Age Remains Undefeated

Micah Blake McCurdy
hockeyviz.com

Rochester, New York
RIT Sports Analytics Conference
September 14, 2019

- How does individual impact on 5v5 shot rate change with age?

Conclusions

- ▶ Peak age is 24
- ▶ Early career improvement in defence: selection
- ▶ Early career improvement in offence: "real"
- ▶ Late-career declines are all in defence.
- ▶ Inflection points around 31 and 34

Conclusions

- Peak age is 24 (thrice!)
- Early career improvement in defence: selection
- Early career improvement in offence: "real"
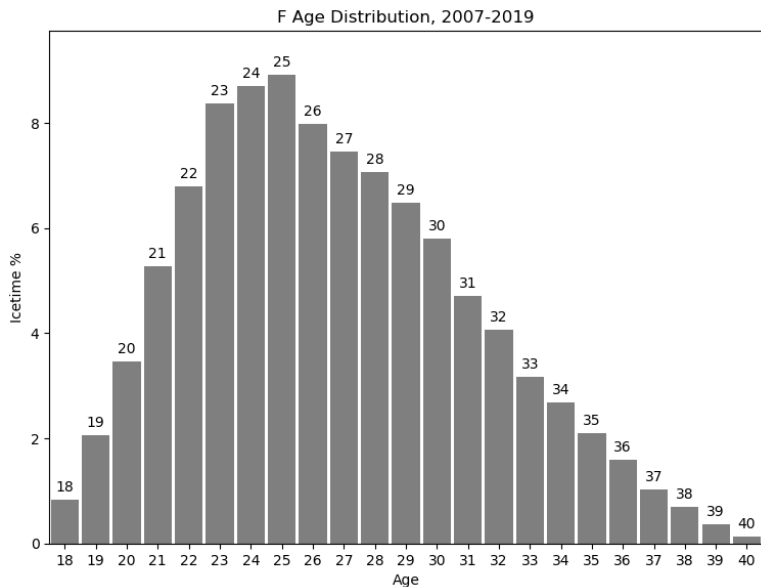- Late-career declines are all in defence.
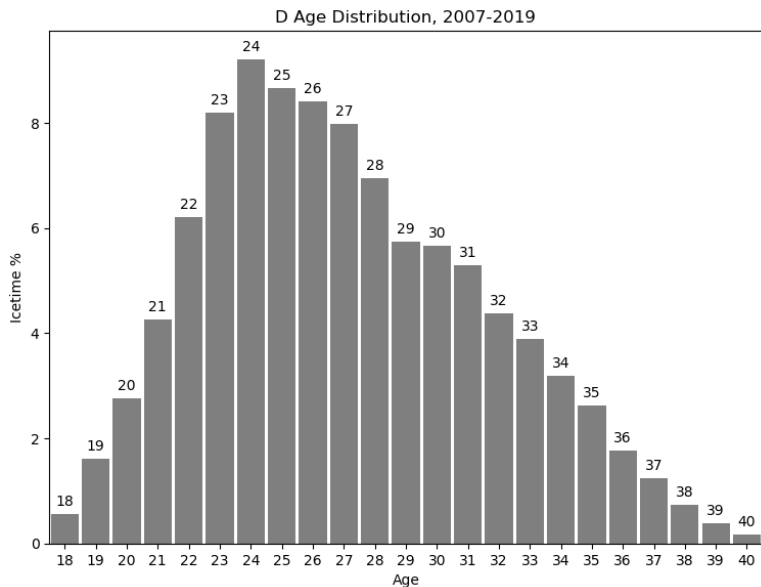- Inflection points around 31 and 34

Total Icetime (2007-2019)

