

# Freakonomics: Putting science back into the social sciences

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# Social Sciences – a definition

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“the scientific study of society” Collins English Dictionary

“a branch of science that deals with the institutions and functioning of human society and with the interpersonal relationships of individuals as members of society” Merriam-Webster dictionary

“the study of how groups of people behave, often in an effort to predict how they will behave in the future” Dictionary.com

# ... and what is included

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Economics

Political Science

Sociology

Human geography

Social psychology

Anthropology

Communication

History

Law

Philosophy

# What characterizes economics?

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Understanding how people consider the (opportunity) costs and benefits in making decisions.

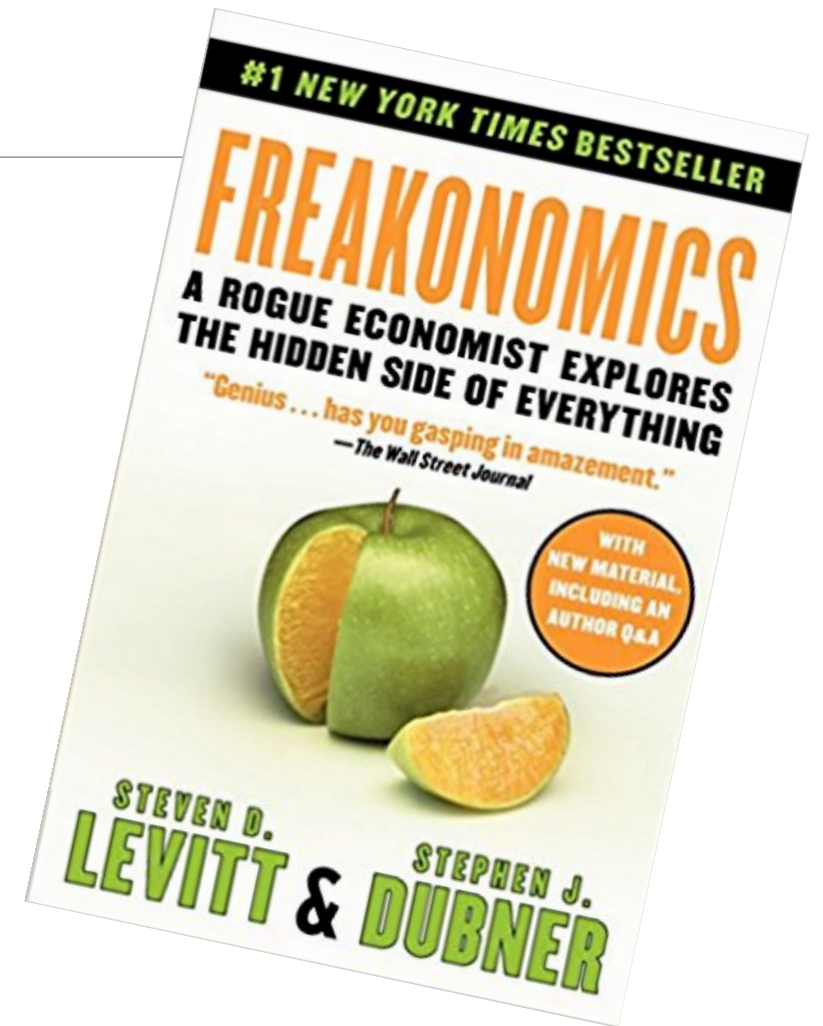
Developing mathematical models to predict individual and group behavior.

Careful use of data and statistical methods focused on causality to understand the behavioral impact of changing circumstances and policies.

# Freakonomics

by Steven Levitt and Stephen Dubner

Economics is above all a science of measurement. It comprises an extraordinarily powerful and flexible set of tools that can reliably assess a thicket of information to determine the effect of one factor, or even the whole effect. That's what the 'economy' is, after all; a thicket of information about jobs and real estate and banking and investment. But the tools of economics can be just as easily applied to subject that are -- well, more interesting. (Levitt and Dubner P. 13)



# Words of Wisdom – Levitt and Dubner

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1. Incentives are the cornerstone of modern life
2. Knowing what to measure and how to measure it can make a complicated world less so.
3. The conventional wisdom is often wrong.
4. Correlation does not equal causality.

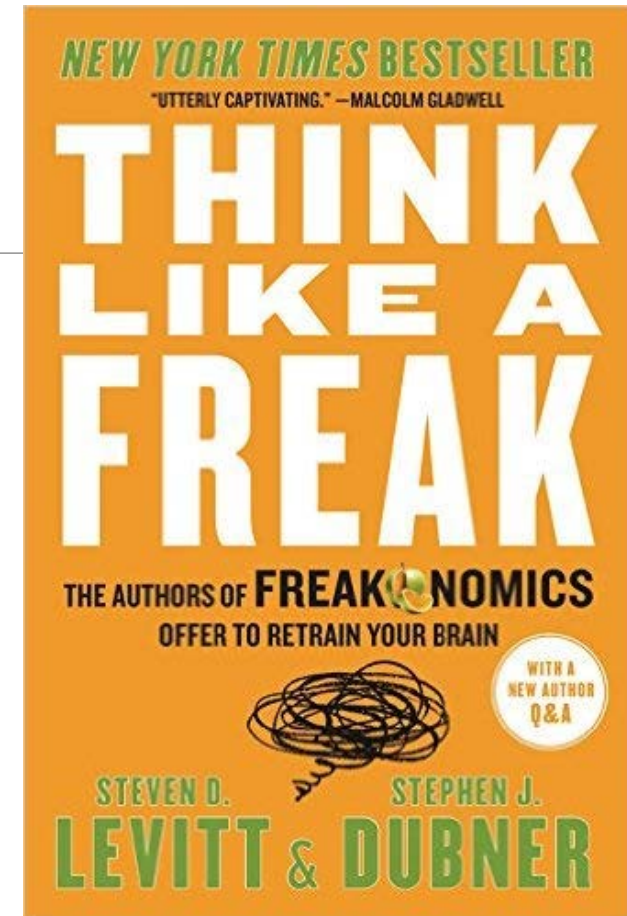
# Correlation does not equal causality

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When two things travel together it is tempting to assume that one thing causes the other. Married people, for instance are demonstrably happier than single people; does this mean that marriage causes happiness? Not necessarily.

