



Ranking System Analysis

$$\begin{array}{l}
 B \lim_{x \rightarrow 1} \frac{ctgx-2}{2\sqrt{1-x^3}} Q'' \quad \int (x \pm a)^c \quad \sum_{n=1}^{\infty} = n-1 \quad \frac{A-C}{A-C} = \\
 +y^2=Z \quad S_3 = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} \quad \phi = \sqrt{\frac{\sum (x-m)^2}{n-1}} \quad S = \int_2^{10} 5t \, dt \quad x \\
 \pi \approx 3.1415 \quad y = \sin x \quad y = \frac{\Delta x}{\Delta z} \\
 P = r^2 \pi \quad (x+y)^2 = \left(\frac{y}{2}\right)^2 \quad \frac{\Delta x}{\Delta y} = \lim_{\Delta y \rightarrow 0} \frac{\Delta x+2}{\Delta y-1} \\
 \Delta t = T - \frac{3a}{x} \quad 8x = 4 - 3y^2 \quad (x+a)^2 = x^2 + 2ax + a^2 \quad f_x = \\
 (x-y^2) \quad y = 2x^2 + 3x \quad \ln(x \pm \sqrt{x^2 \pm a^2}) + c \quad X_{1/2} = \frac{b \pm (a-c)}{\sqrt{2a}} \\
 \int \frac{\sqrt{x+a^2}}{x} \quad e = 2.7g \quad e = \cos x + \tan y \quad \tan(2a) = \frac{2 \tan(a)}{1 - \tan^2(a)} \\
 P = \sum_{i=0}^{\infty} x_i^a \quad y = \frac{\Delta x}{\Delta z} \quad \ln = \sqrt{axb} \quad \sum_{n=0}^{+\infty} \frac{x^n}{n!} \quad \sin a = \frac{b}{c} \quad x \\
 = (y-1)^2 \quad (x+h) \sin a = \frac{b}{c} \quad \sum_{n=0}^{+\infty} \frac{x^n}{n!} \quad \sin a = \frac{b}{c} \quad x
 \end{array}$$

Considering Change

The CHSAA ranking system

Listening to Member Schools

The CHSAA Office, and members of the Board of Directors, have heard from member schools that they want to examine if our seeding system should change.

Always Looking to Improve

Asking the question: “Is what we’re doing now the best solution?”

We Have the Data

So let’s put it to use.

Evolution of seeding systems

2000s



All over the place

Varied

Sport-by-sport. Not much consistency.

Seeding Committees

Group of retired administrators, paid mileage to watch dozens of games and seed basketball tournaments.

Predetermined Bracket

Bracket slots determined based upon league finish.

Evolution of seeding systems

Early 2010s



Mathematical Formulas

Power Points

- Used in football
- Extremely simplistic
- Not very accurate

MaxPreps Rankings

- Used to seed girls volleyball regionals
- High degree of accuracy (> 90% prediction rate)
- Difficult to understand

RPI

- Commonly used (NCAA, NAIA)
- Very simple
- Transparent
- Improved accuracy

Evolution of seeding systems

Late 2010s



Combined Data

Coaches Polls

- Human Element
- Weekly votes
- Final vote only counts

Packard Rankings

- Colorado Mesa professor
- Basketball and football only

MaxPreps/RPI

- Membership familiar with them at this point

Evolution of seeding systems

2020s-Now



CHSAA Seeding Index

MaxPreps & RPI only

- No human element
- Data-based

Combine the data

- Two vastly different ratings
 - MP: 25.6
 - RPI: 0.683
- Normalized, turned into percentages

