

# Significance vs. relevance, fishing and multiple estimates

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Oslo, October 2019

# Outline

- Significant associations
- Relevant effects
- Fishing
- Presenting multiple estimates

# Significant associations

Risk of low birth weight (<2500g) same in Finland and Sweden?

Years	Risk Finland	Risk Sweden	RR	P-value
1	4.2	4.3	1.008	0.75
5	4.3	4.2	0.984	0.14
10	4.3	4.2	0.974	0.001
20	4.3	4.2	0.978	<0.001
40	4.3	4.2	0.975	<0.001

# Significant associations

Risk of low birth weight (<2500g) same in Finland and Sweden?

2.5% risk reduction in Sweden

About 2580 children born with low birth weight in Finland each year

About 65 fewer children would have low birth weight if the risk were like in Sweden

# Significant associations

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~2.5% risk reduction in Sweden

~2580 children with low birth weight in Finland

~65 fewer children with “Swedish risk”

Important? Trustworthy?

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Important? Trustworthy!

# Relevant effects

What if the outcome was “infant mortality” instead of “low birth weight”?

~65 fewer infants would die in Finland if they had the “Swedish risk”

More important?

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More trustworthy?

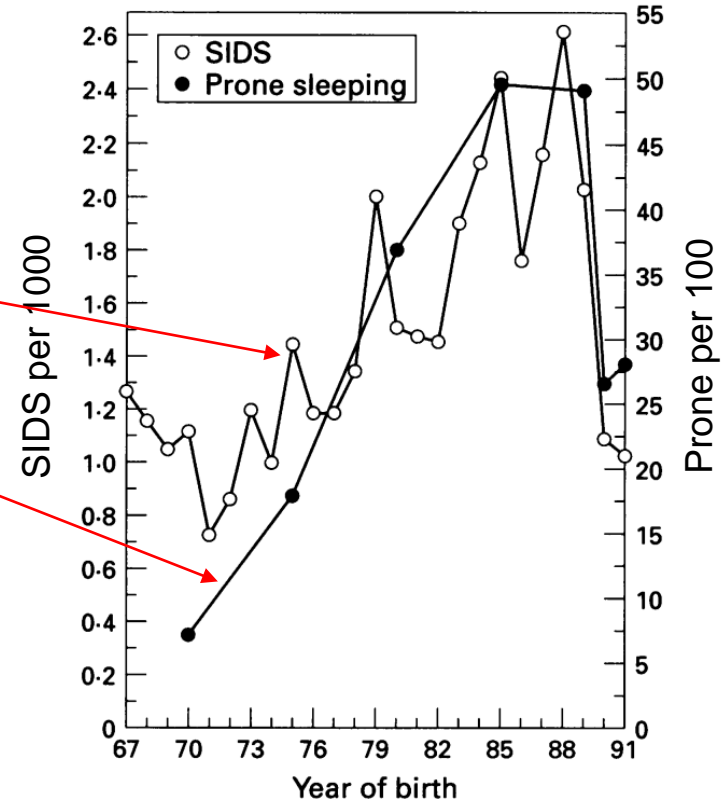


# Relevant effects

Sudden infant death syndrome (SIDS)

Risk of SIDS increased in Norway from the 70s through the 80s

Prone sleeping (on the belly) also increased (questionnaires)