Age Distribution, 2007-2019
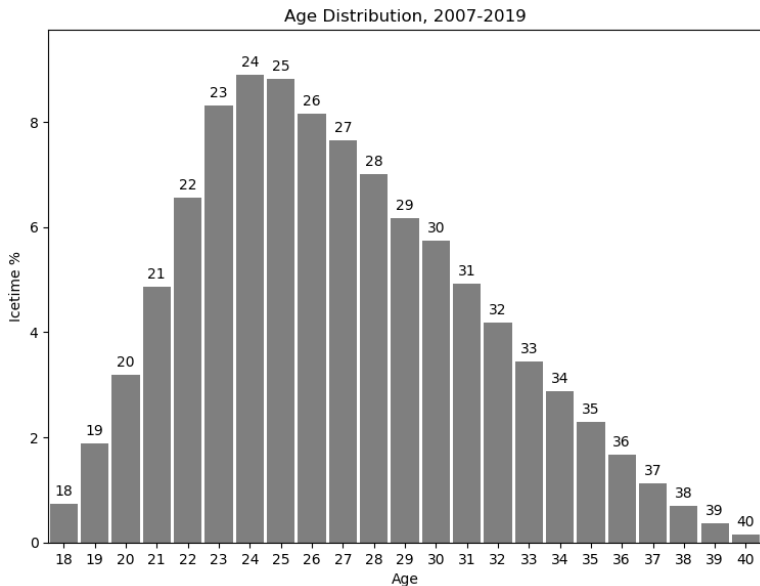
Conclusions

- Peak age is 24

Total Icetime (2007-2019, Forwards)

F Age Distribution, 2007-2019

Total Icetime (2007-2019, Defenders)

D Age Distribution, 2007-2019

Comers and Goers (2008-2018)

Age Distribution, 2008-2018

Comers (2008-2018)
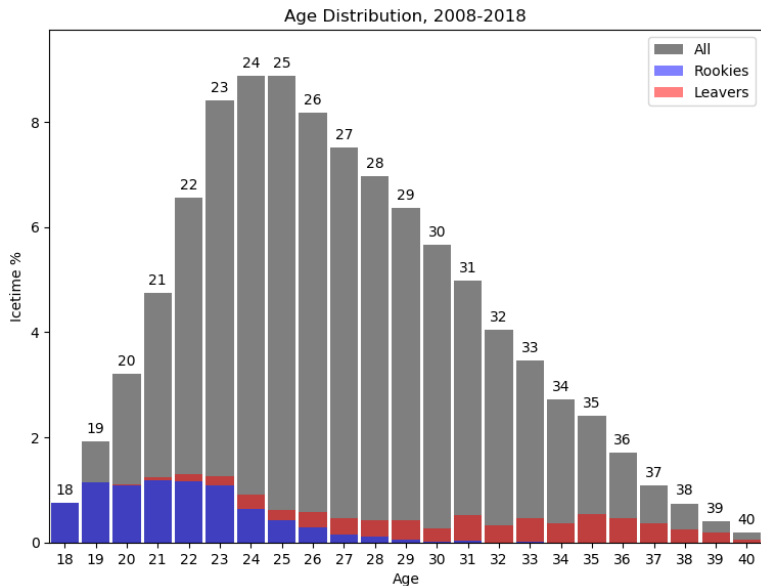
Age Distribution, 2008-2018

Goers (2008-2018)

