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Social Class Disparities in Health: A Vexing Puzzle with a Surprising Answer?

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Presentation to accept 2008 George A. Miller Award for outstanding article across specialty areas, Division 1, APA

Agenda

1. What are “disparities”?
2. What’s the vexing puzzle?
3. Is human cognitive diversity key to solving it?
4. If yes, so what?

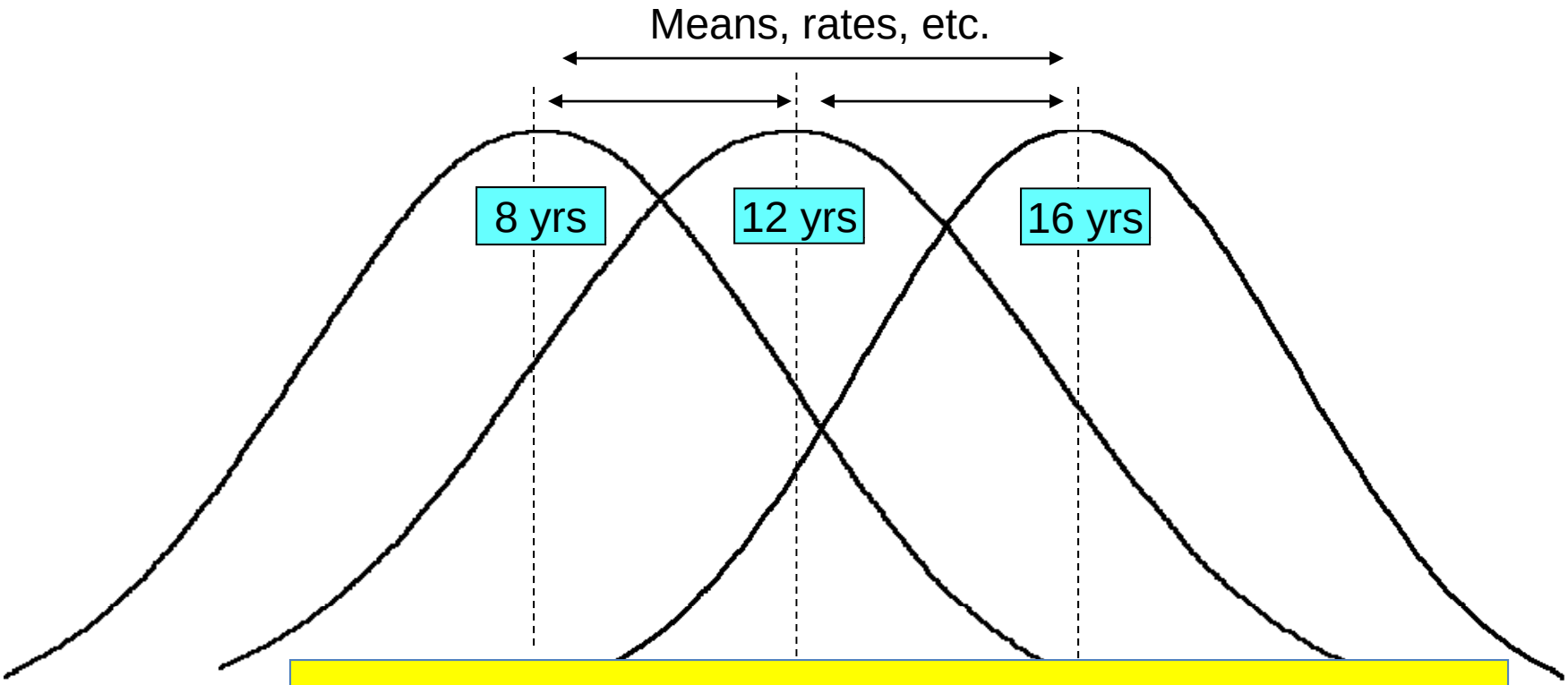
Answers: All surprising

Agenda

1. **What are “disparities”?** Examples
2. Why such a vexing puzzle?
3. Is human cognitive diversity the key to solving it?
4. If yes, so what?

“Disparity” = group differences on health outcome X

“Explaining” between-group variation



Typical indicators of socioeconomic status (SES)

- **Years education**
- **Occupational status**
- **Income**

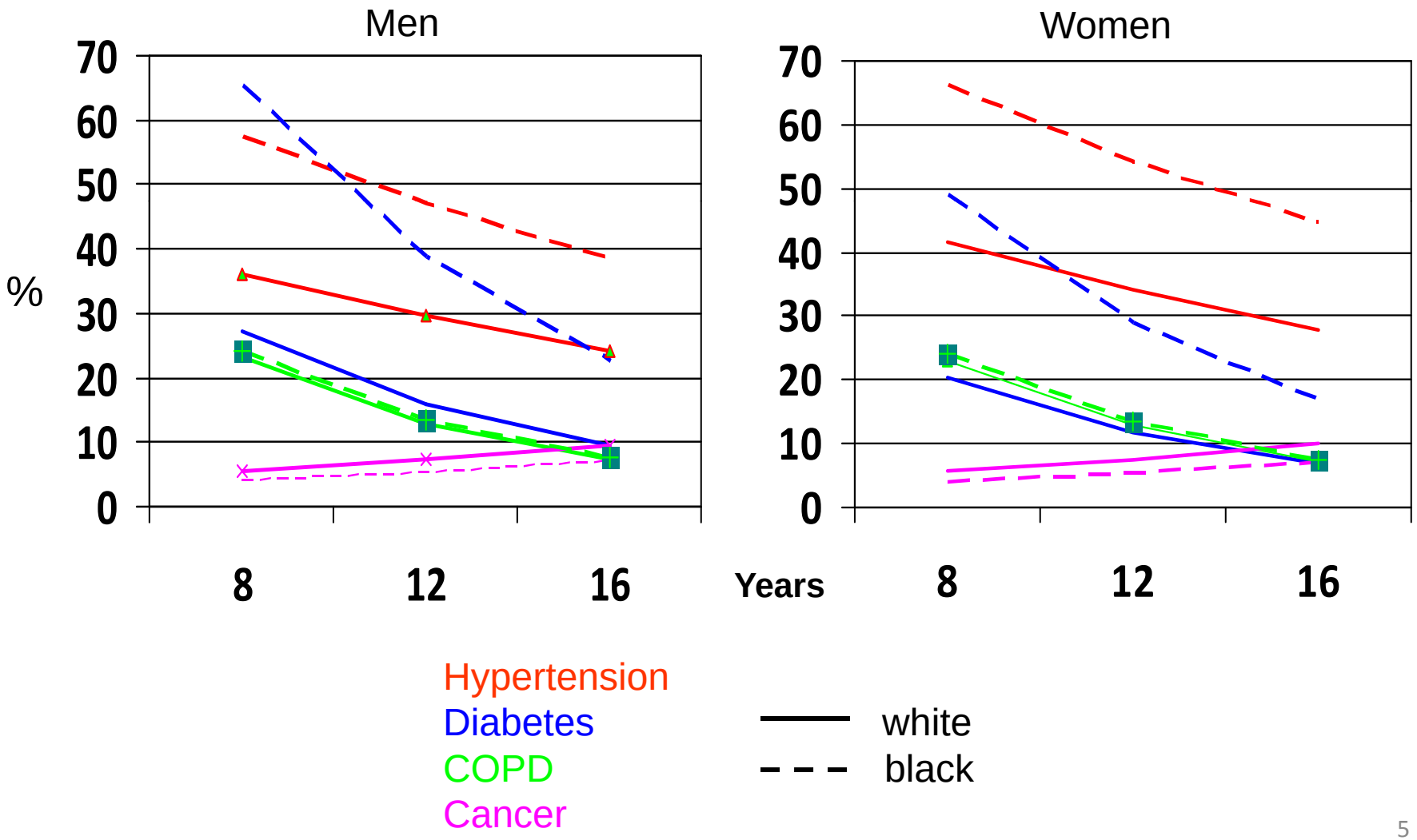
?

But not clear what they really represent or have in common

Typical health disparities by education; in all races & sexes:

% of non-ill 51-year-olds expected to have this chronic illness by age 63

(Hayward et al, 2000)



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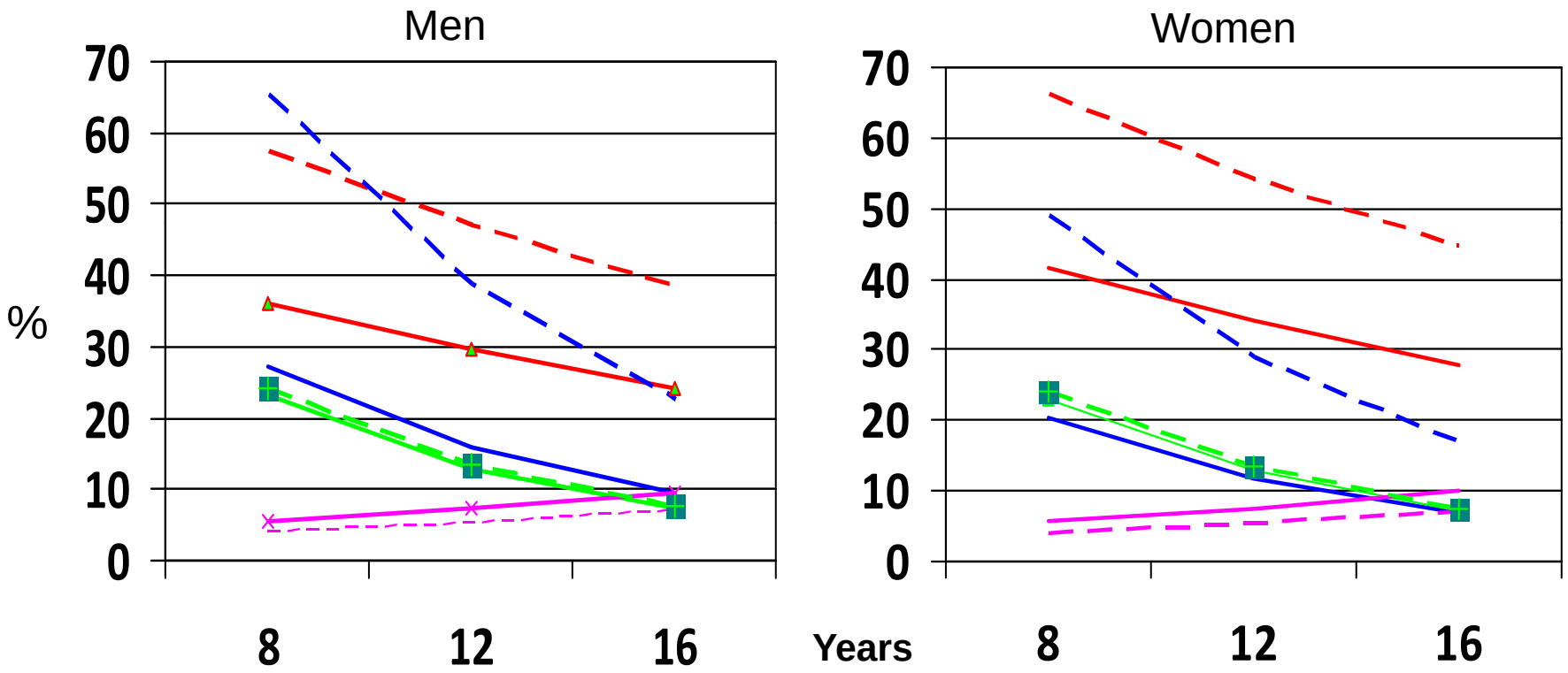
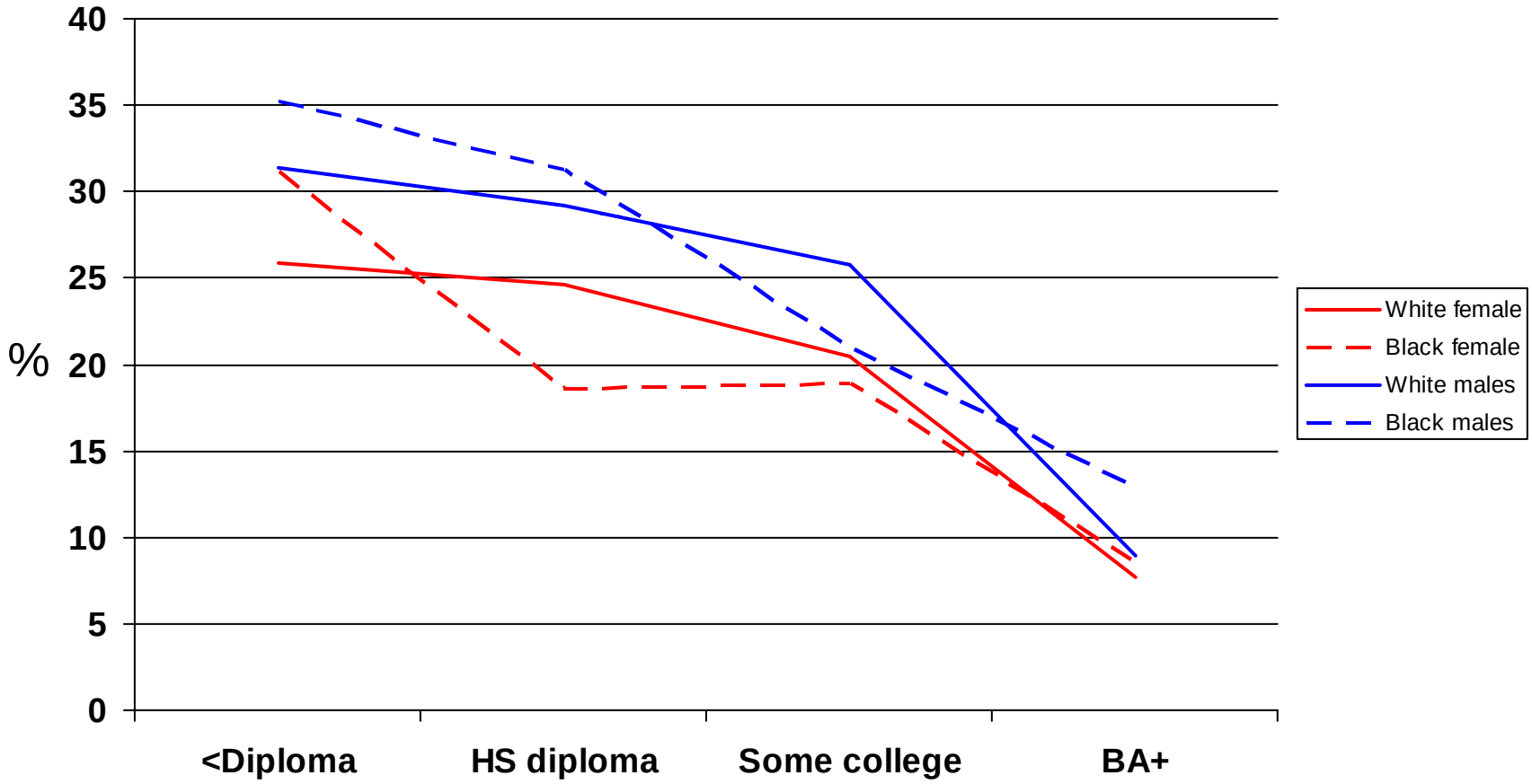