(Think Like a Freak -- Levitt and Dubner P 16.)

1. People who will be happy when married are the people who choose to get married. (Sample selection bias)
2. Marriage doesn't cause happiness, happiness causes marriage. (Reverse causality)
3. Marriage and happiness are unrelated; but wealth leads to marriage and wealth leads to happiness. (Omitted variable bias)



# “Peer effects” in health, education, and work.

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Who is a ‘peer’?

- The people around you, whose characteristics and behavior you can observe.
- Classmates; Roommates; Friends; Siblings/family members; Co-workers;

What is a ‘peer effect’?

- When the characteristic or behavior of those around you affect your behavior (behaviors are positively correlated.)

Why a peer effect? Is there an incentive to behave like a peer? Does it alter costs or benefits? In “Think Like a Freak”, a field experiment of hanging four signs on a door to encourage energy conservation included:

Protect the Environment; Do your Part for Future Generations; Save Money; **Your Neighbors are Doing it.**



# Can't we just observe that peers behave alike?

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Students in high-ability classes perform better

- Parents who seek out advanced classes provide educational environment
- Did the class cause the scores or the scores cause the class?
- Are there other characteristics of the class that enhance student performance?

Adolescents who smoke most likely have friends who smoke.

- Kids who have rebellious/risk-taking personalities become friends.
- Did the friends cause the smoking or did smoking cause the friends?
- Do they live in a community where smoking is commonplace?
  
- Sample selection; reverse causality; common shocks;

# What we'd like to do is conduct a scientific experiment.

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Select two samples of adolescents who are identical (age, sex, income, parents education or smoking status).

Assign some of them to a class with high-performing peers or assign some of them friends who smoke and others non-smoking friends.

Make sure that they have the same experiences (quality of teacher; same curriculum) (anti smoking messages in school, smoking rules on their campus, availability of cigarettes)

Compare outcomes.

# The best of all possible worlds.... in the social sciences.

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Treatment is selected at random (the groups you are comparing are identical except for the smoking behavior of peers).

All other variables are controlled.

Outcomes are measurable.

# What is the social science equivalent?

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**Lab experiment** – the researcher controls the choices, other factors and other participants to mimic ‘the real world’.

**Field experiment** – run an experiment in the real world. Control what you can – at least the participants are making real decisions and they may not know that they are part of an experiment.

**Natural experiment** -- the researcher has no control over the choices or conditions – but by nature or institutions, a dramatic change occurs that affects only segments of the population (preferably at random).

- Instrumental variables
- Difference-in-differences
- Regression discontinuity models

# Begin with educational outcomes: K -12

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Difficulty is that parents choose schools (parents who invest in their children will choose 'good' schools). And get their children into 'good' classes. Or teachers and schools sort children into ability-based classes. How to get random (or non-choice-based) peers?

Natural Experiments!

First experiment: Chinese middle schools randomly assigned.

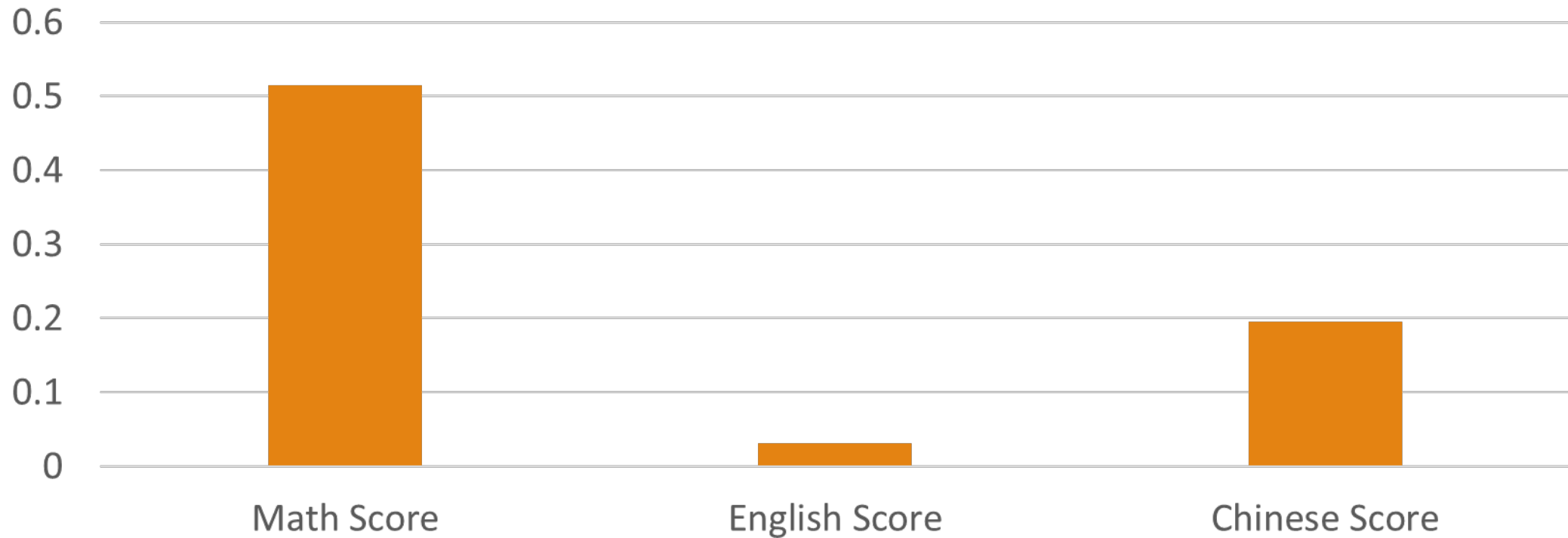
Carmen and Zhang, 2012



# Random assignment: Chinese Middle School (Carmen and Zhang, 2012)

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Effect of Random Assignment to High Achieving Peers



# Natural Experiment: Busing

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Busing in Wake County, North Carolina (Hoxby and Weingarth, 2005)

- Initially based on race; later based on income;
- Compare outcomes based on changes in peer mean achievement
  - (Linear-in-Means/Bad Apple/Shining Light/Boutique model)
- A 1 point increase in mean peer test scores increases own score by .25-.35