Age Distribution, 2008-2018 (5.9% of total)
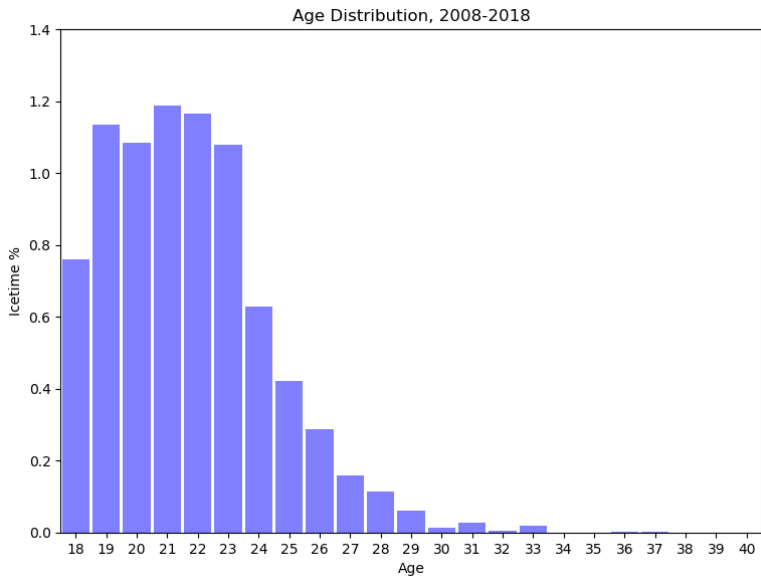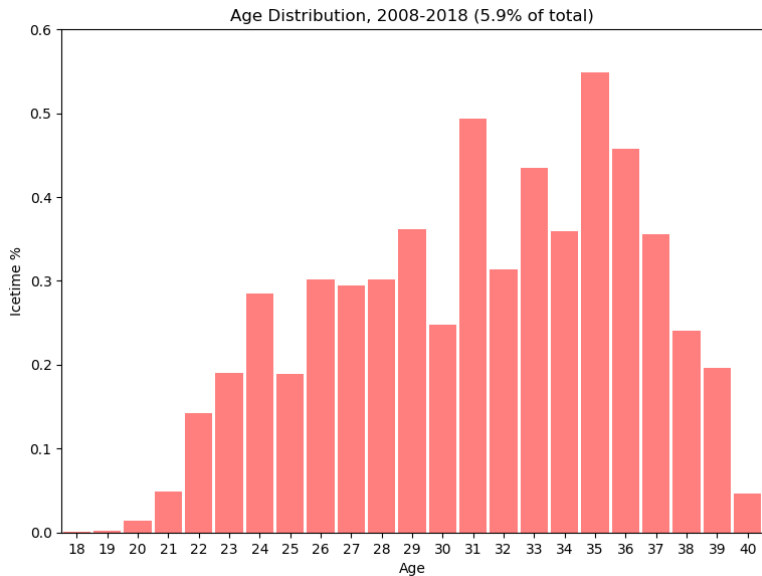
Framing

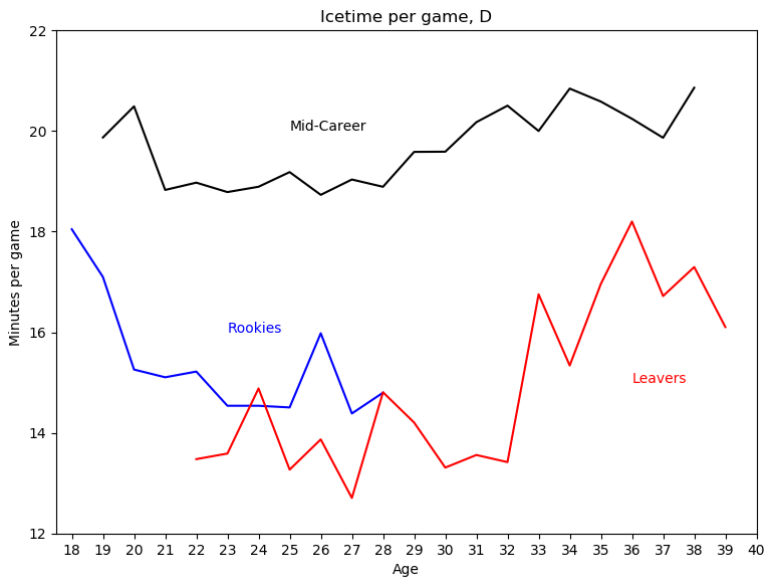- Player entries don't drop off until age 24
- Non-trivial amount of leaving even at age 24
- By icetime, half of leavers are 32 or younger

Icetime per Game (Forwards, 2007-2019)
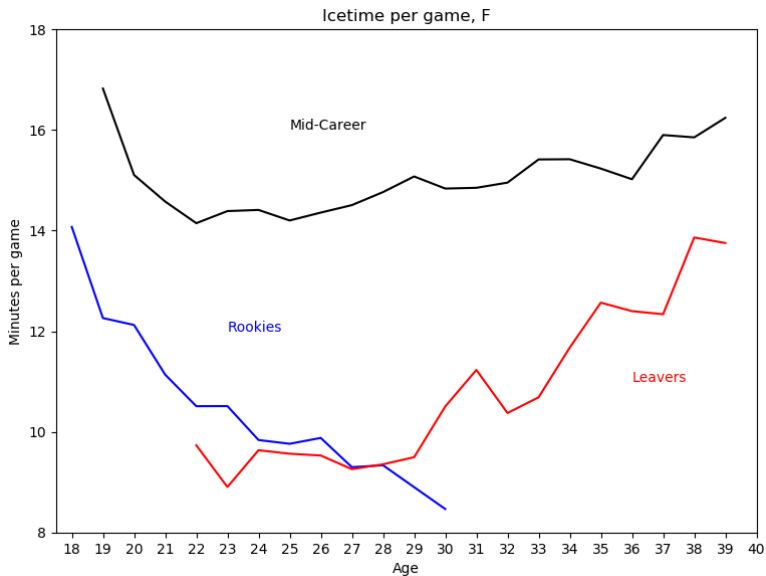
Icetime per game, F