- Fewer health problems in higher social classes (educ, occup, or $)
- True for all races, sexes
- Exceptions are rare (e.g., cancer morbidity)

Disparities in health behavior by education; all races & sexes:

% who smoke, 2006 (age adjusted)

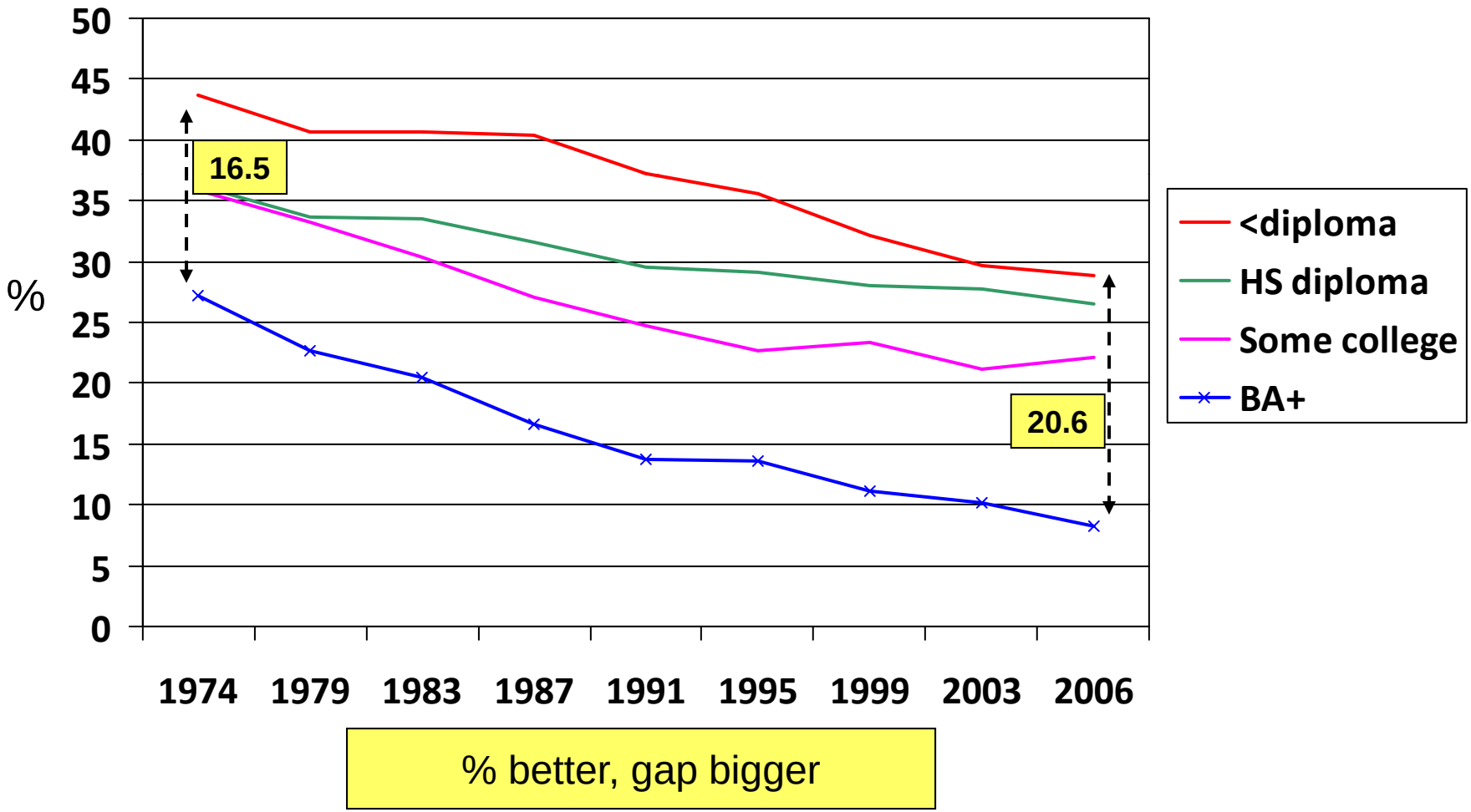
(CDC, Health in the United States, 2008, Table 64)



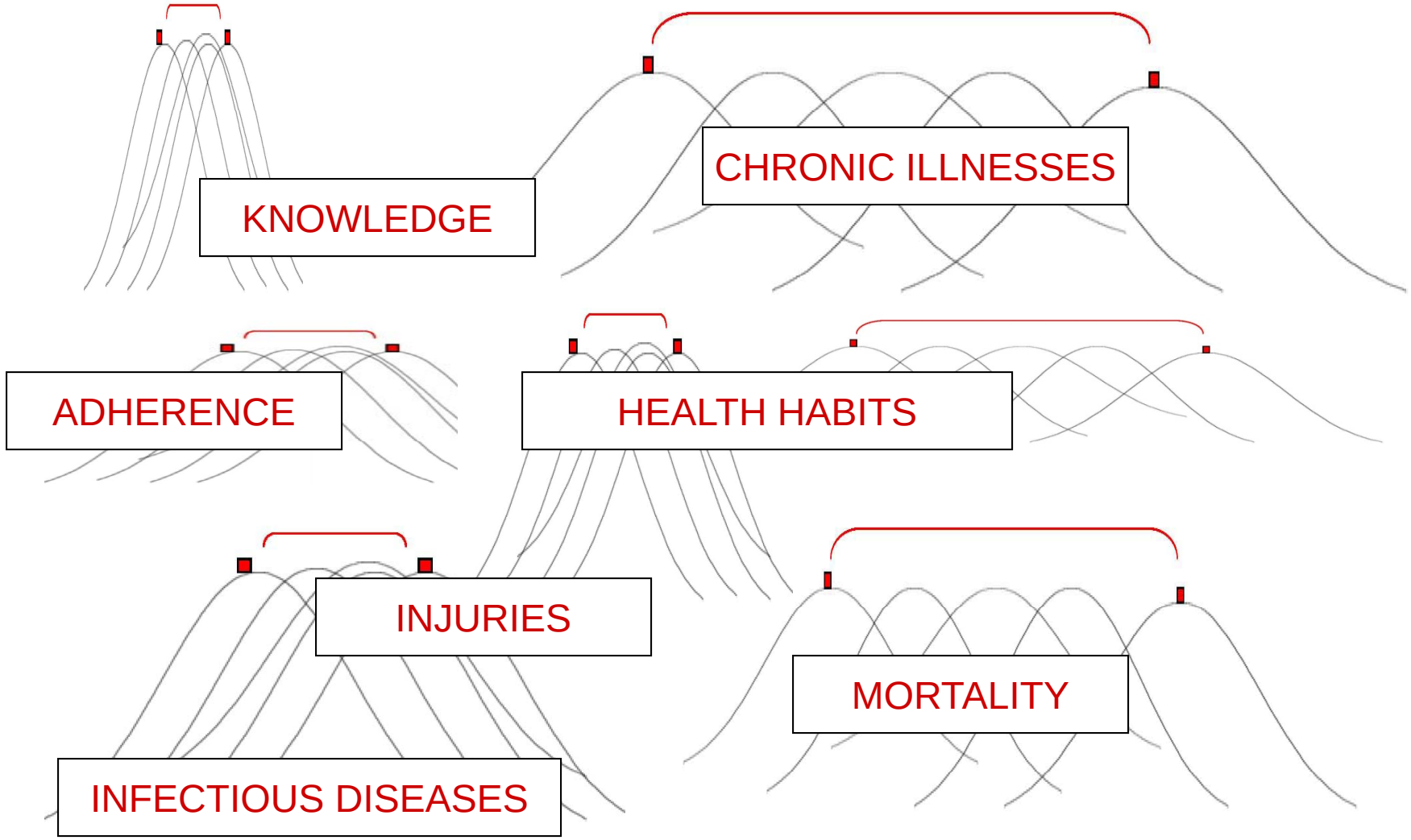
Typical course of behavior disparities over time, by education:

% who smoke, 1974-2006, ages 25+ (age-adjusted)

(CDC, Health in the United States, 2008, Table 64)