Irgens et al., 1995

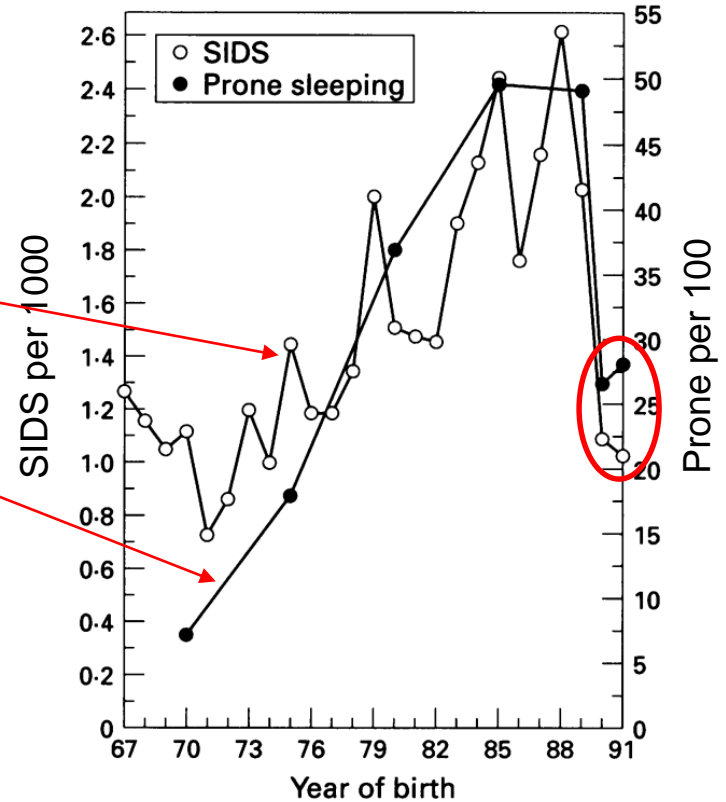
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From January 1990 mothers were advised to avoid prone sleeping

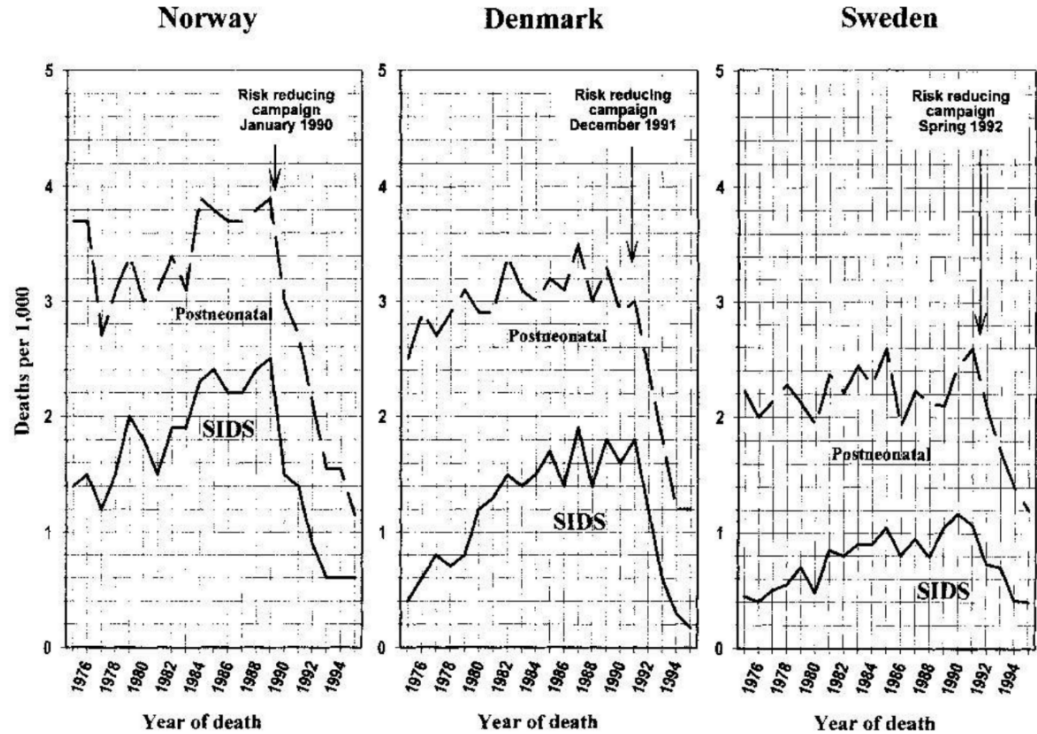


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# Relevant effects

Similar campaigns in Denmark and Sweden as well.

Small absolute reductions, but very important findings!