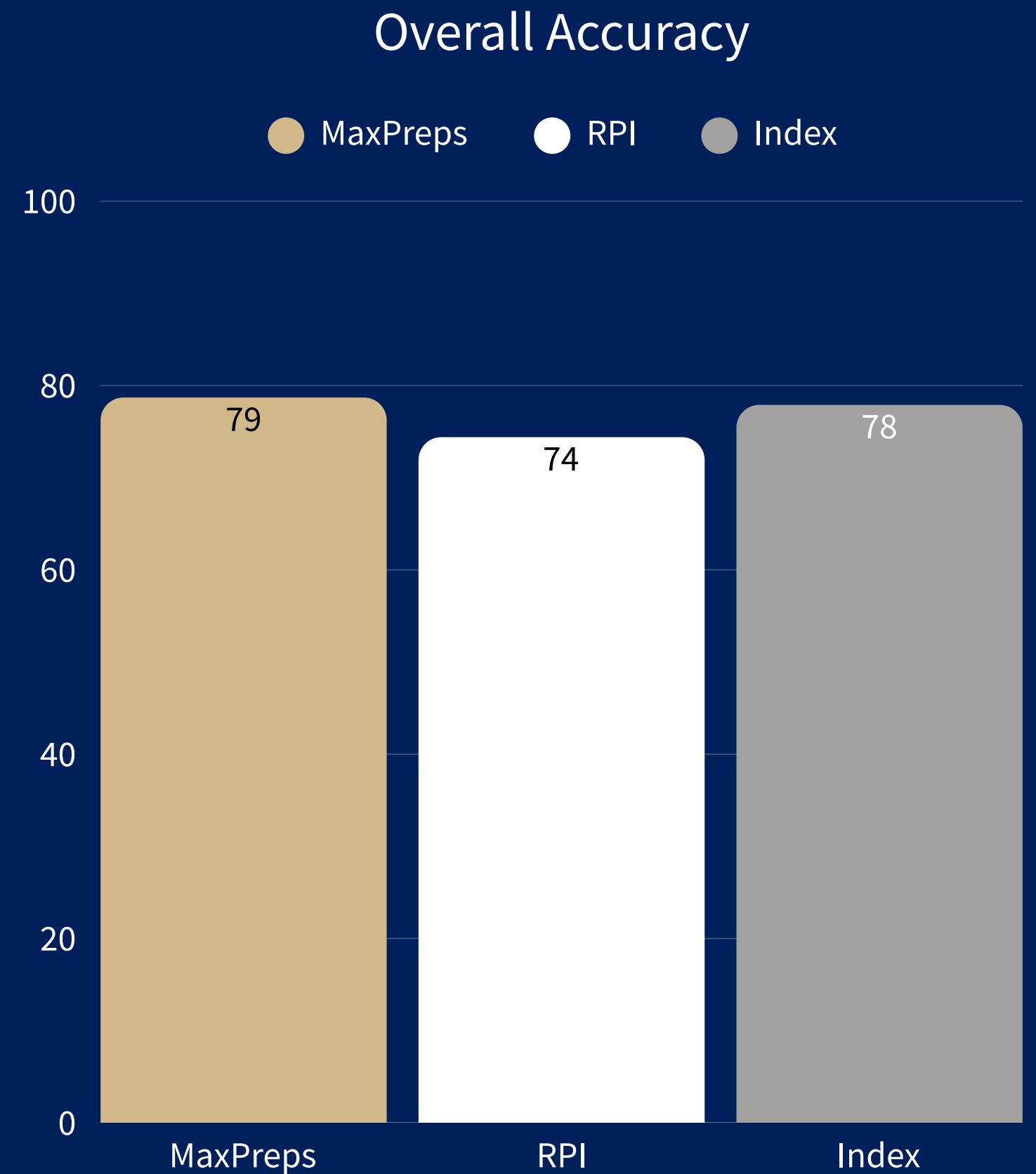
Transparency

- Data constantly available on CHSAANow
- RPI updates hourly
- MP updates 2x weekly