Many families of health disparities



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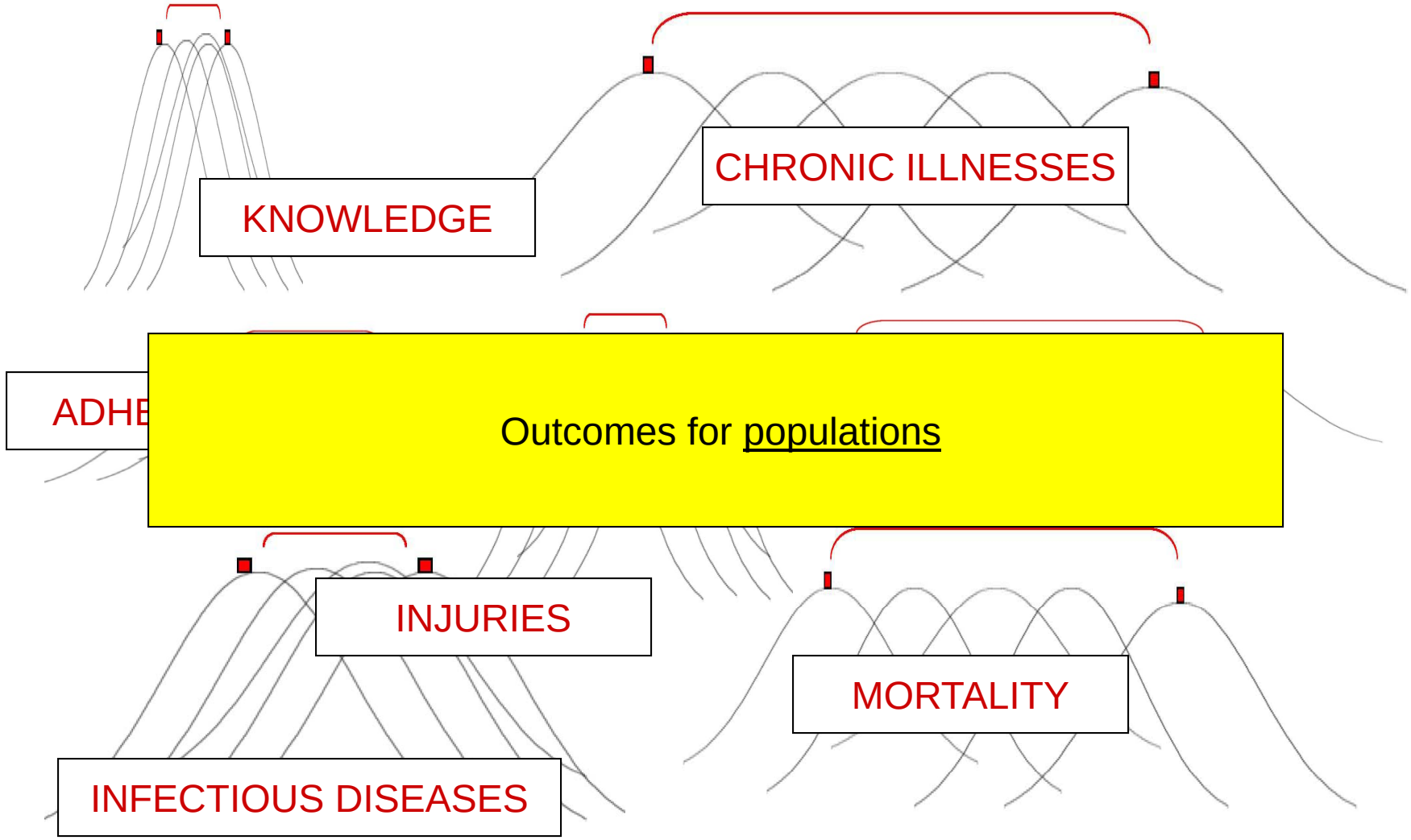
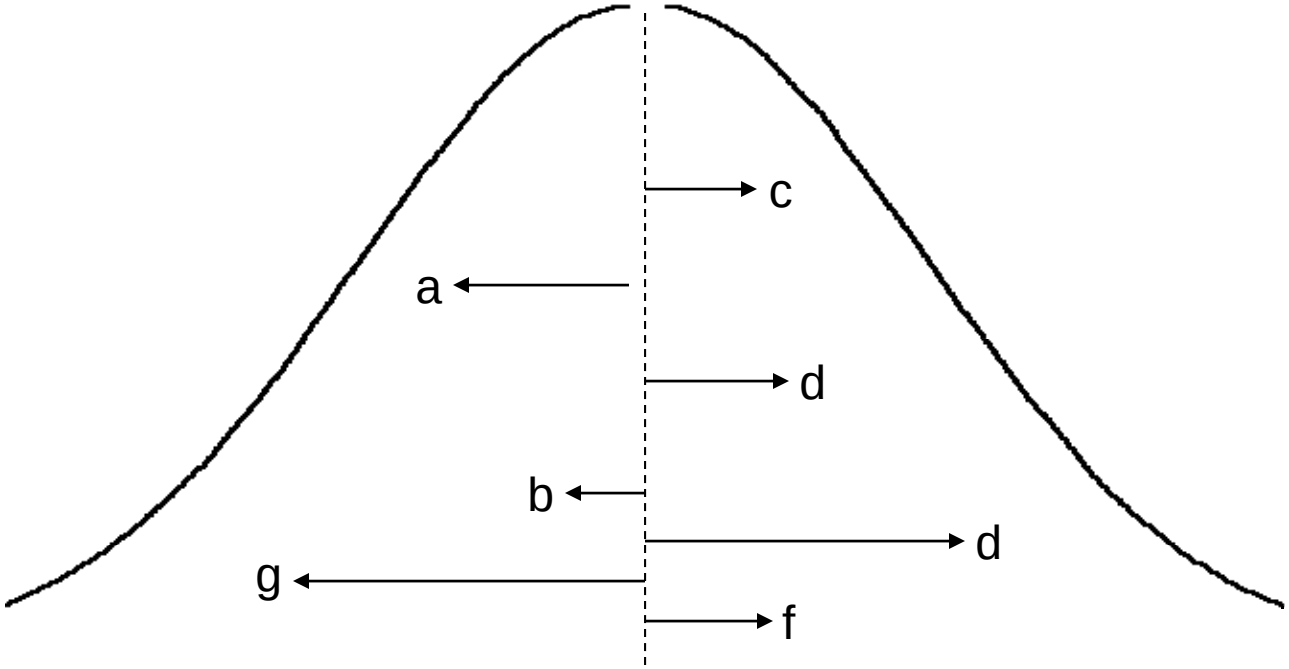


This is **not** about individual differences in health outcomes

Not “explaining” within-group variation

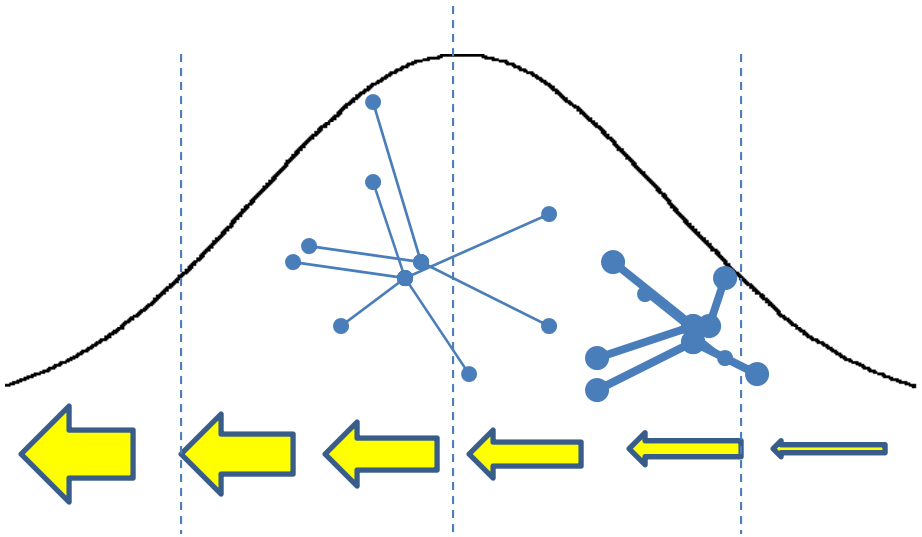


Within-group and between-group variance may arise from different mix of causes

Often misunderstood!

Study of populations aided by epidemiological approach

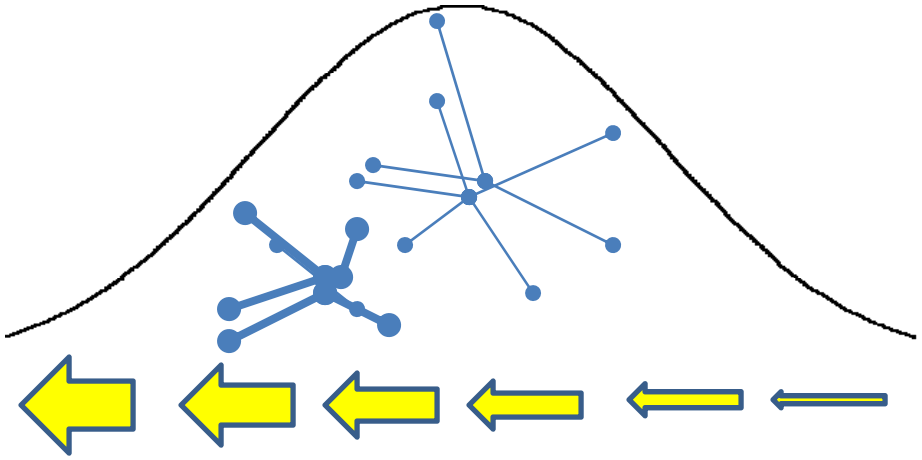
- Outcomes
  - Means, rates, relative risk, odds ratios for groups
- Predictors—classic trio
  - Exposure to hazards, help (probability)
  - Host (susceptibility)
  - Vector (virulence, burden)



Study of populations aided by epidemiological approach

- Outcomes
  - Means, rates, relative risk, odds ratios for groups
- Predictors—classic trio
  - Exposure (probability) — Current focus of SES disparities research
  - Host (susceptibility)
  - Vector (virulence, burden)

Missing 2/3



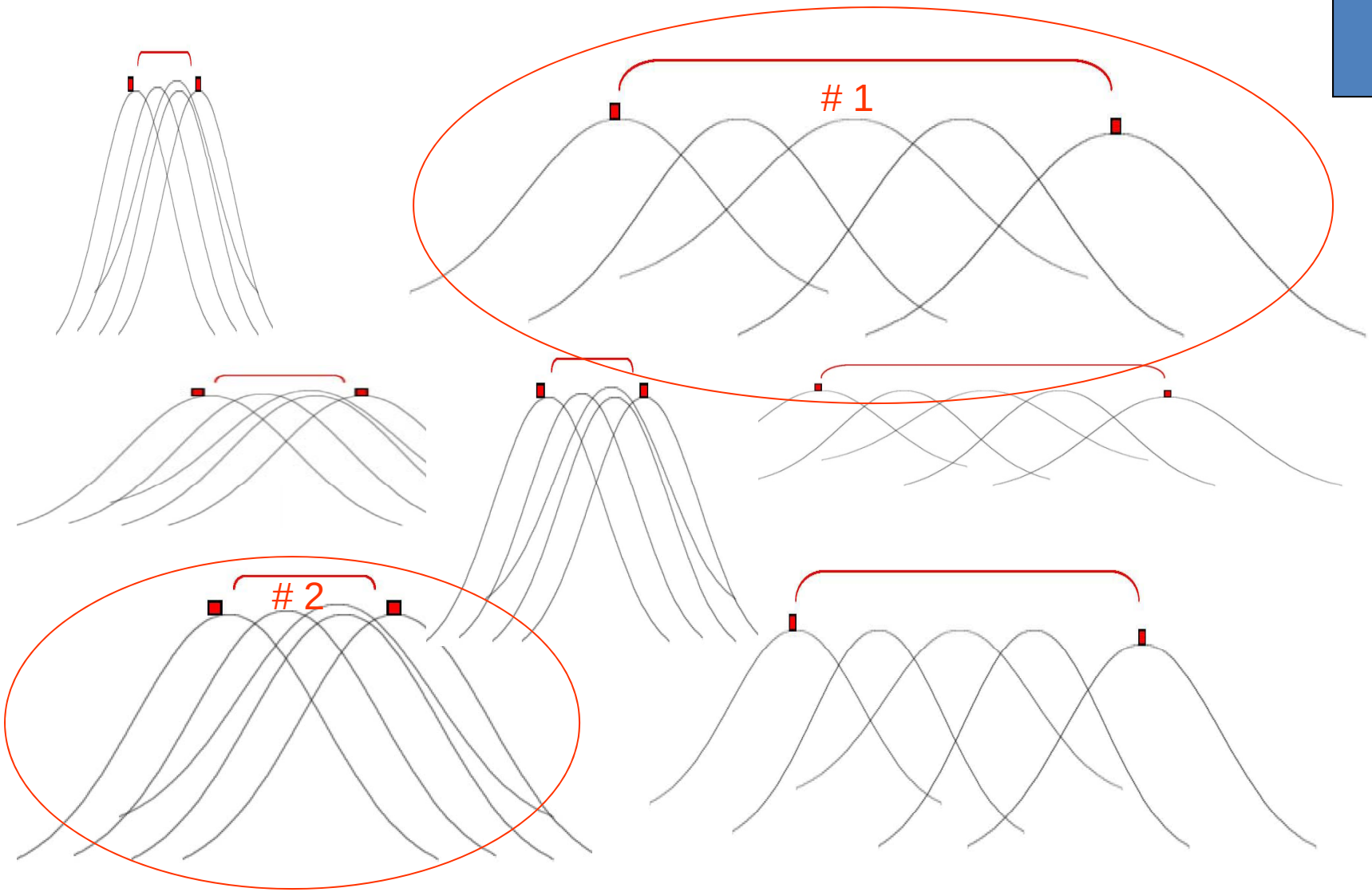
Agenda

1. What are “disparities”?
2. **Why such a vexing puzzle?**

   But first, what exactly are we trying to explain?

