

# The Highway to WAR: Defining and Calculating the Components for Wins Above Replacement

Sam Ventura  
Andrew C. Thomas

Department of Statistics  
Carnegie Mellon University  
[www.war-on-ice.com](http://www.war-on-ice.com)  
@stat\_sam

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## For More Details...

We (okay, Andrew) wrote an 11-part series called “The Road To WAR”

Series index: <http://blog.war-on-ice.com/the-road-to-war-series-index/>

Highlights:

- ▶ “The Single Number Dream”
- ▶ “What do we mean by ‘replacement’?”
- ▶ WAR for penalties taken and drawn
- ▶ WAR for shooting/goaltending
- ▶ WAR for shot rates (Corsi!!!)

I will go into far less detail in this talk

# Why Do We Care About “Replacement”?

**Even if we don't care, GMs do (or should)**

Comparing to a replacement-level player mimics the decisions that GMs make on a daily (or yearly) basis.

We can quantify how much a win is worth for a franchise

So with WAR, we can quantify how much a player is worth for a franchise

# WAR: What Is It Good For?

## **Single number metric:**

- ▶ Puts all skills on the same comparable scale
- ▶ Currency: Goals (converted to wins)

## **Broken down into components:**

- ▶ Faceoffs
- ▶ Penalties drawn and taken
- ▶ Shooting
- ▶ Goaltending
- ▶ Shot generation and suppression

## **Flexible – can add more components as new data arrives, e.g.:**

- ▶ Passing data (go help Ryan Stimson!)
- ▶ Zone entry data
- ▶ Player-tracking data

# Defining “Replacement Level”

For each component of WAR, we need to (separately) define replacement-level. But how?

## “Poor Man’s Replacement”:

- ▶ For a given component, define a replacement threshold / criterion
- ▶ For all players below that threshold, pool them into one meta-player
- ▶ How the pooled players perform in aggregate is considered the replacement level for that component

## Thresholds for each component:

- ▶ Faceoffs: Player has taken  $< 50$  faceoffs
- ▶ Penalties: Player has played  $< 60$  minutes
- ▶ Shooting: Player has taken  $< 15$  shots (in a danger zone)
- ▶ Goaltending: Goalie has faced  $< 150$  shots (in a danger zone)
- ▶ Shot rates: Player has played  $< 60$  minutes

## Poor Man's Replacement – An Example for Shooting

For medium-danger (MD) shots:

1. Threshold: 15 MD shots
2. Players with fewer than 15 MD shots taken are grouped together
3. Grouped players have a MD shooting percentage of 4%
4. Replacement-level for MD shooting is now 4%
5. For a shooter with MD 200 shots & 14% MD shooting percentage, the player scored  $200 * (14\% - 4\%) = 20$  goals above replacement

# Converting Goals to Wins (or Points)

In any given season, the value of a goal changes, usually due to changes in league-wide scoring rates

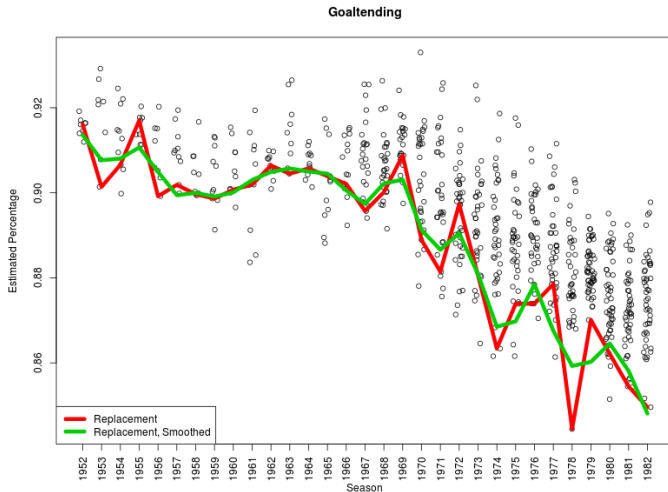
Basic calculation:

- ▶ 3 goals  $\approx$  1 point in standings
- ▶ **6 goals  $\approx$  1 win**
- ▶ Obtained from linear regression (standings points given goals)

Alternative names:

- ▶ SPAR (standings points above replacement)
- ▶ SOLAR (shoot-out losses above replacement)

# Replacement Level Goaltending Through 1982

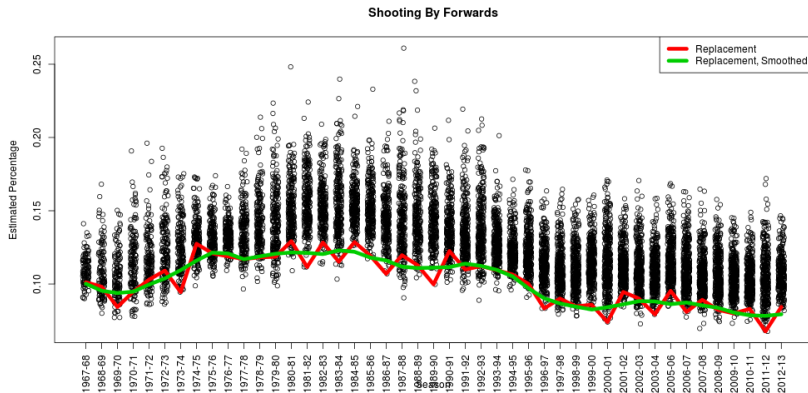


Best Season: Bernie Parent, 1972-73, 104 GAR

Best Career: Tony Esposito, 886 GAR



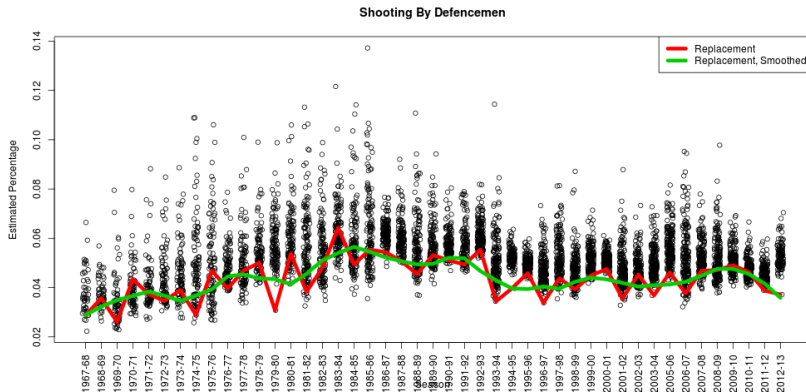
# Replacement Level Shooting Through 2013 (Forwards)



Best Season: Mario Lemieux, 1989-90, 50 GAR

Best Career: Wayne Gretzky, 322 GAR

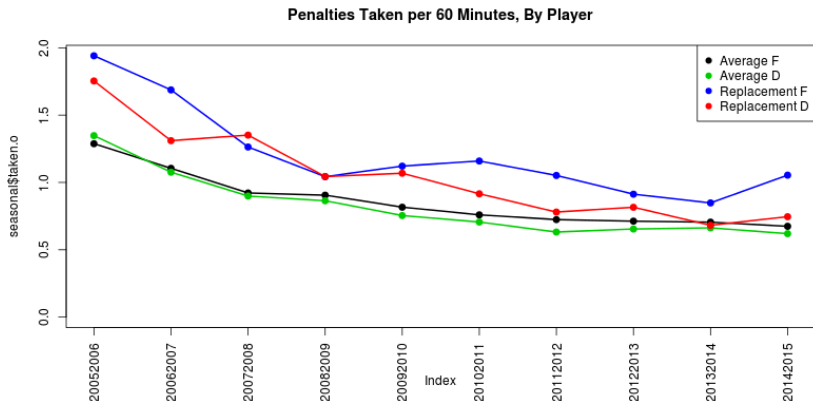
# Replacement Level Shooting Through 2013 (Defensemen)