Icetime per Game (Defenders, 2007-2019)

Icetime per game, D

Outline

- Isolate performance from context
- Track changes from year to year
- Account for selection bias
  - Leaving <u>and</u> entering

Performance Isolation

- Input data is output from my 5v5 shot rate impact model (Edgar)
- Individual impact isolated from:
  - Teammates
  - Opponents
  - Zone deployment
  - Score deployment
  - Head coach
- Regression on maps, not numbers.
  - Today turn all the maps into threat

Age Regression

The easy bit:

- ▶ Every <u>pair</u> of consecutive seasons is an observation
  - ▶ Keyed to age (cleverly massaged)
  - ▶ Response is the change in isolated impact

Age Regression

The easy bit:

- ▶ Every pair of consecutive seasons is an observation
  - ▶ Keyed to age (cleverly massaged)
  - ▶ Response is the change in isolated impact
- ▶ One variable for each age between 18 and 49

Age Regression

The hard bit:

- Every <u>entry</u> season is an observation
    - Keyed to age (as above)
    - Response is the <u>absolute</u> isolated impact in the rookie year

Age Regression

The hard bit:

- ▶ Every <u>entry</u> season is an observation
  - ▶ Keyed to age (as above)
  - ▶ Response is the <u>absolute</u> isolated impact in the rookie year
- ▶ One "entry" variable for each age between 18 and 49

Age Regression

The hard bit:

- Every <u>entry</u> season is an observation
  - Keyed to age (as above)
  - Response is the <u>absolute</u> isolated impact in the rookie year
- One "entry" variable for each age between 18 and 49
- Entry variables encode "how good do I have to be to make the NHL at age x?"

Age Regression

The hard bit:
- ▶ Every exit season is an observation
  - ▶ Keyed to age (as above)
  - ▶ Response is the absolute isolated impact in the final year
- ▶ One "exit" variable for each age between 18 and 49
- ▶ Entry variables encode "what is lost when a player leaves the league at age x?"

Example

Sleve McDichael has a three-season career:

	ENTER 20	AGE 20	AGE 21	AGE 22	AGE 23	EXIT 23	?
Entering	1	1					77
Y1 to Y2			1				+1
Y2 to Y3				1			−6
Leaving					1	1	−72

Fitting Notes

- Regression
- With "Ridge" penalties, since we know that physiological changes are small.
- With "Fusion" penalties for adjacent years.

Fitting Notes

- ▶ Regression
- ▶ With "Ridge" penalties, since we know that physiological changes are small.
  - ▶ Bias values toward zero
- ▶ With "Fusion" penalties for adjacent years.
  - ▶ Bias values towards each other

Selection Bias

► Every* career is artificially smudged before and after.

Selection Bias

- Every* career is artificially smudged before and after.
  - Mitigates selection bias
  - Estimate strength of entering / leaving cohorts at various ages

Selection Bias

- Every* career is artificially smudged before and after.
  - Data doesn't stretch back far enough to get everybody's rookie years
  - Many current players aren't finished their careers yet.

Selection Bias

- Every* career is artificially smudged before and after.
  - Data doesn't stretch back far enough to get everybody's rookie years
  - Many current players aren't finished their careers yet.
   - So the selection bias mitigation is affected by selection bias.