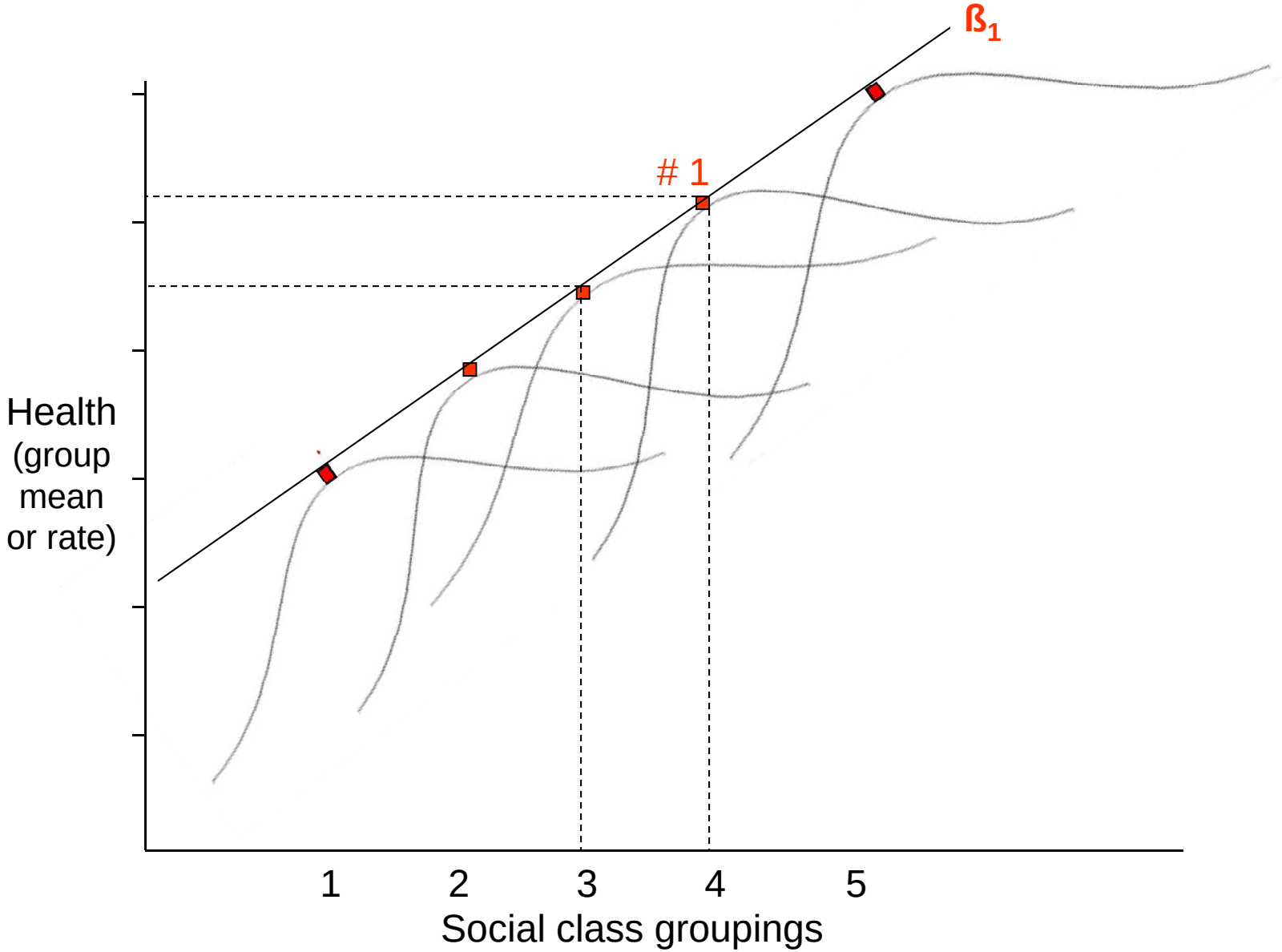
   - **Statistically** Illustration
   - **Substantively**
3. Is human cognitive diversity the key to solving it?
4. If yes, so what?

Illustration with 2 disparities



Statistically…

Each disparity is a gradient, with a slope (ß)



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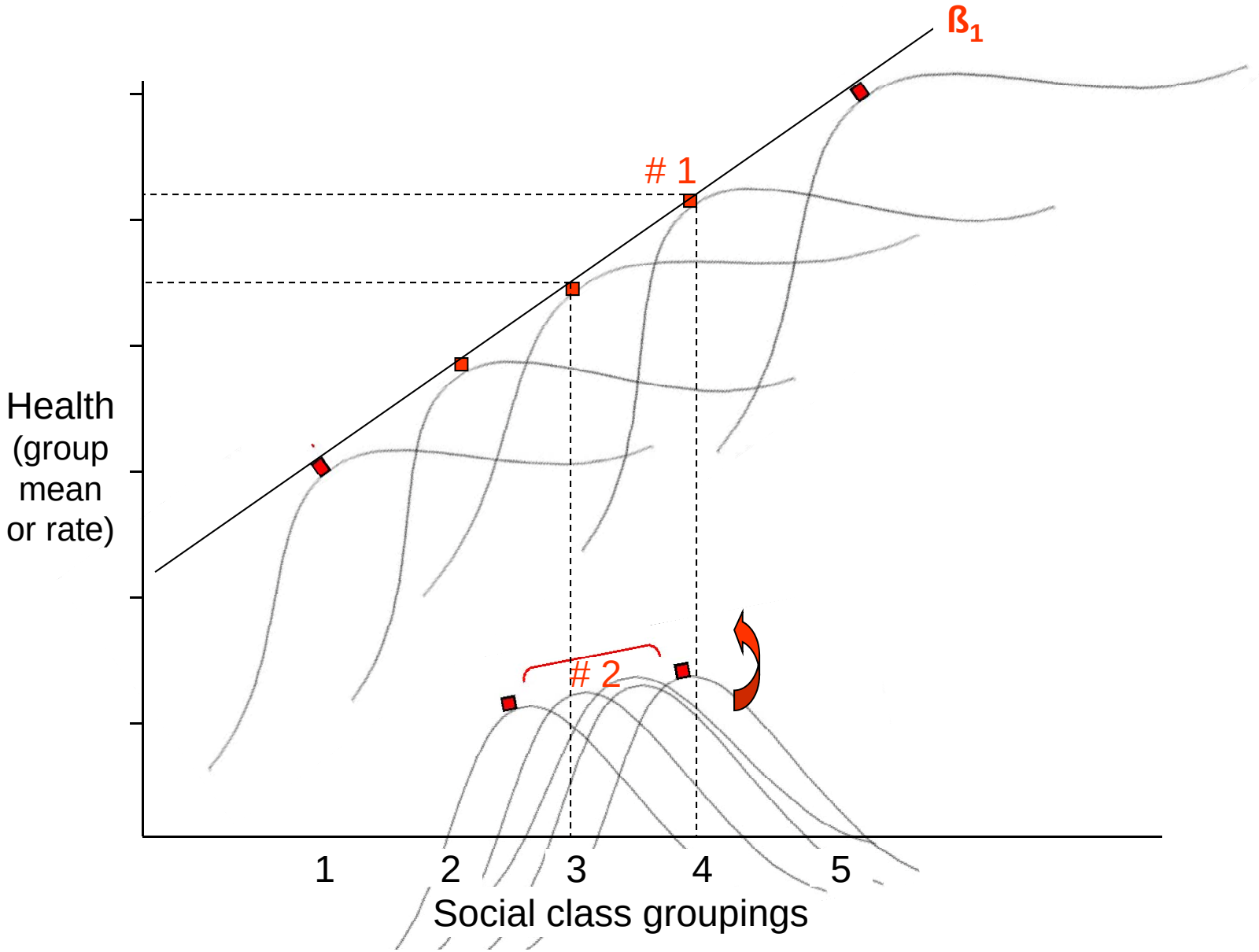