# Instrumental Variables: Tracking (Boutique classes)

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(Argys, Rees and Brewer, 1996); Assignment into school tracks;

- Low ability track
- Mid-ability track
- High-ability track

VS

- Heterogeneous class

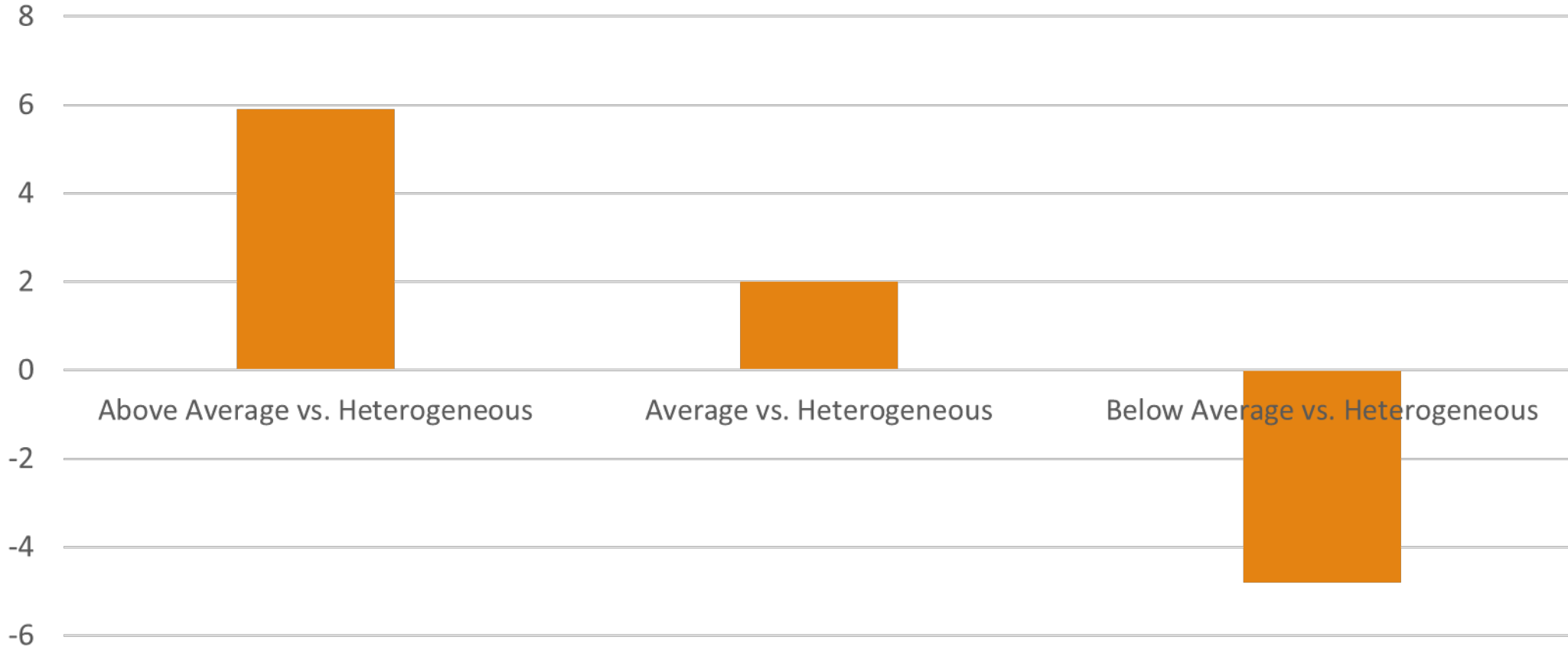
Can we just observe the differences? No – parents/teachers may choose classes.

Instrument for tracking is school size.

Outcome: test scores



# The Effect of Ability Grouping on Test Scores Grade 10



# Peer Effects in Higher Education

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How do we find randomly (exogenously) assigned peers in college?

**Roommate Assignment!** Almost randomly assigned. Information regarding application ACT/SAT, hs GPA, major, and in a few cases, alcohol and tobacco use.

- Dartmouth (Sacerdote, 2001) small effects
- Williams College (Zimmerman, 2003) small effects
- University of Maryland (Foster, 2005) small effects
- **Berea College (Kentucky/Appalachian) positive effects** (Stinebrickner and Stinebrickner, 2006)
  - Roommate hs GPA and ACT on grades-- females

# Maybe not just roommates?

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Larger peer groups in higher education

Squadrons? Air Force Academy in Colorado Springs (Carrell, Fullerton and West, 2009)

Groups of 32 cadets that formed a tightly controlled social network— attended similar classes with identical syllabi and common exams. Random sorting by sex; race and ethnicity; attending a military high school.

A one standard deviation increase in squadron hs GPA led to a .05 individual GPA increase. Largest effects in Math and Science.

2.5 times larger than effects at Williams College.

# Peer Effects – Risky Behaviors

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**Friends Who Smoke** - kids with three or more friends who smoke are ten times more likely to smoke than kids whose friends don't smoke. Make it a point to know who your kid's friends are.

([www.raisesmokefreekids.com](http://www.raisesmokefreekids.com))

Friends are endogenous –  
can we find random exposure to peers?