Selection Bias

- Every* career is artificially smudged before and after.
  - Data doesn't stretch back far enough to get everybody's rookie years
  - Many current players aren't finished their careers yet.
    - So the selection bias mitigation is affected by selection bias.
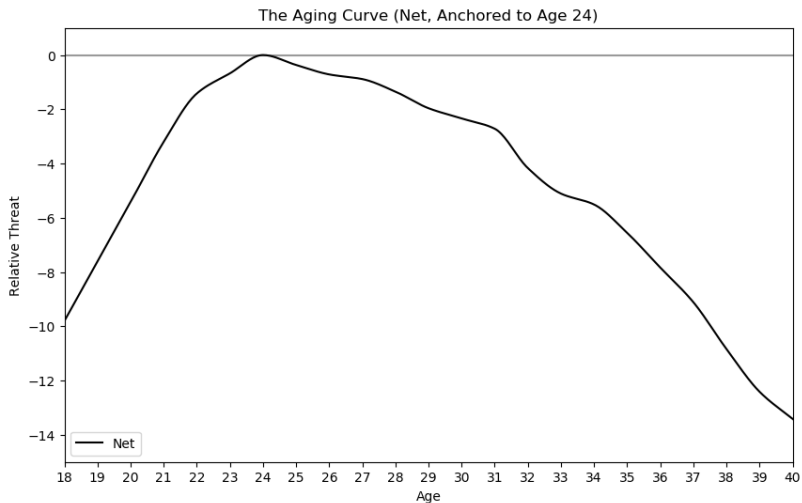   - LOL

Isolated Impact, observed by age

Changes due to age

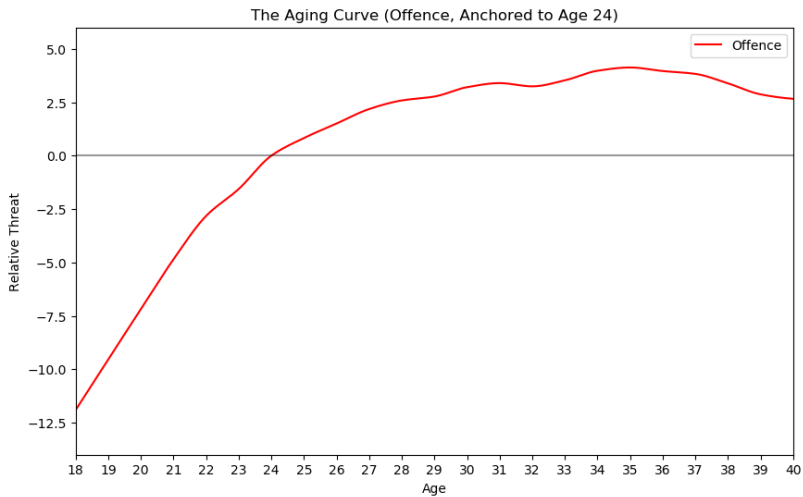

Aging Changes (Selection-Corrected)
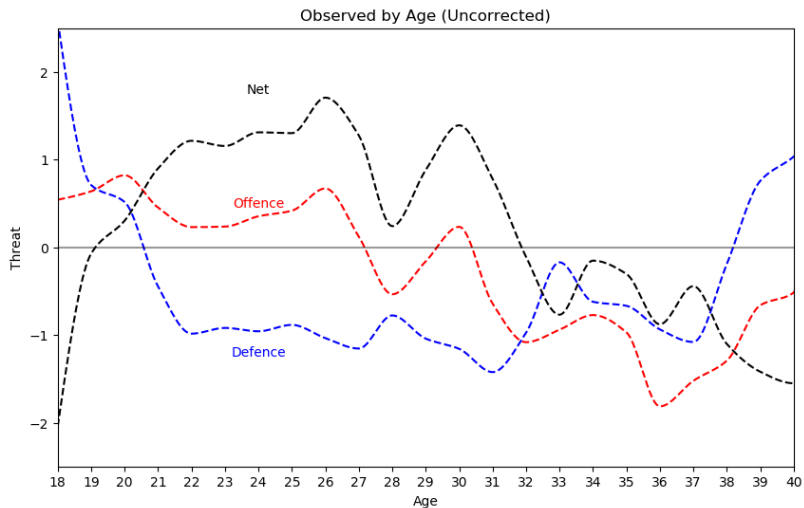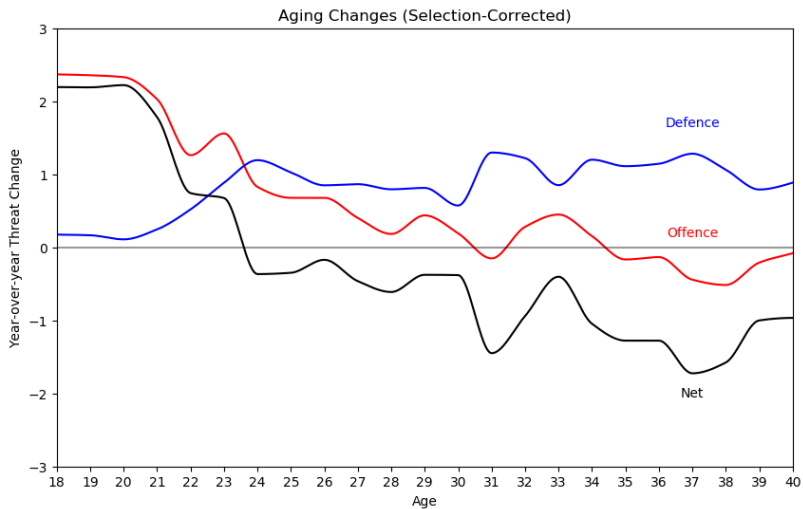
Changes due to age