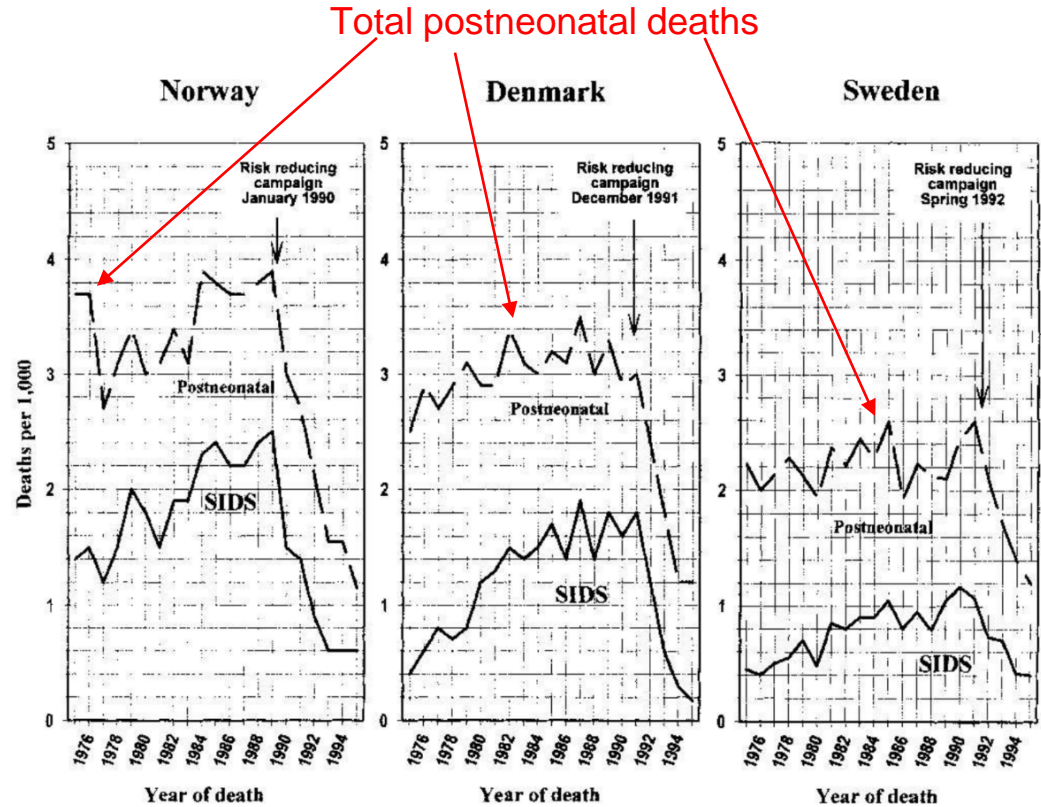


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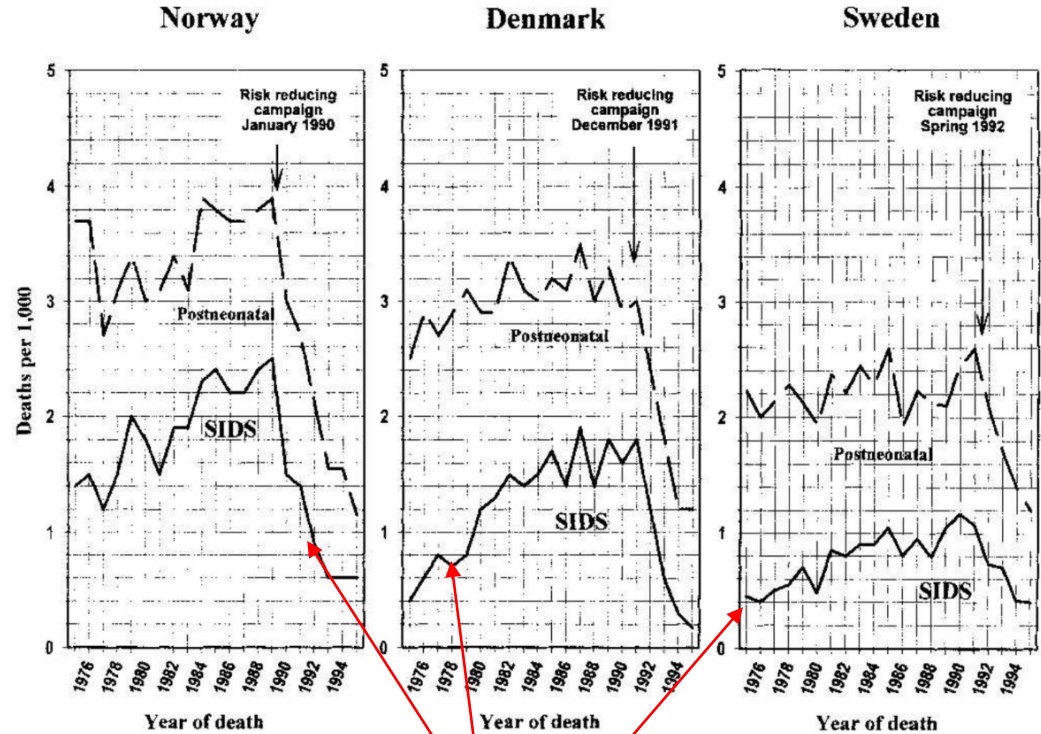