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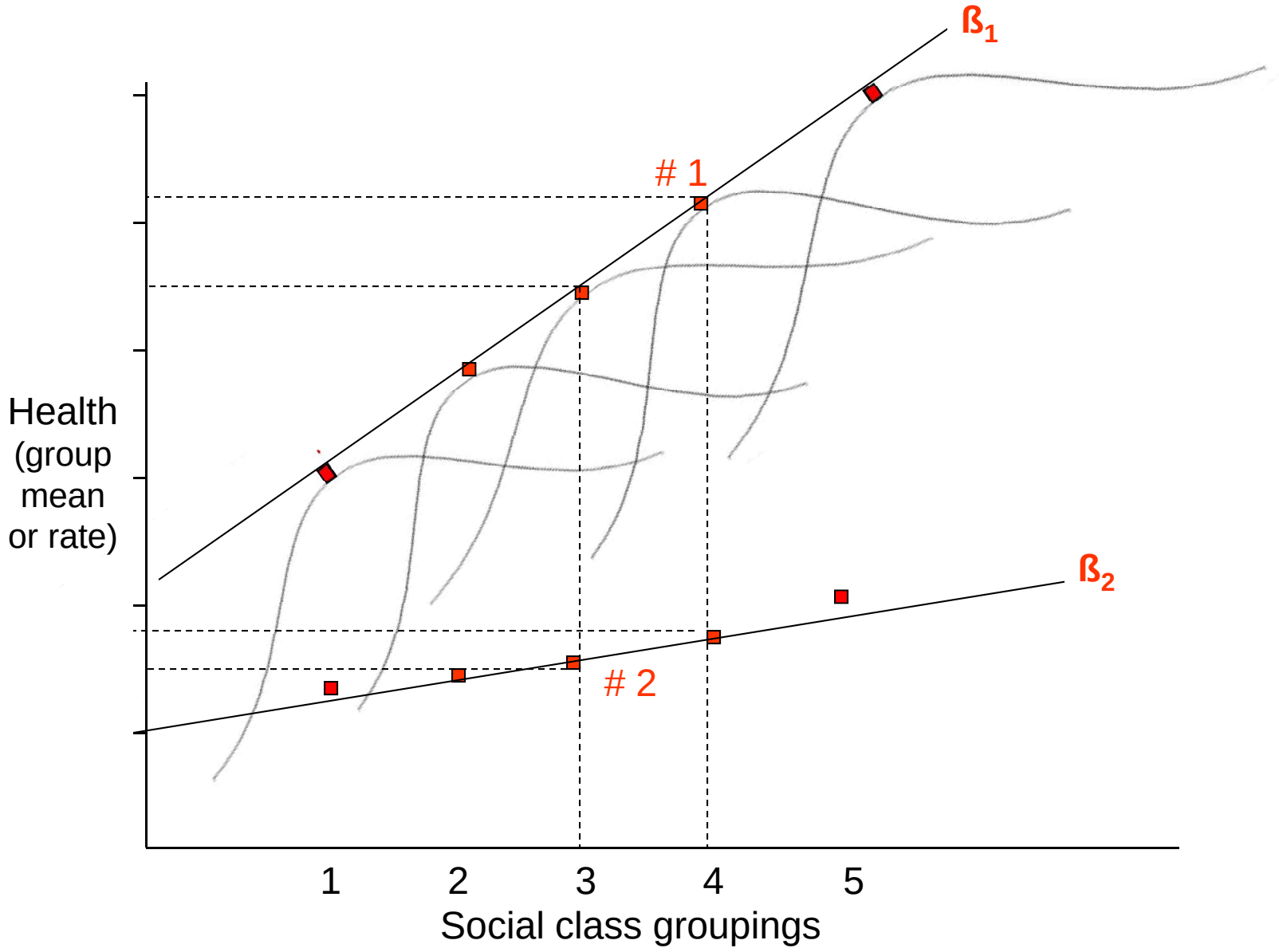
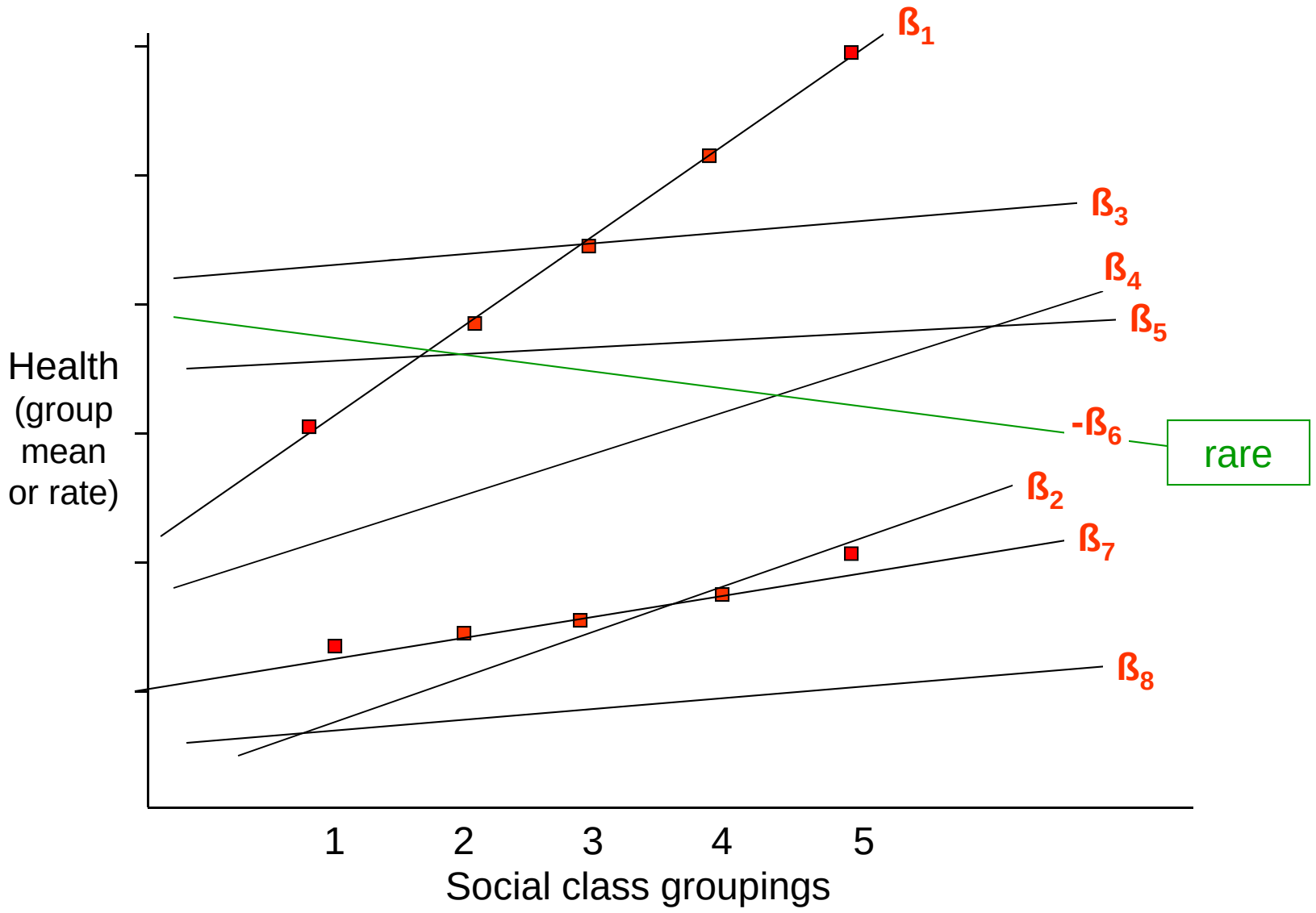


Many families of health gradients (slopes):

Morbidity, mortality, knowledge, prevention, adherence, etc.

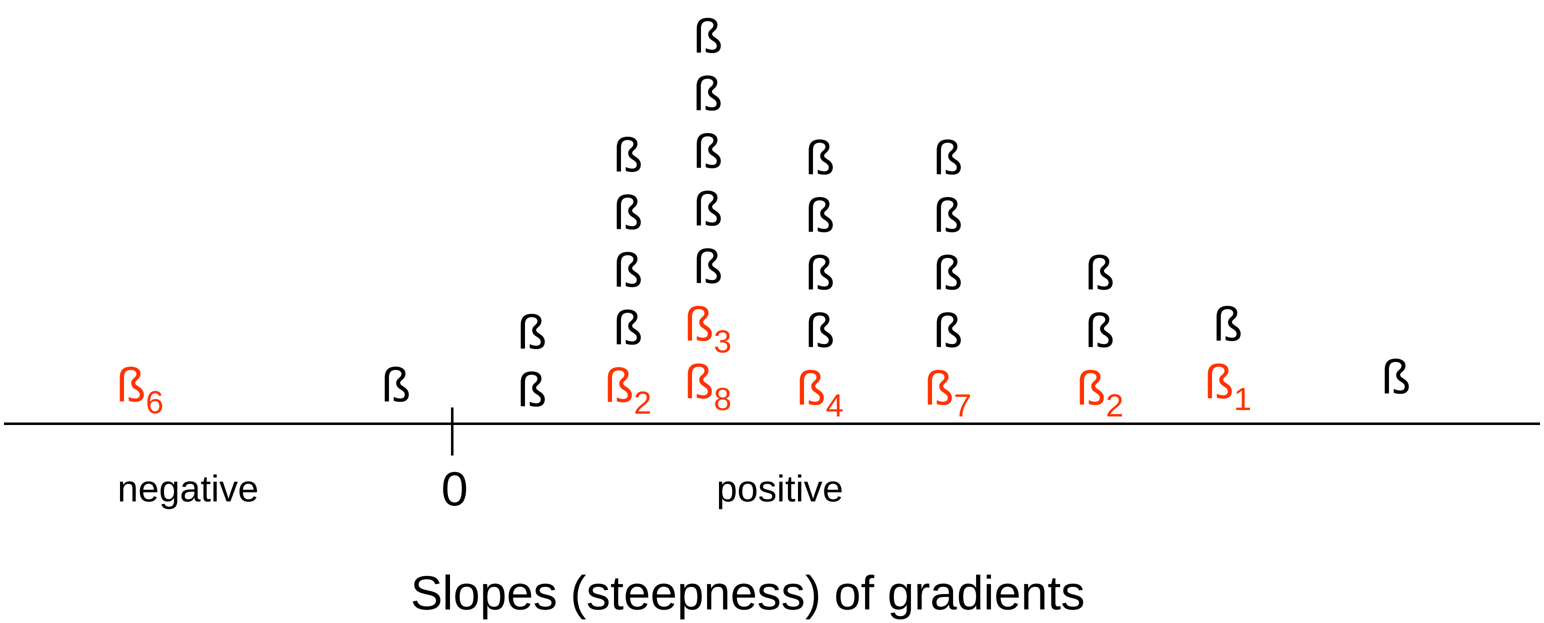


So, to explain SES disparities:

Explain the distribution of co-evolving gradients

(ß, their standardized slopes)

Common policy goal : All β = 0



Agenda

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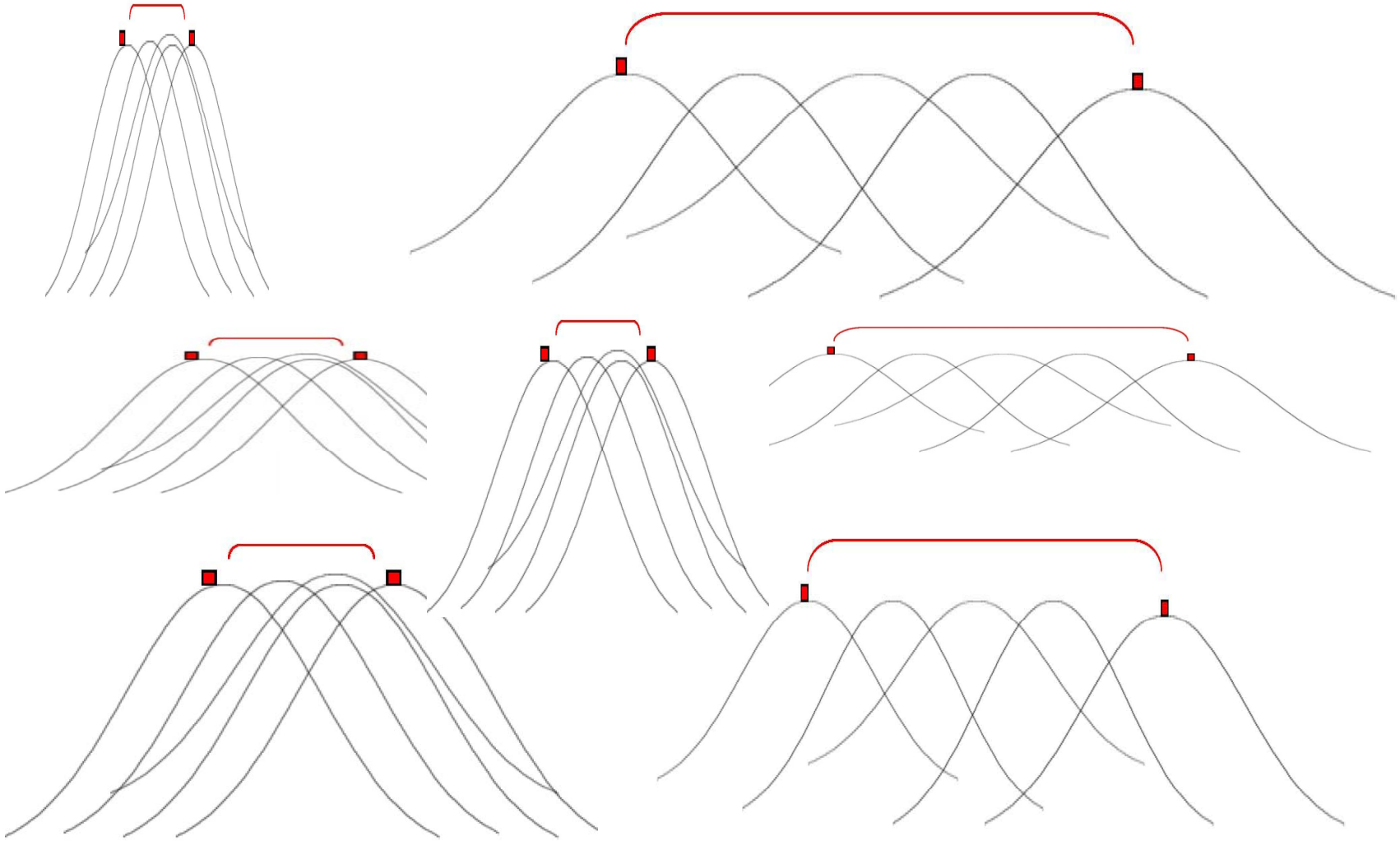
2. **Why such a vexing puzzle?**

   But first, what exactly are we trying to explain?

   - **Statistically**
   - ➢ **Substantively**

   Examples
3. Is human cognitive diversity the key to solving it?
4. If yes, so what?