- ▶ Offence improves quickly early, then slows and stabilizes.
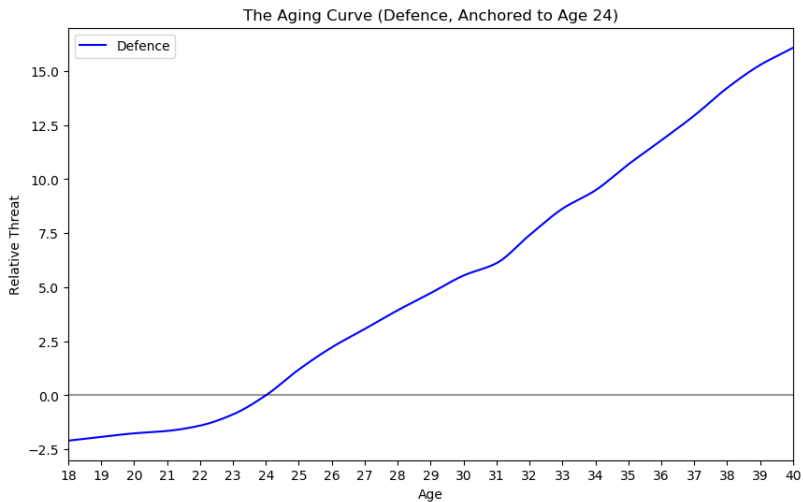- ▶ Defence is always getting worse.
- ▶ Peak age is 24.

"The" Aging Curve

The Aging Curve (Net, Anchored to Age 24)

"The" Aging Curve

"The" Aging Curve

The Aging Curve (Defence, Anchored to Age 24)

Conclusions

- Peak age is 24
- Early career improvement in defence: selection
- Early career improvement in offence: "real"
- Late-career declines are all in defence.
- Inflection points at 31 and 34
    - 24-31: Gentle decline (0.4 threat per year)
    - 31-34: About twice as steep (0.9)
    - 34-40: About three times as steep (1.3)

Conclusions

- ▶ Peak age is 24
- ▶ Early career improvement in defence: selection
- ▶ Early career improvement in offence: "real"
- ▶ Late-career declines are all in defence.
- ▶ Inflection points at 31 and 34
  - ▶ 24-31: Gentle decline (0.4 threat per year)
  - ▶ 31-34: About twice as steep (0.9)
  - ▶ 34-40: About three times as steep (1.3)
    - ▶ Ain't that the truth

Historical Work

Many, many people have tried; minute cutoffs are rife.

- Younggren Twins (@EvolvingWild)
  - Isolated (WAR), selection bias treatment orthogonal
- Eric Tulsky (many things)
- Michael Schuckers (thanks!)
  - Goalies, save % in excess of league average.

Future Work

- Aging of shooting talent
- Aging of special teams impact
- Aging of penalty differential

Thanks!