# Birth Order as a Natural Experiment

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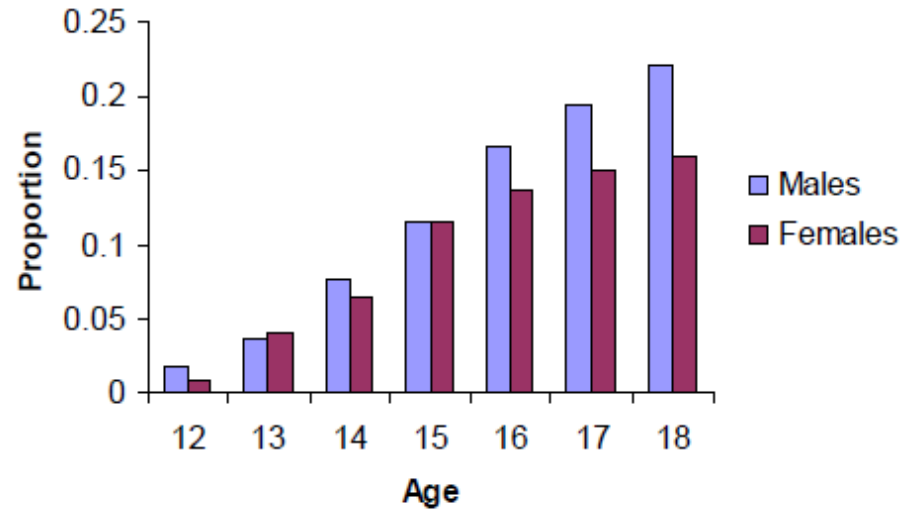
Argys, Rees, Averett and Witoonchart, (2006)

- Because some risky behaviors typically increase with age during adolescence, we examine 'random' exposure to older peers
- Older siblings – within a family of a particular size, birth-order is random.
- Does exposure to older siblings increase risky behaviors among younger siblings?

# Risky Behaviors increase with age

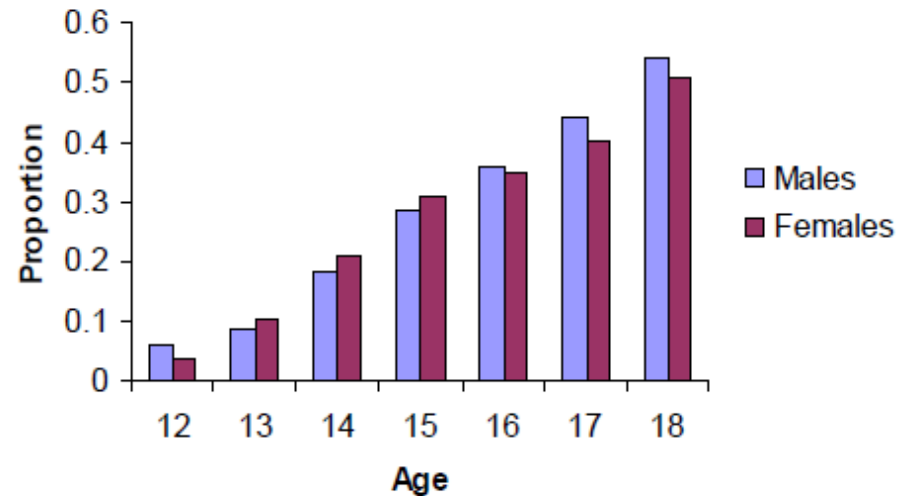
**Figure 1. Marijuana Use by Age and Gender**

$\beta = .031$  (p-value < .001)\*

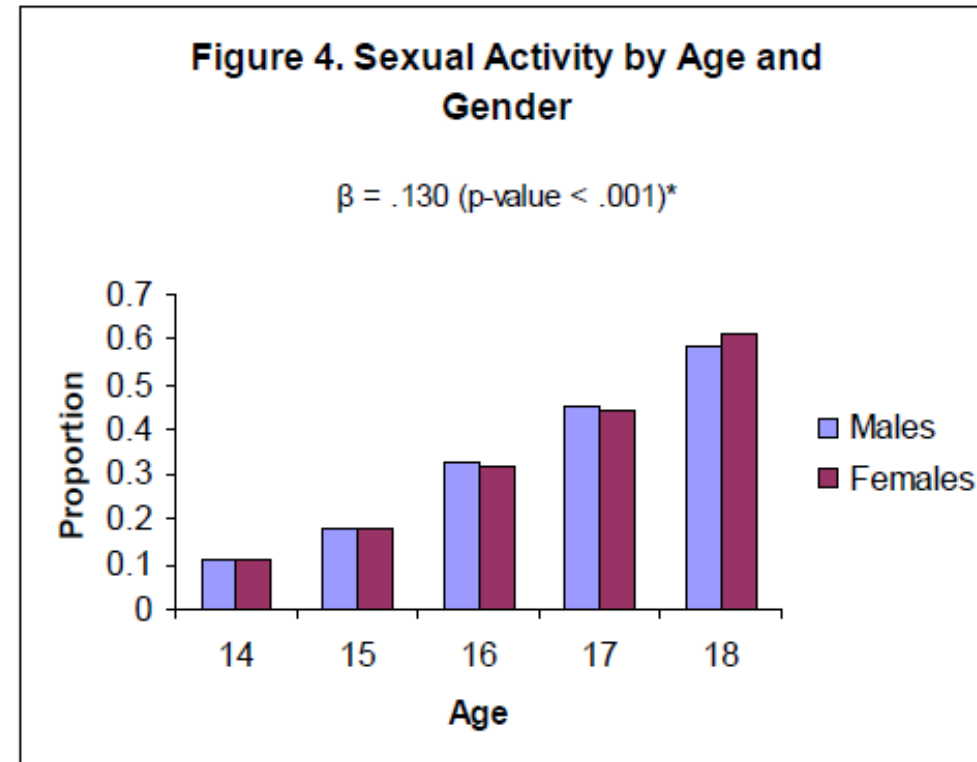
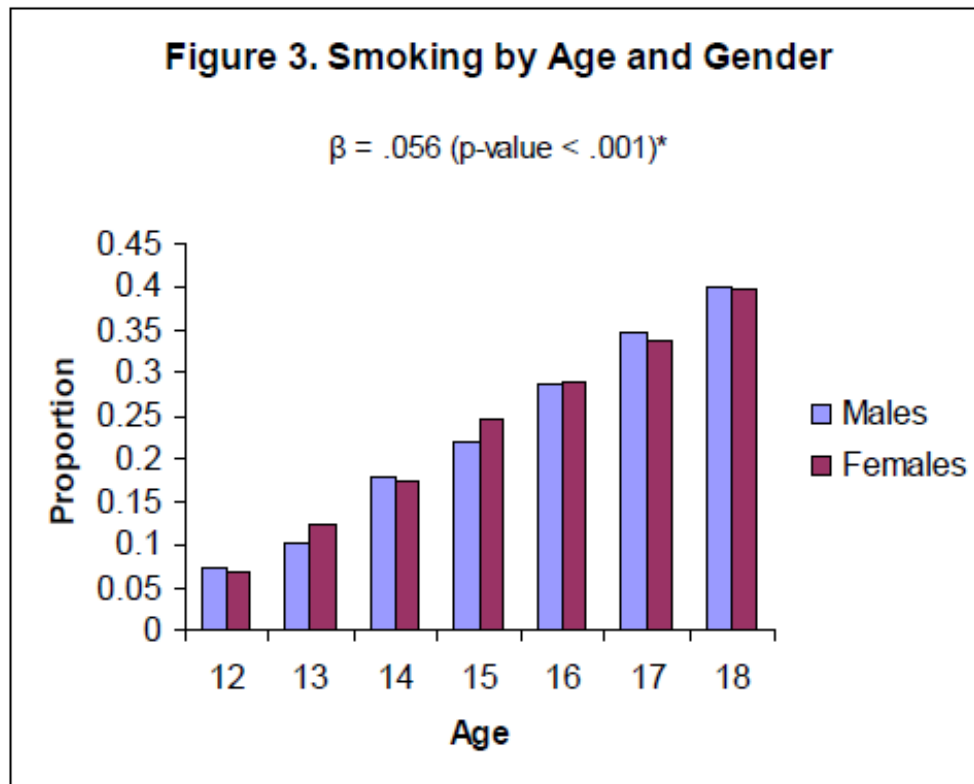