Best Season: Orr (1974-75), Coffey (1985-86): 31.5 GAR

Best Career: Paul Coffey, 185 GAR

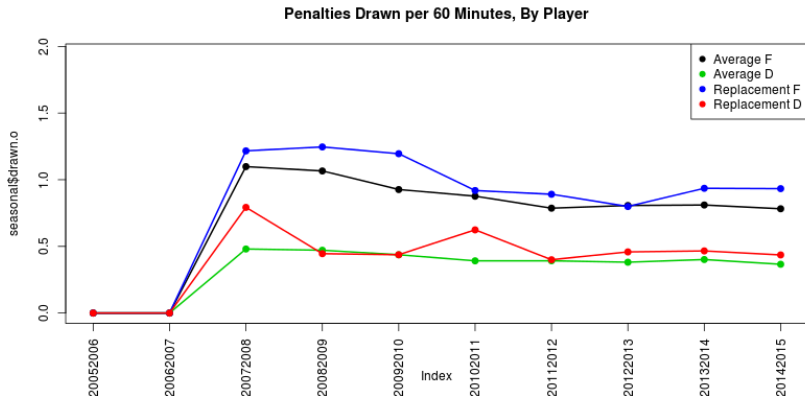
# Replacement Level Penalties Taken Since 2005-06



Best Careers: St. Louis (6.71 WAR), B. Richards (6.61), Campbell (5.87)

Worst Careers: Neil (-5.03 WAR), Hartnell (-4.10), Downie (-3.69)

# Replacement Level Penalties Drawn Since 2007-08



Best Careers: D. Brown (6.14 WAR), P. Kaleta (4.02), E. Malkin (3.46)  
Worst Career: Brad Richards (-3.15 WAR)

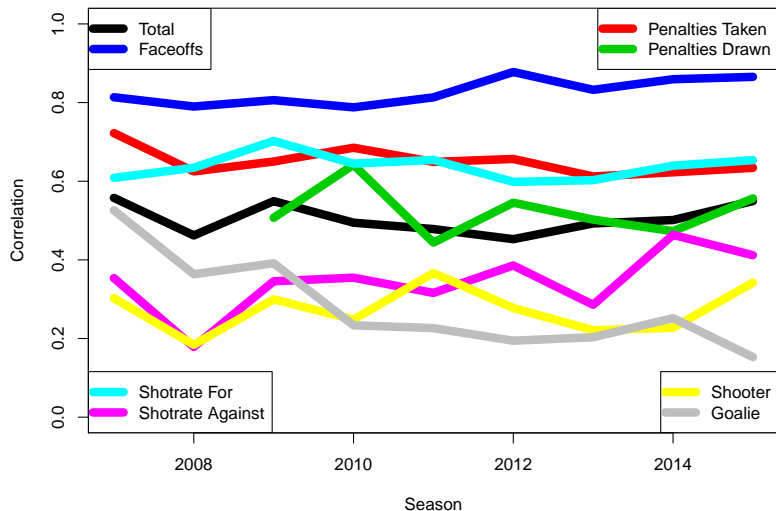
# Shot Generation and Suppression

Cool questions we can answer:

- ▶ Who is the best on the power-play?
  - ▶ This season: Sharks dominate PP GAR leaderboard
  - ▶ Historical GAR leaders: Selanne, Malkin, Pronger, Datsyuk, every Sharks player since 2005-06
- ▶ Who is the best/worst this season at 5-on-5, offensively?
  - ▶ Best: Tavares (11.5 GAR), Stralman (10.1), Letang (9.6)
  - ▶ Worst: Fayne (-5.42 GAR), Malhotra (-4.98), Guenin (-4.63)
- ▶ Who is the best/worst this season at 5-on-5, defensively?
  - ▶ Best: Koivu (5.59 GAR), Bergeron (5.48 GAR)
  - ▶ Worst: Kessel/JVR/Bozak combine for -27 GAR
- ▶ Who is the best/worst this season on the penalty kill?
  - ▶ Best: Subban, Girardi, Coglano, Suter (all near 3 GAR)
  - ▶ Worst: Carlson, Scuderi, OEL, Talbot (-4 to -5 GAR)

# Repeatability of GAR

Season-To-Season GAR Correlation, 2006 -- 2015



# Hart, Norris, Vezina, and Calder Winners?

Hart: Carey Price

Vezina: Carey Price

Norris: Erik Karlsson

Calder: Stone (11.97 GAR), Forsberg (11.62 GAR)

# Thanks!

Contact me:

Email: [sventura@stat.cmu.edu](mailto:sventura@stat.cmu.edu)

Twitter: [@stat\\_sam](https://twitter.com/stat_sam)

Thanks!