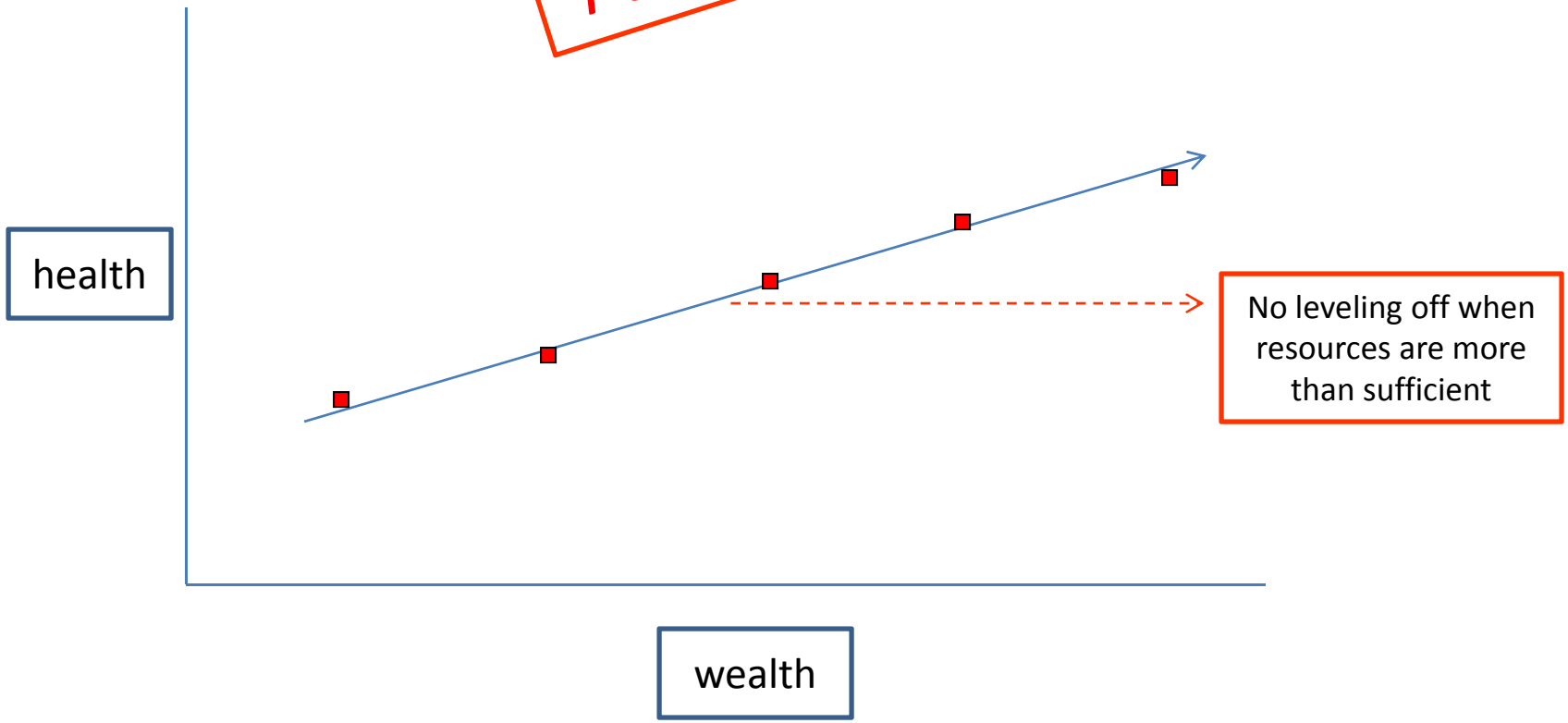
General puzzle: Health disparities are *too* general for SES mechanisms to explain



They are pervasive, persistent and monotonic regardless of time, place, health system, disease, and behavior. Why??

Exposure hypothesis 1:
"Wealth = health" (can afford good care)

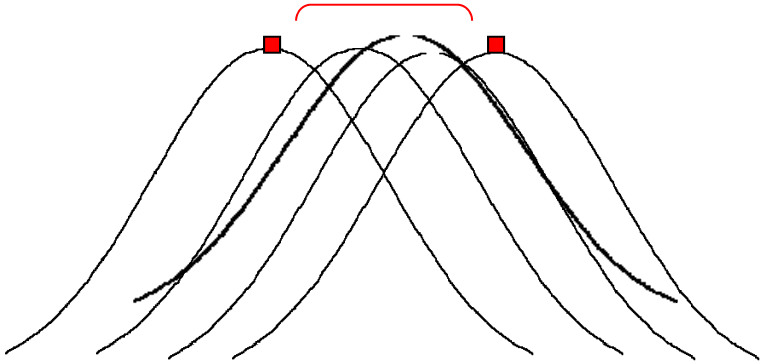
REJECTED—
Puzzle greater!



Experimental test of exposure hypothesis 1:

Equalize access to care ➡ equalize health

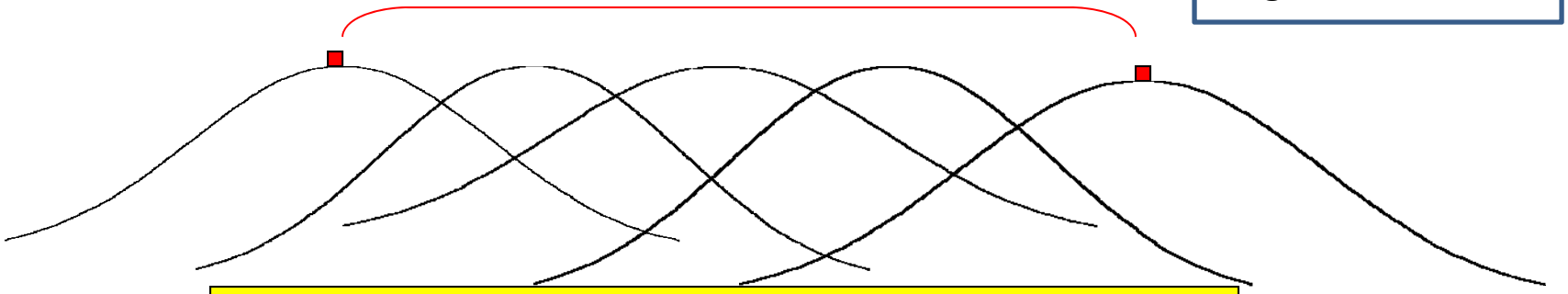
- Time 1: Unequal access



FAILED—Puzzle greater!

- Time 2: After equal access (free care)

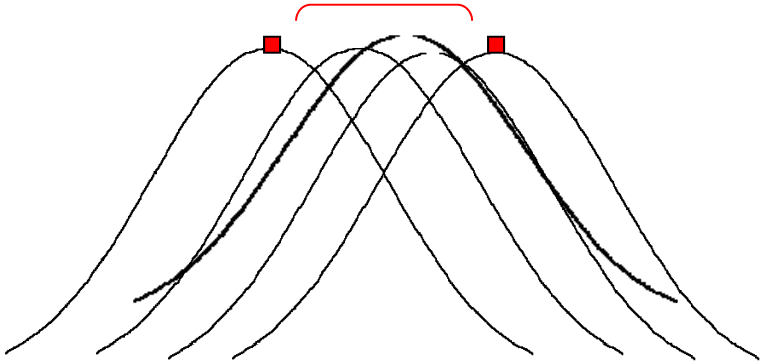
E.g., UK in 1950s



Health disparities *grow*, not shrink

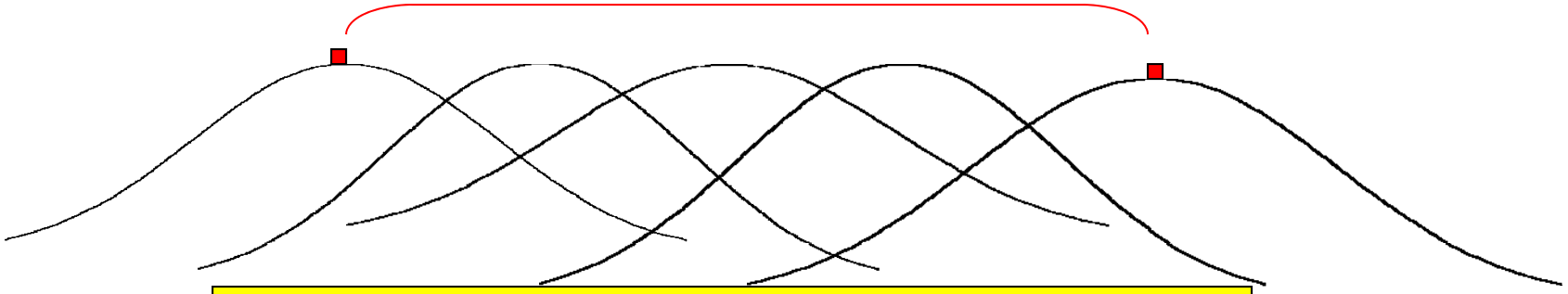
Experimental test of exposure hypothesis 2: Unequal education ➡ unequal health

- Time 1: Unequal knowledge of



FAILED—Puzzle greater!

- Time 2: After public health campaign

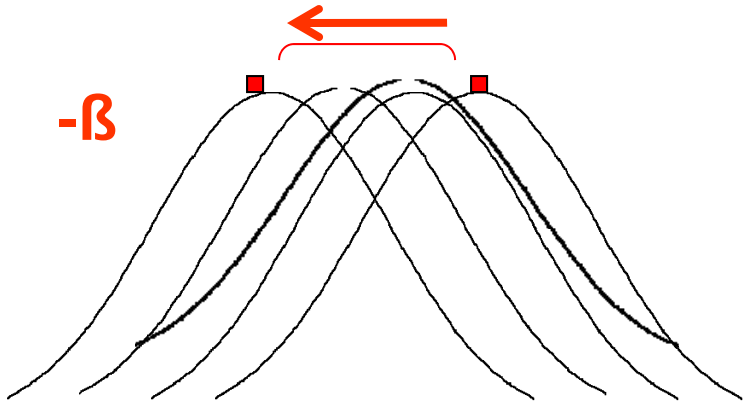


Knowledge disparities *grow*, not shrink

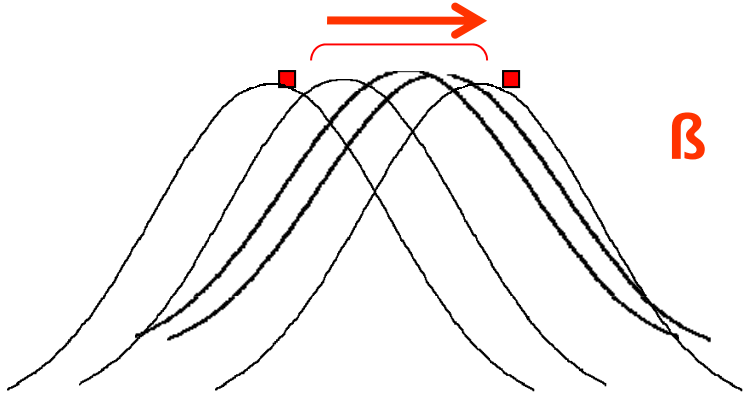
Or disparities even reverse direction with new screening tests (e.g., death rates from breast cancer)