**Figure 2. Alcohol Use by Age and Gender**

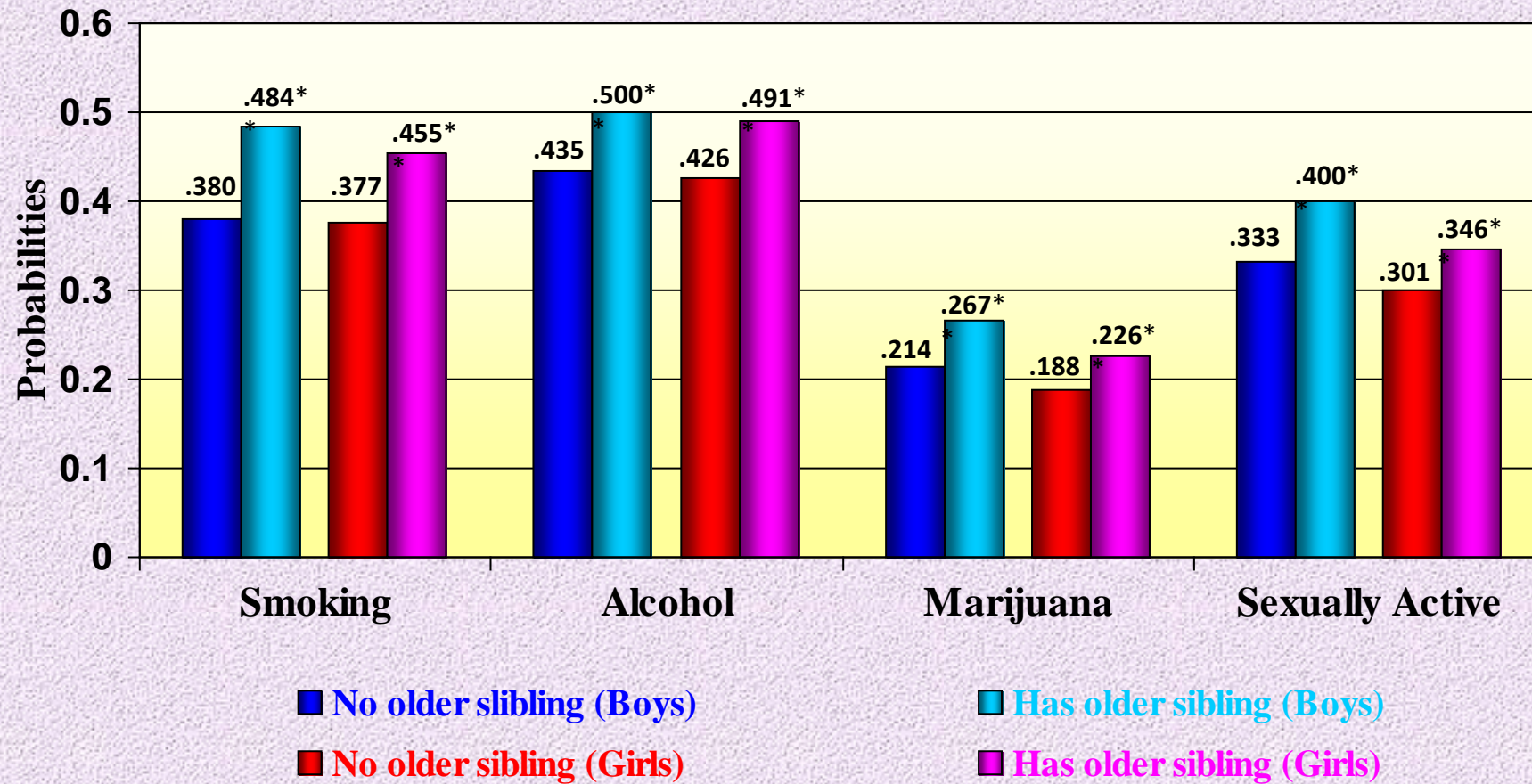
$\beta = .079$  (p-value < .001)\*



# Risky Behaviors increase with age .... Does exposure to older siblings matter?



**Figure 1: The effect of an older sibling on substance use and sexual behavior**





# Some Risky Behaviors don't Increase with Age

FIGURE 5.—DESTROYING PROPERTY BY AGE AND GENDER

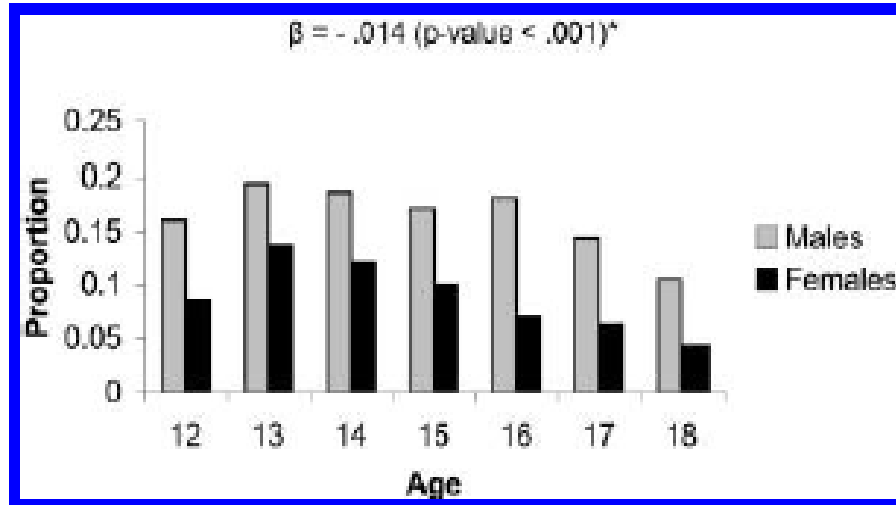
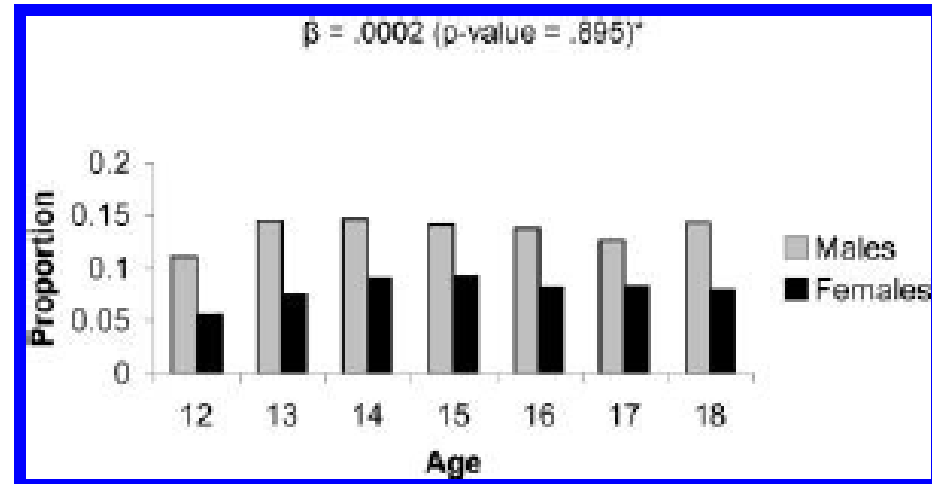