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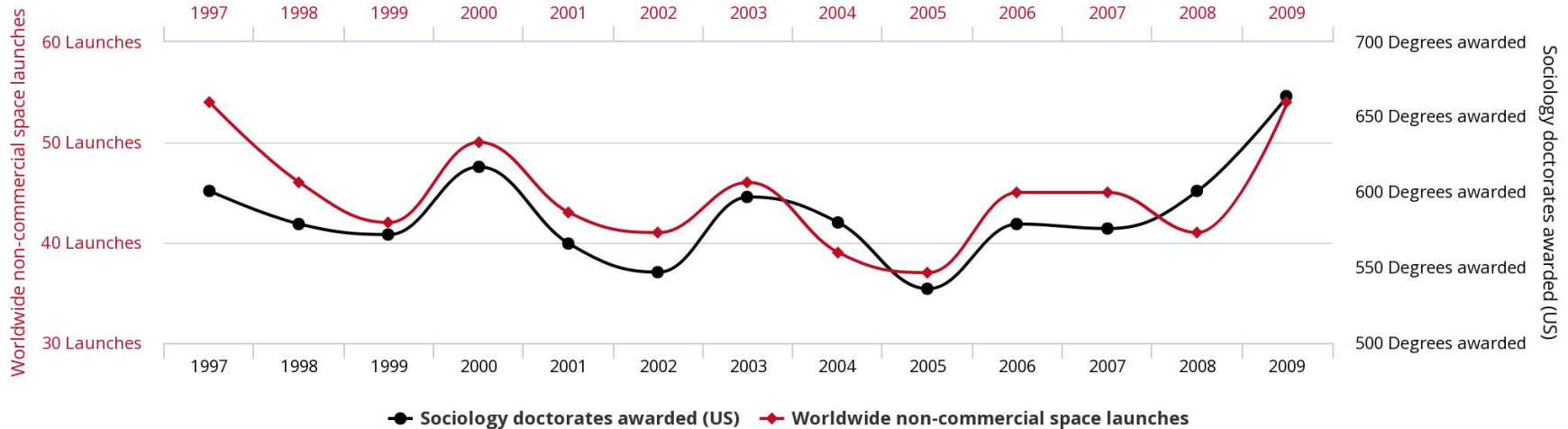
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# Fishing

