Age Remains Undefeated

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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

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- Early career improvement in defence: selection
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Total Icetime (2007-2019)

Age Distribution, 2007-2019

<table>
<thead>
<tr>
<th>Age</th>
<th>Icetime %</th>
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</tbody>
</table>
Conclusions

- Peak age is 24
Total Icetime (2007-2019, Forwards)
Total Icetime (2007-2019, Defenders)
Comers and Goers (2008-2018)

Age Distribution, 2008-2018

[Bar chart showing age distribution with labels: All, Rookies, Leavers]
Comers (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 (Defenders, 2007-2019)
Outline

- Isolate performance from context
- Track changes from year to year
- Account for selection bias
  - Leaving and 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 _pair_ of consecutive seasons is an observation
  - Keyed to age (cleverly massaged)
  - Response is the change in isolated impact
Age Regression

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- Every **pair** of consecutive seasons is an observation
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- One variable for each age between 18 and 49
Age Regression

The hard bit:

- Every entry season is an observation
  - Keyed to age (as above)
  - Response is the absolute isolated impact in the rookie year
Age Regression

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- One “entry” variable for each age between 18 and 49
Age Regression

The hard bit:

- Every **entry** season is an observation
  - Keyed to age (as above)
  - Response is the **absolute** 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:

<table>
<thead>
<tr>
<th>ENTER</th>
<th>AGE</th>
<th>AGE</th>
<th>AGE</th>
<th>AGE</th>
<th>AGE</th>
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<tbody>
<tr>
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<td>21</td>
<td>22</td>
<td>23</td>
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<td>?</td>
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</tbody>
</table>

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
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)

- Defence
- Offence
- Net

Year-over-year Threat Change

Age

18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
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

The Aging Curve (Offence, Anchored to Age 24)
"The" Aging Curve

The Aging Curve (Defence, Anchored to Age 24)
Conclusions

- Peak age is 24
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- 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)
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  - 34-40: About three times as steep (1.3)
    - Ain’t that the truth
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!