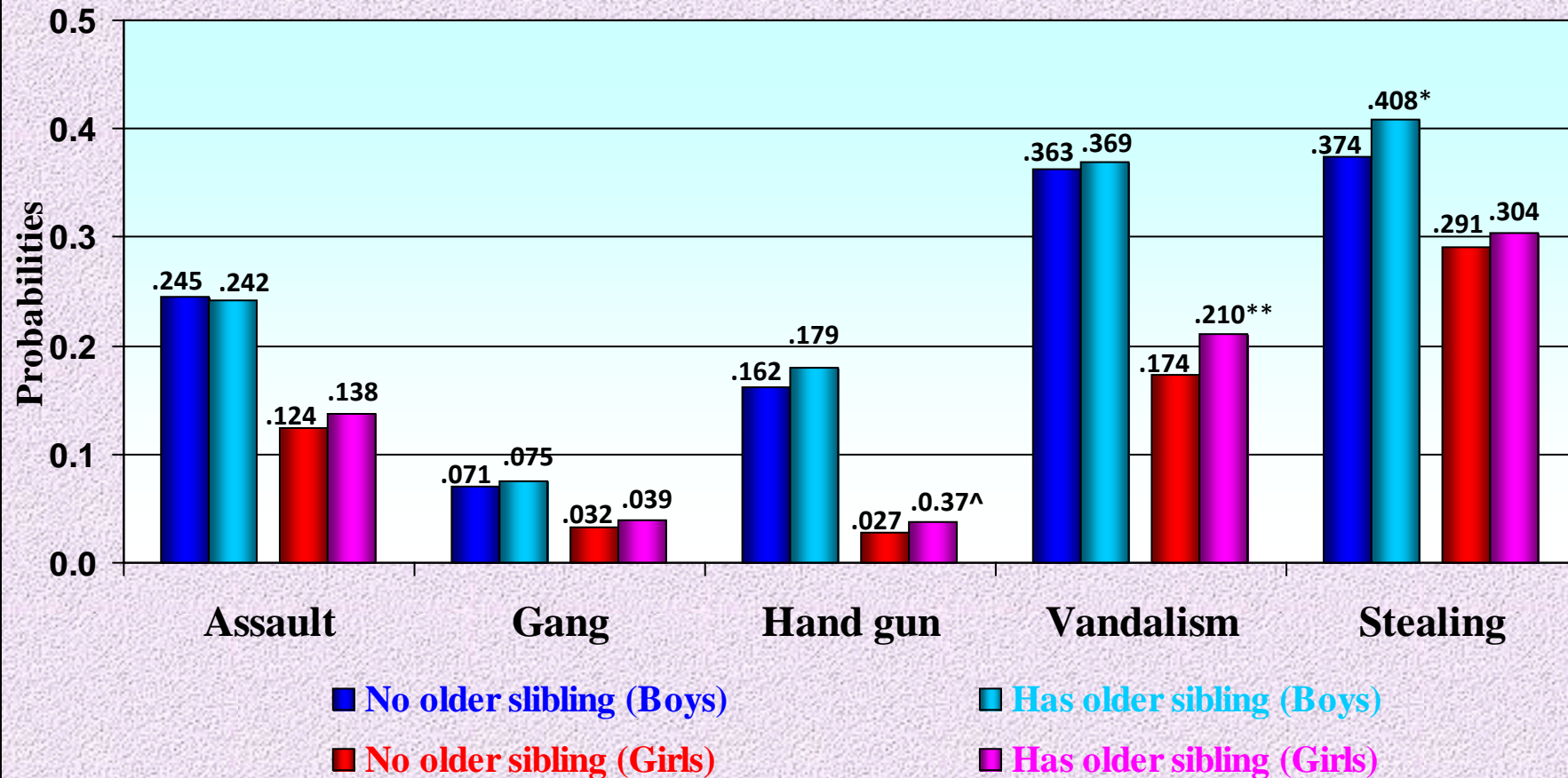


FIGURE 6.—FIGHTING BY AGE AND GENDER



**Figure 2: The effect of an older sibling on criminal and delinquent activities**



# Another Natural Experiment Exposing Adolescents to Older Peers – Age of School Peers

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Natural Experiment (Argys and Rees, 2008)

There is variation across states in the dates/ages at which children may begin kindergarten (shown in the following table).