- Negative disparities for Outcome X at Time 1

More educated women have higher death rates

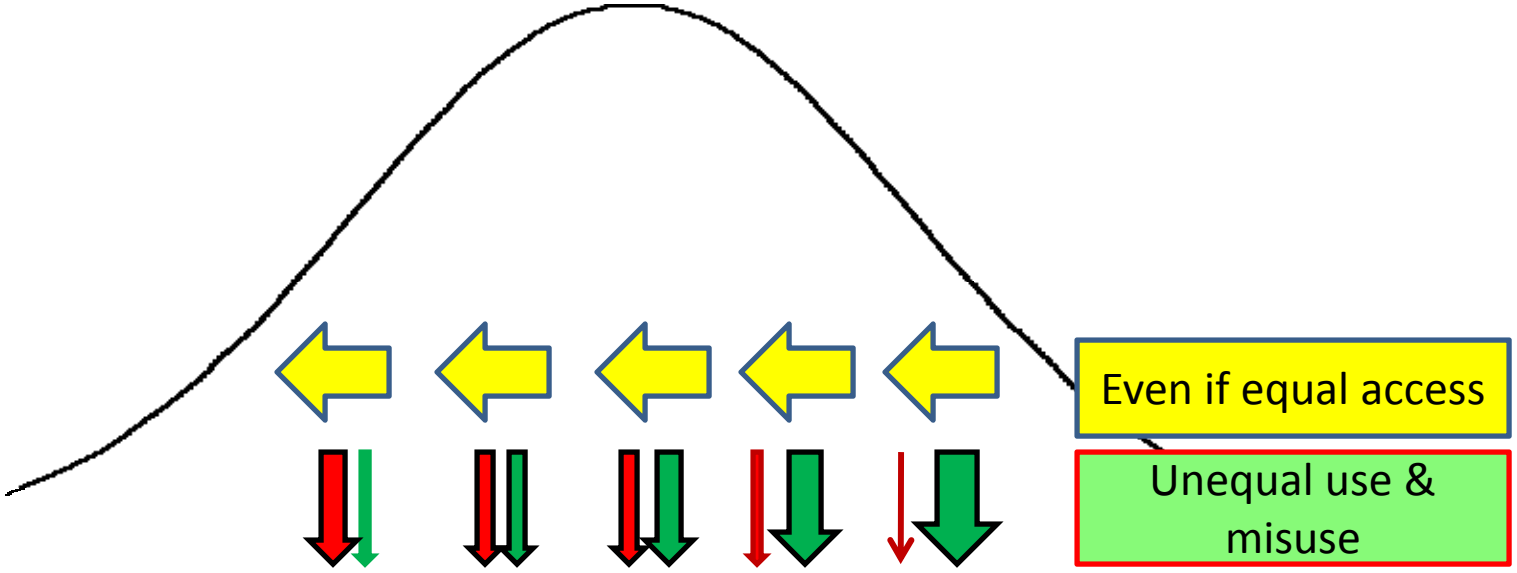


- Positive disparities for Outcome X at Time 2

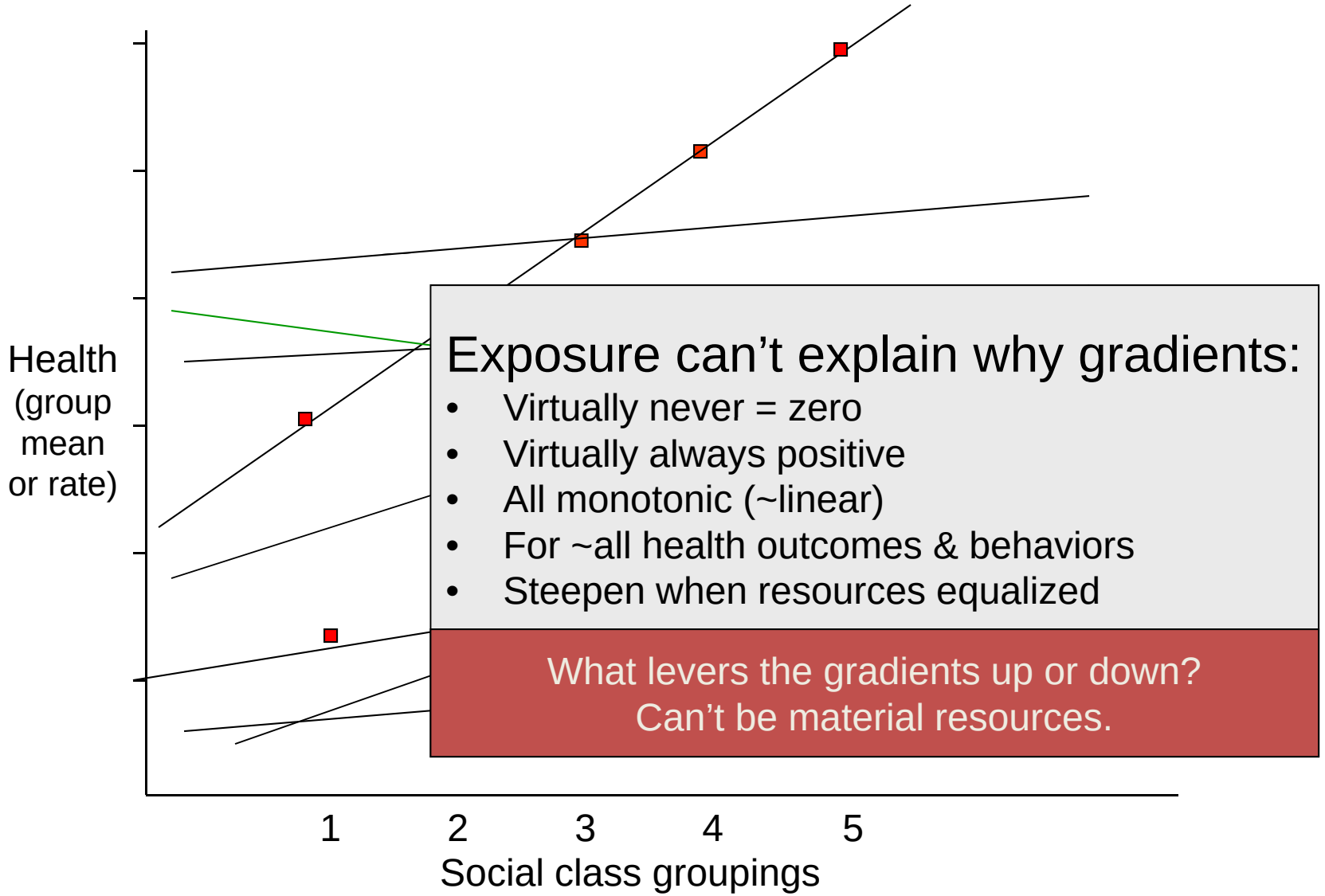


Access matters, but so does utilization

- Mammograms
- Adherence to treatment
- Seat belt use
- Etc.



Summary of puzzle



Exposure can't explain why gradients:

- Virtually never = zero
- Virtually always positive
- All monotonic (~linear)
- For ~all health outcomes & behaviors
- Steepen when resources equalized

What levers the gradients up or down?
Can't be material resources.

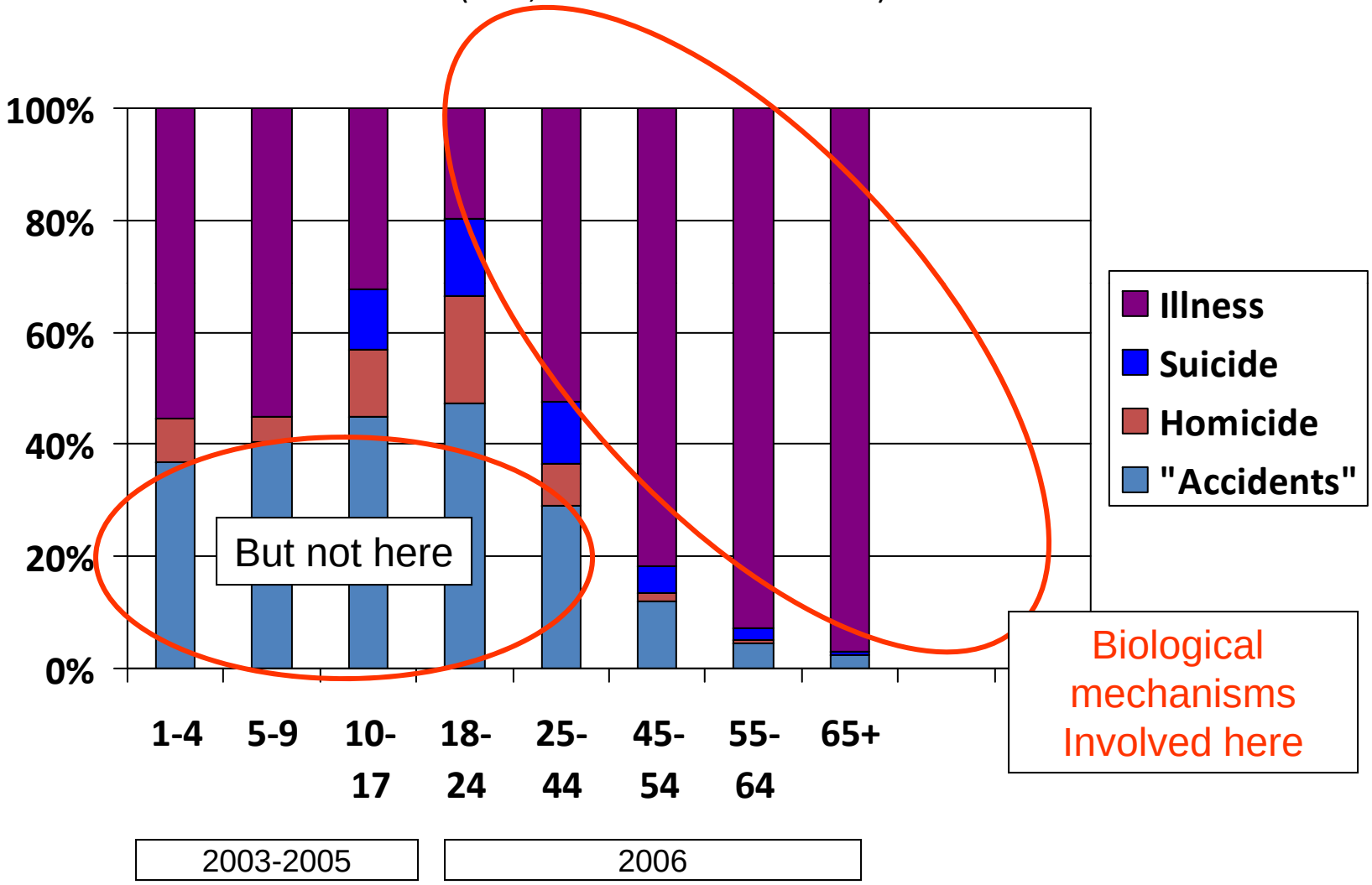
So, the field seeking more "fundamental cause" of SES disparities

- This cause must:
  - be pervasive & domain-general
  - have linear (monotonic) effects
  - not be material
- Most popular suspect = inequality itself
  - relative deprivation ⇒ chronic psychological stress
    ⇒ damaging physiological process: **"allostatic load"**
- Stress important, but can't explain:
  - why adding resources *increases* disparities
  - disparities in non-biological outcomes

First, physical illness is only one cause of injury & death:

Causes of death, males by age

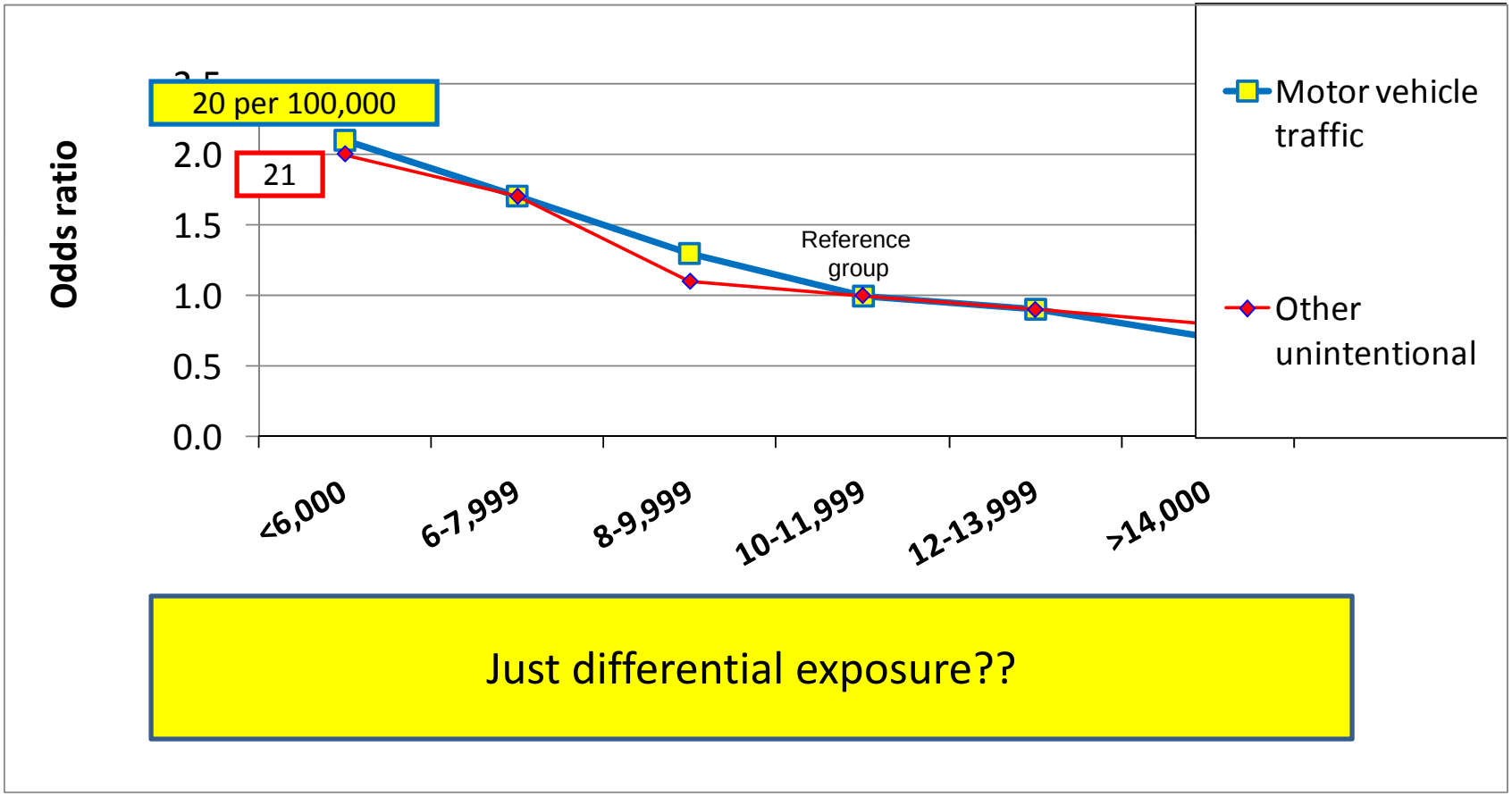
(CDC, Health data interactive)