Seeding Model Comparison

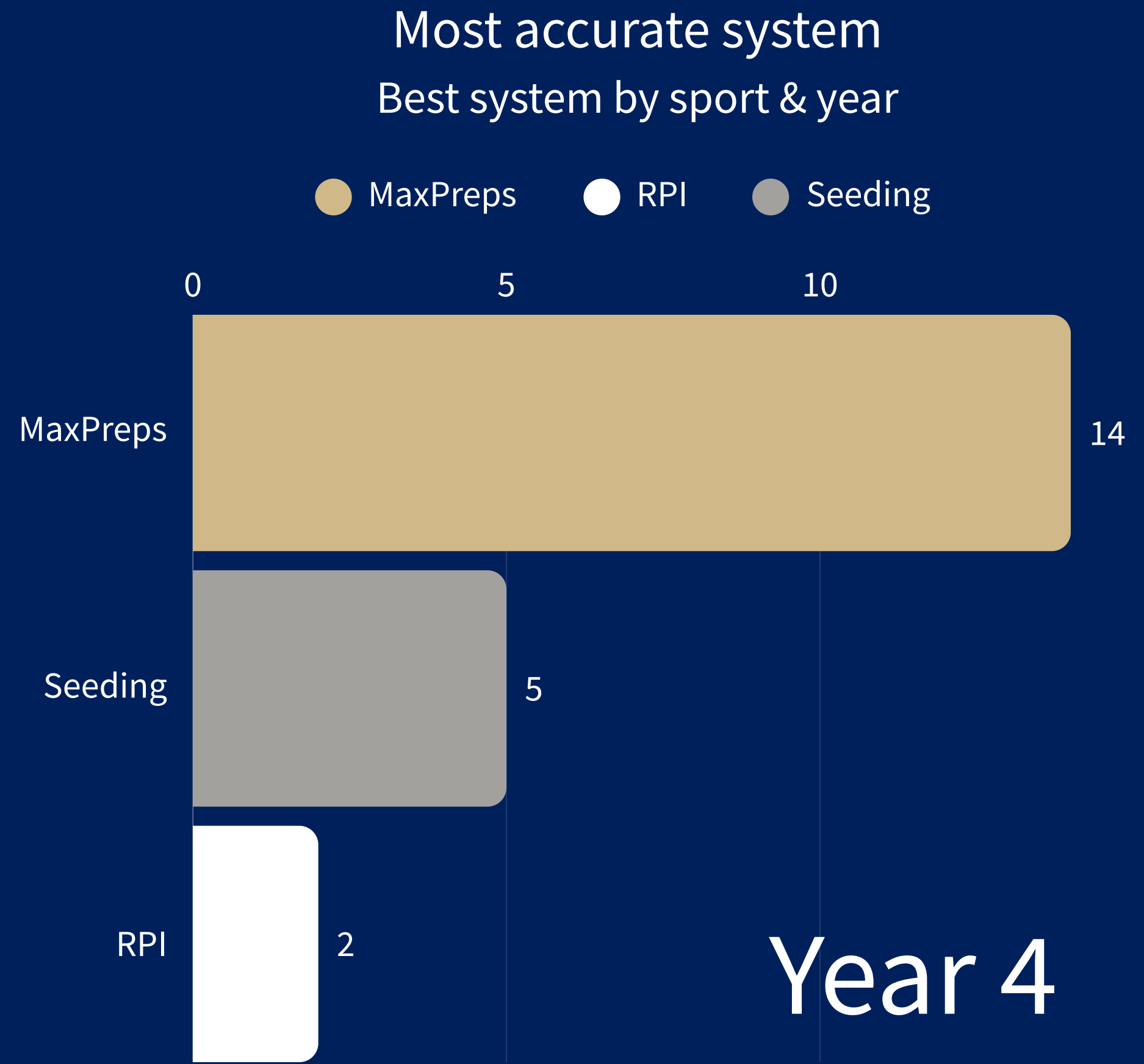
- Four seasons of data
- Football, Girls Volleyball, Boys & Girls Basketball
- Compared each model's seed and expected outcome to actual outcome
- For example:
 - 🏈 No. 14 Chatfield 37, No. 11 Grandview 28
 - ❌ Seeding: (11) Grandview > (14) Chatfield
 - ❌ RPI: (11) Grandview > (20) Chatfield
 - ✅ MaxPreps: (9) Chatfield > (13) Grandview

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What does the data say?

- MaxPreps is the most accurate system
- It even out-performs the Seeding Index
 - This means that the RPI waters down MaxPreps' accuracy in the Seeding Index combination
- Comparing all three systems (includes ties) in all postseason contests:
 - MaxPreps best in 14
 - Seeding Index best in 5
 - RPI best in 2
- Head to head, RPI vs. MaxPreps:
 - MaxPreps was more accurate in 14
 - RPI was more accurate in 1
 - In first-round contests only, MP more accurate in 15. RPI in 1.



Seeding Sytem Comparison

MaxPreps vs. RPI

	RESULT	OPPONENTS	OPPONENTS' OPPONENTS	EXPONENTIAL OPPONENTS	GAME SCORE
RPI	✓	✓	✓	✗	✗
MaxPreps	✓	✓	✓	✓	✓

Why is MaxPreps more accurate?



More Data

Ratings Percentage Index (RPI)

Pros

- ✓ Common system, used in multiple sports associations.
- ✓ Simple and transparent — Easy for the average person to understand.
- ✓ Calculations can be duplicated by school or community members.
- ✓ Used in Colorado for a decade. Communities are familiar with it.
- ✓ Updates hourly.

Overly simplistic.



Only three levels of data.



As a result, it is easy for coaches to try and manipulate.



With the exception of football, classification is not taken into account.



Scheduling is very important. Results in schools refusing to play others.



Cons

MaxPreps Rankings

Pros

- ✓ Exponentially more data is included in the calculation, increasing accuracy.
- ✓ CHSAA can run it on-demand, whenever we need to.
- ✓ Allows schools to schedule more freely.
- ✓ They are investing in the system to improve it: Hiring a data scientist.
- ✓ Used in CO for 15+ years and many other states/sections.
- ✓ Classification automatically taken into account through increased data set.

The exact formula is proprietary, meaning it can't be duplicated.

Margin of victory component, raising questions of sportsmanship.

Reliance on outside company.

Cons