## Worldwide non-commercial space launches correlates with Sociology doctorates awarded (US)

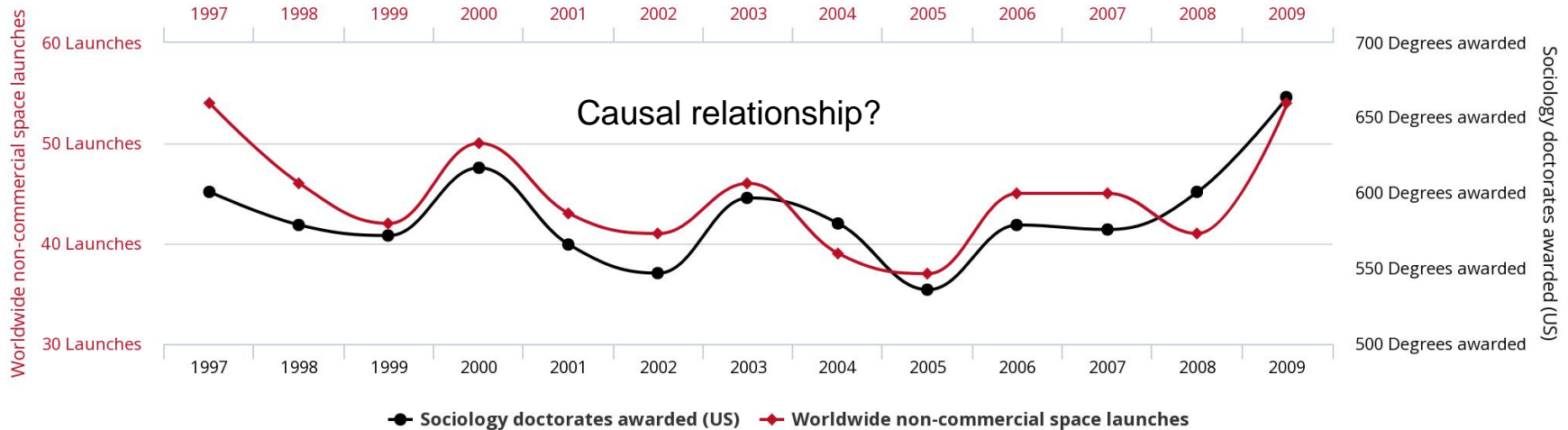


From: <http://www.tylervigen.com/spurious-correlations>

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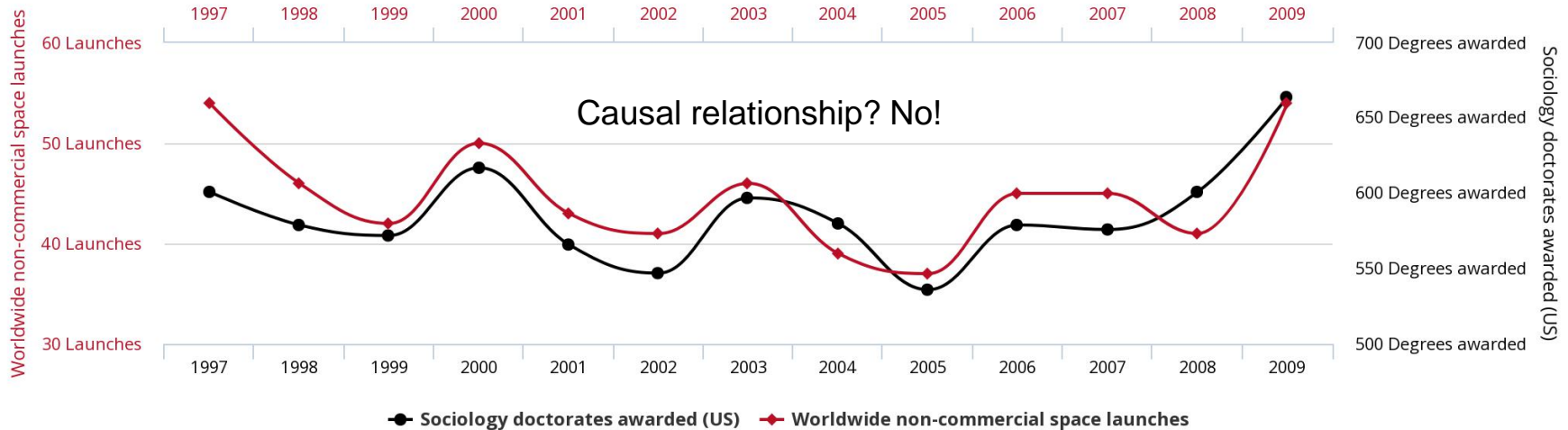


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Pregnancy related maternal illness  
vs. long-term social outcomes in children

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gestational diabetes  
hypertension  
inflammations  
etc.