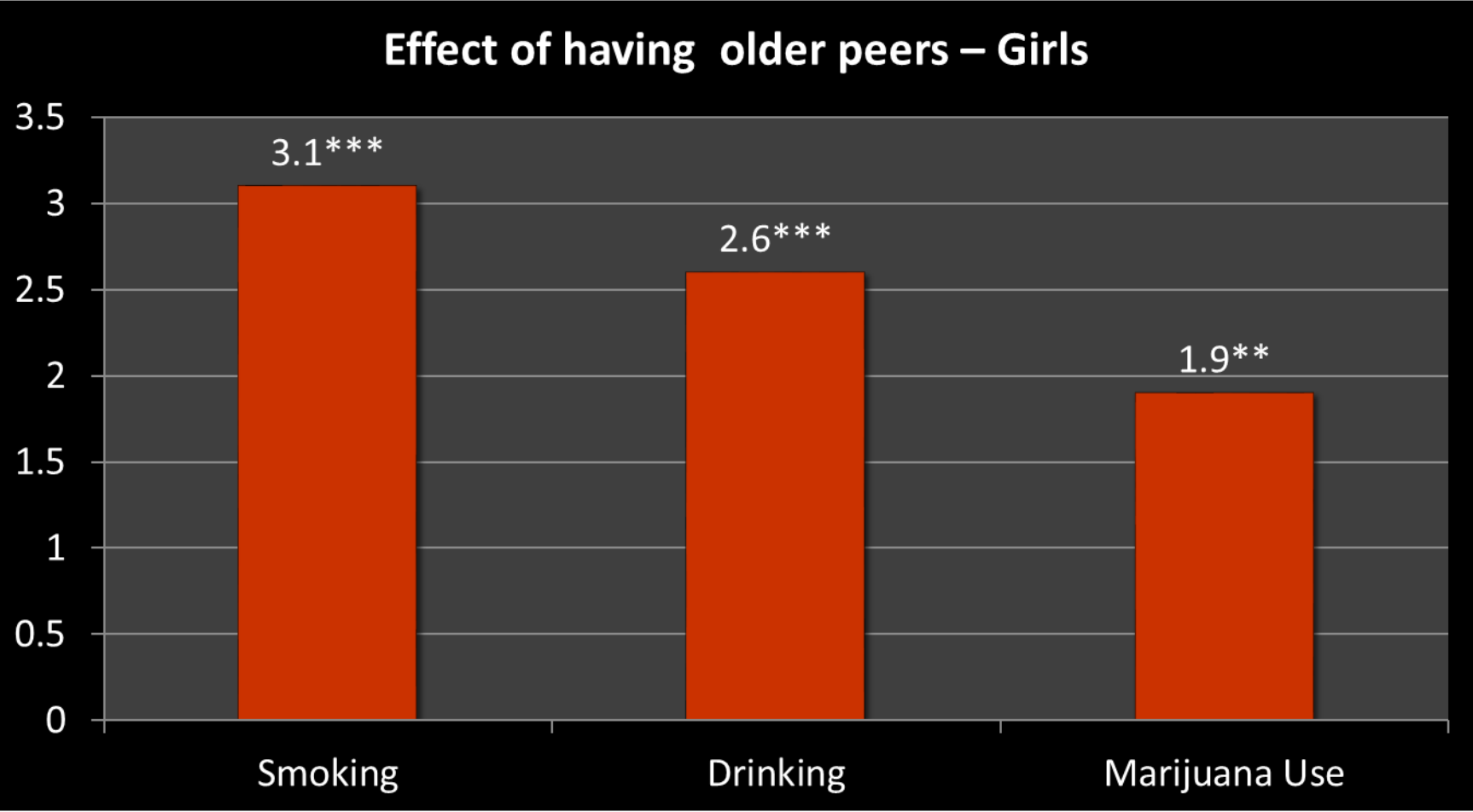
Combined with natural variation in birthdates throughout the year, children are ‘randomly’ placed into classrooms with relatively older or younger children.

Does exposure to older peers in your classroom increase the likelihood of engaging in risky behaviors (that increase with age)?

**Table 1. Kindergarten Start Dates by State, 1985-1989**

<i>States</i>	<i>Date by Which Child Must Be 5 to Enter Kindergarten</i>
North Dakota, Washington	August 31
Arizona, Florida, Georgia, Kansas, Massachusetts, Minnesota, Mississippi, New Mexico, Oklahoma, South Dakota, Texas, Utah, Wisconsin, West Virginia	September 1
Missouri (1985 –86 school year) (1986 –87 school year) (1987-88 through 1989-90 school years)	September 1 August 1 July 1
Montana	September 10
Iowa, Wyoming	September 15
Nevada, Ohio, Tennessee, Virginia	September 30
Alabama, Arkansas, Kentucky	October 1
Idaho, Maine, Nebraska	October 15
North Carolina	October 16
South Carolina	November 1
Illinois (1985-86 through 1986-87 school years) (1987-88 school year) (1988-89 school year)	November 1 October 1 September 1
Alaska	November 2
Oregon (1985-86 school year) (1986-87 through 1989-90 school years)	November 15 September 1
California, Michigan, New York	December 1
Hawaii, Maryland, Rhode Island, Washington DC	December 31
Connecticut, Delaware	January 1

# Finding Peer Effects: A Test of the Contagion Hypothesis



# Risky Behaviors in College too.

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Roommate studies also used to investigate risky behaviors.

Roommates assigned by lottery at Northwestern University (Kremer and Levy, 2009)

- Roommates prior drinking is associated with lower GPA and increased drinking – predominately for males.

Fraternities -- Fraternity membership by a roommate increases fraternity membership and drinking among males at Dartmouth.

