZR) and Baseball-Reference uses Defensive Runs Saved (DRS). On the pitching side, Fangraphs uses FIP to determine "runs," while Baseball-Reference uses runs allowed.

Run Value - Run Value Added / Above Average

Descriptive, Predictive

Formula: *Based on Run Expectancy Matrix*

Average (Always): 0

Is recorded on a pitch-by-pitch basis, while most statistics are calculated by PA/AB. Is heavily context based as well, so a strikeout pitch with the bases loaded is going to have more associated run value than a strikeout pitch with the bases empty. This statistic is calculated using probabilities to determine the expected run value before and after a given pitch. There is also a variant of this that accounts for sample size: RV/100, which is run value per 100 pitches.

wOBA - Weighted On-Base Average

Descriptive, Very Predictive

Formula: $\frac{0.69\ (BB - IBB) + 0.722\ HBP + 0.888\ 1B + 1.271\ 2B + 1.616\ 3B + 2.101\ HR}{AB + BB - IBB + SF + HBP}$

2023 Average: .318

Arguably the preeminent single measure of offensive production. A measure of a player's ability to get on base, assigning different values for different results. For a pitcher, this is calculated with the hits/results that they allow to hitters. A tuned version of On-Base Plus Slugging (OPS) which is also a commonly used measure of offensive production.

xwOBA - Expected Weighted On-Base Average

Descriptive, Very Predictive

Formula: *Predicted Proportion of Hit Given LA & EV. Assigns parts of each hit-type by probability to the wOBA formula. Accounts for Sprint Speed on weakly hit balls*

2023 Average: .321

Does not use any actual on-field results of a batted ball. Instead accounts for how hard and at what angle the ball was hit to determine that the overall average value of the hit (i.e. the hit had a 80% probability to be a double and 20% chance to be a flyout, so the hitter is credited with the wOBA value of 80% of a double and 20% of a flyout).