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employment status  
marital status  
income  
education level  
etc.

sex  
socio-economic background  
birth weight  
immigrant status  
etc.

# Fishing

Married vs. single  
Married/cohabitating vs. single  
Married/cohabitating vs. divorced/separated vs. Single

Easy to og fishing in register epidemiology!

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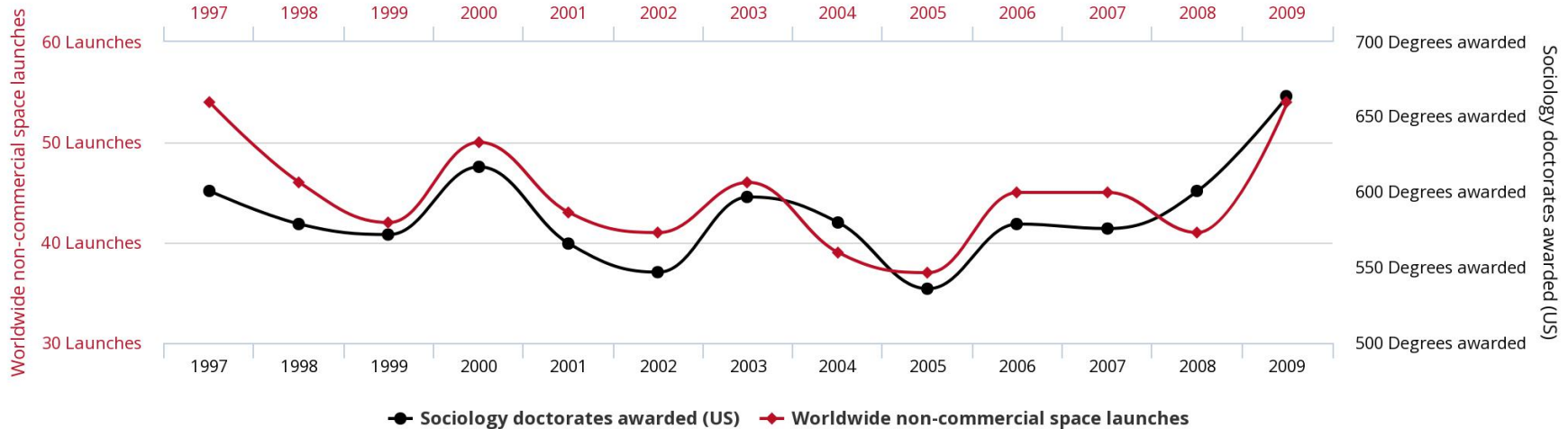
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sex  
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etc.

University vs. not university  
Primary school vs. high school vs. university  
Years of education after primary school

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# Fishing

<https://projects.fivethirtyeight.com/p-hacking/>



# Presenting multiple estimates

Investigating several association between conditions and outcomes

One exposure vs. several outcomes

- Premature birth vs. health, education, work, and so on

Several exposures vs. single outcome

- Survival for different cancers

# Presenting multiple estimates

Investigating several association between conditions and outcomes

Several exposures AND several outcomes

- Comorbidities for people admitted to intensive care units
- Exposure: Why were they admitted?
- Exposure: How long did they stay?
- Exposure: What treatment did they receive?
- Outcomes: Other conditions

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# Presenting multiple estimates

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- We expect one false positive ( $p < 0.05$ ) if we present 20 estimates with p-values or 95% confidence intervals
- How many false positives do we expect if we present 10 estimates?
- About one half.

# Presenting multiple estimates

Investigating several association between conditions and outcomes

- The more estimates we present in our tables, the more likely it is that «the most significant» is a false positive
- So what do we do?

# Presenting multiple estimates

Investigating several association between conditions and outcomes

- Bonferroni correction ( $p^*=p/n$ ) is a good rule of thumb.