# Peers and Work Productivity

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Quasi-random co-worker assignment:

1. Grocery store clerks (Mas and Moretti, 2008)
  - Grocery store checkout clerks are assigned to registers at random.
  - Data from scanners suggests that working near a faster clerk increases scanning speed.
  - A 10% increase in peer's speed increases worker productivity by 1.7%
2. Fruit pickers (Bandiera, Barankay and Rasul, 2008)
  - A large number of fruit pickers all working an orchard within sight of each other.
  - More closely match the pace of a nearby co-worker if there is a social relationship.
  - A somewhat unexpected result in a pay-for-performance (piece-rate) job.

# More Random Assignment at Work

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Golf Tournaments (Guryon, Cross, and Notowidigdo, 2009)

Golfers are initially grouped at random— within category and tournament.

- Peer ability is measured by (a modified version of) a golfer's handicap.
- Individual performance is measured as the difference between performance that day and the player's usual performance.
- Very large payoffs for making the cut and particularly low scores.
- Conclusion: Money trumps peer pressure! No effect of pairings on performance.



# “Laboratory Experiment” at work (Falk and Ichino, 2006)



# Clean Evidence on Peer Effects

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Controlled Field Experiment in Switzerland

Randomly Selected Subjects

Paid independently of their work output -- Stuffing envelopes

Worked in pairs (in sight of each other) and alone

Findings:

Strong evidence of positive peer effects in the pair treatment

Higher productivity in the pair treatment

# Patterns in Peer Effects?

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Educational peer effects are stronger at earlier ages

Ability grouping benefits higher ability students. (May or may not benefit lower ability students.)

College peer effects are more pronounced for risky behaviors than for educational outcomes

Peer effects in a work setting may be effective, but can be offset by productivity-based compensation.

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# References – Levitt and Dubner

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**Levitt, Steven D, and Stephen J. Dubner.** (2005). **Freakonomics: A Rogue Economist Explores the Hidden Side of Everything.** New York: William Morrow.

**Levitt, Steven D. and Stephen J. Dubner** (2009). ***Super freakonomics: Global cooling, patriotic prostitutes, and why suicide bombers should buy life insurance.*** New York, N. Y.: Harperluxe.

**Levitt, Steven D. and Stephen J. Dubner.** (2014). *Think Like a Freak: The Authors of Freakonomics Offer to Retrain Your Brain.* First edition. William Morrow, an imprint of New York, NY: Harper Collins Publishers.

# References

- Argys, Laura M., Daniel I. Rees, and Dominic .J. Brewer, (1996) ‘Detracking America’s schools: Equity at zero cost?’ *Journal of Policy Analysis and Management*, 15: 623–645.
- Argys, Laura M., Daniel I. Rees, Susan L. Averett and Benjama Witoonchart. (2006). “Birth Order and Risky Adolescent Behavior.” *Economic Inquiry*, 44(2): 215-233.
- Argys, Laura M., and Daniel I. Rees. (2008). “Searching for Peer Group Effects: A Test of the Contagion Hypothesis.” *Review of Economics and Statistics*, 90(2): 442-458.
- Averett, Susan L., Laura M. Argys and Daniel I. Rees. (2011). “Older siblings and adolescent risky behavior: does parenting play a role?” *Journal of Population Economics*, 24(3): 957-978
- Bandiera, Oriana and Barankay, Iwan and Rasul, Imran (2008) *Social capital in the workplace: evidence on its formation and consequences*. Labour Economics, 15 (4). pp. 724-748
- Carman, Katherine G. and Lei Zhang. (2012). “Classroom peer effects and academic achievement: Evidence from a Chinese middle school.” *China Economic Review* 23: 223-237.
- Carrell, Scott E., Richard L. Fullerton and James E. West. (2009) “Does Your Cohort Matter? Measuring Peer Effects in College Achievement.” *Journal of Labor Economics* 27(3): 439-464.

# References, continued

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Duflo, Ester, Pascaline Dupas, and Michael Kremer. (2011). “Peer Effects, Teacher Incentives, and the Impact of Tracking: Evidence from a Randomized Evaluation in Kenya.” *American Economic Review* 101 (August): 1739-1744.

Eisenberg, Daniel, Ezra Golberstein and Janis L. Whitlock. (2012) “Peer effects on risky behaviors: New evidence from college roommate assignments.” *Journal of Health Economics*, 33: 126-138

Falk, Armin, and Andrea Ichino. (2006). “Clean evidence on peer effects.” *Journal of Labor Economics* 24(1): 39–57.

Foster, Gigi, (2006). “It’s not your peers, and it’s not your friends: Some progress toward understanding the educational peer effect mechanism.” *Journal of Public Economics*, 90:1455-1475.

Guryan, Jonathan, Kory Kroft and Matthew Notowidigdo, (2009). “Peer Effects in the Workplace: Evidence from Random Groupings in Professional Golf Tournaments.” *American Economic Journal: Applied Economics* 1(4): 34-68.

# References, continued

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Hoxby, Caroline M and Gretchen Weingarth, (2005) “Taking Race out of the Equation: School Reassignment and the Structure of Peer Effects.” Unpublished.

<https://www.pausd.org/sites/default/files/pdf-faqs/attachments/TakingRaceOutOfTheEquation.pdf>

Kremer, Michael, and Dan M. Levy. (2008). “Peer effects and alcohol use among college students.” *Journal of Economic Perspectives* 22(3): 189–206.

Mas, Alexandre, and Enrico Moretti. (2009). “Peers at work.” *American Economic Review* 99(1):112–45.

Sacerdote, Bruce L. (2001). “Peer effects with random assignment: Results for Dartmouth roommates.” *Quarterly Journal of Economics* 116(2): 681–704.



# References, continued

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Stinebrickner, Ralph, and Todd R. Stinebrickner. (2006). “What can be learned about peer effects using college roommates? Evidence from new survey data and students from disadvantaged backgrounds.” *Journal of Public Economics* 90(8–9):1435–54.

Zimmerman, David J. (2003). “Peer Effects in Academic Outcomes: Evidence from a Natural Experiment.” *Review of Economics and Statistics*, 85(1): 9–23.