Common theme—all are preventable

Example: Unintentional ("accidental") death

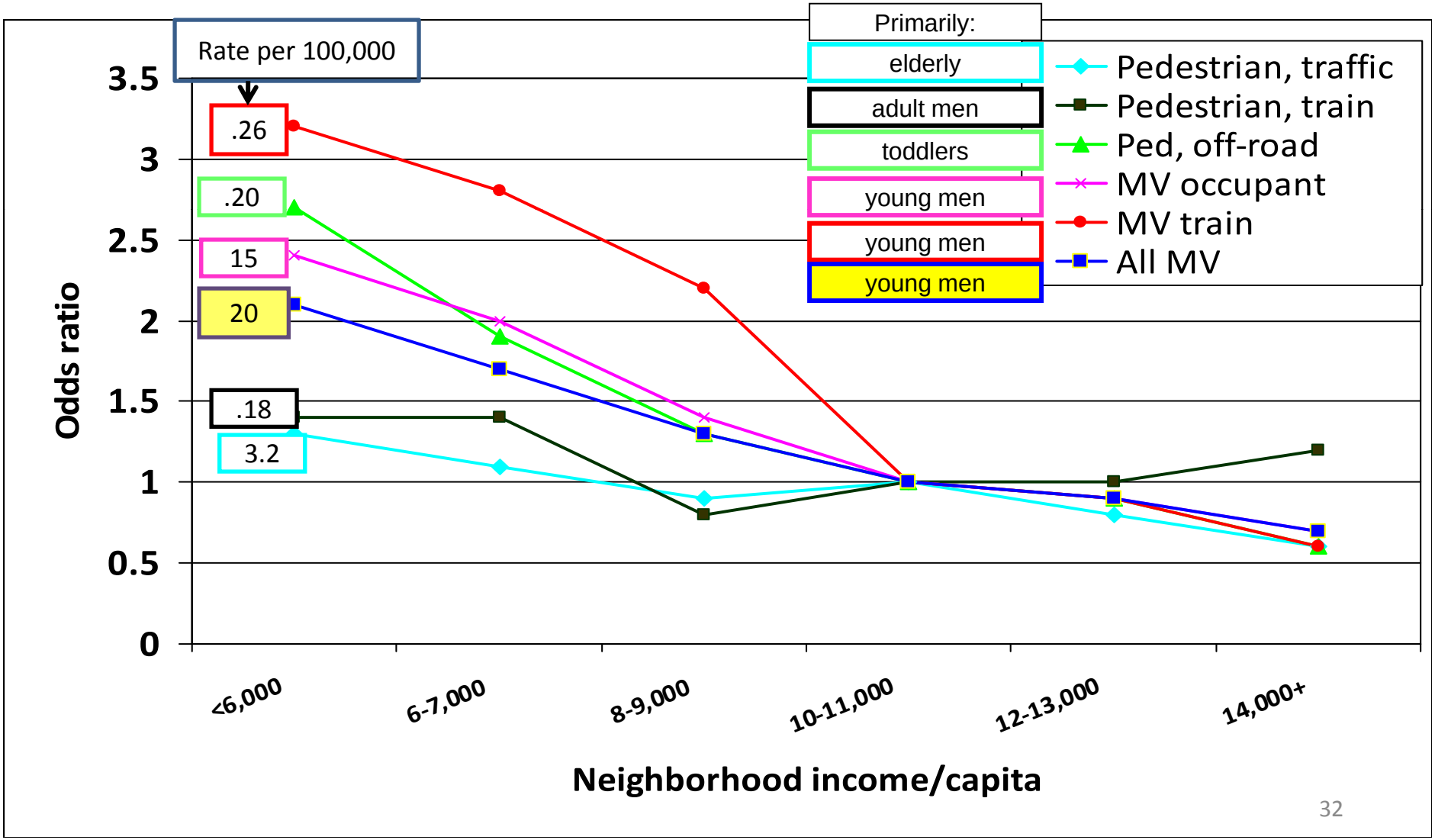
Odds ratios by neighborhood income (1980-86)



Odds = $\frac{\text{\% affected}}{\text{\% not}}$ Odds ratio = $\frac{\text{Odds for Group 1}}{\text{Odds for reference group}}$

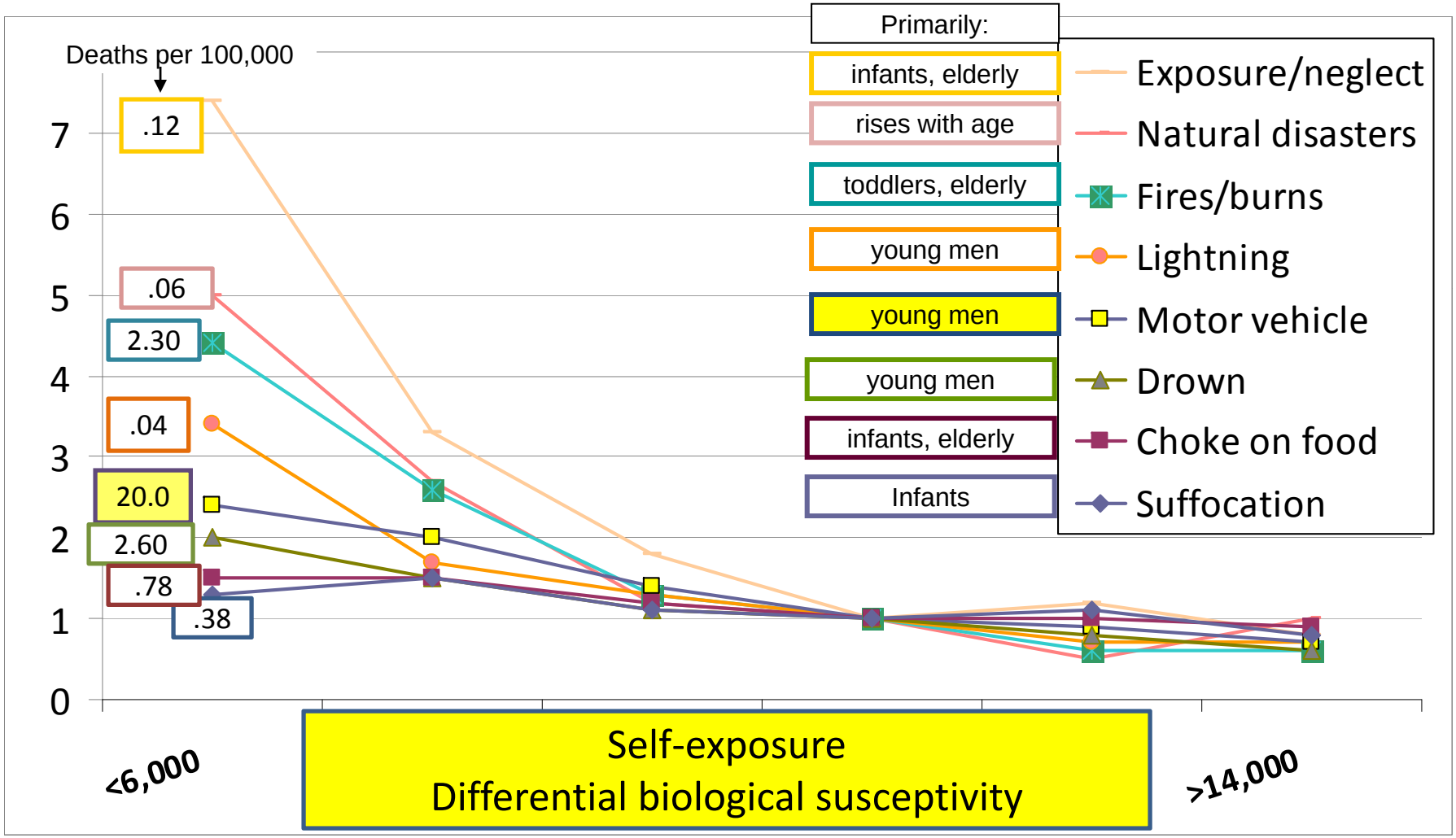
Selected causes of “motor vehicle traffic” death, by neighborhood income/capita (1980-86)

(Baker, O’Neill, Ginsburg, & Li, 1992)



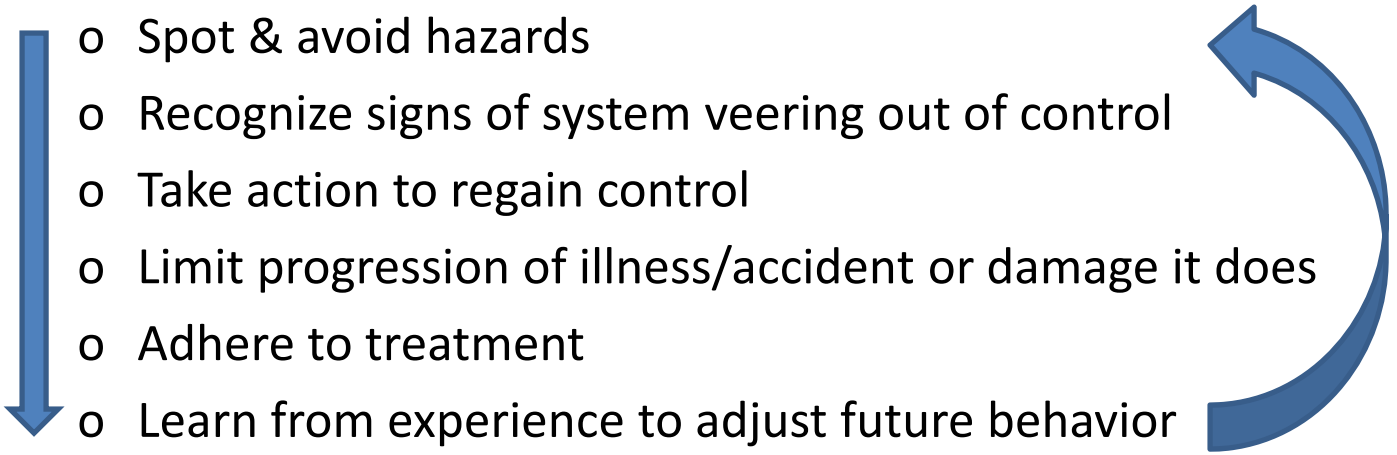
Selected "other" causes of unintentional death, by neighborhood income/capita (1980-86)

(Baker, O'Neill, Ginsburg, & Li, 1992)



The common mechanism for illness and injury?

- Prevention
  - It's our job
  - It's daily, unrelenting, life-long (hazards are everywhere)
  - It's complex
- It's a highly cognitive, multi-step, active process
  - Spot & avoid hazards
  - Recognize signs of system veering out of control
  - Take action to regain control
  - Limit progression of illness/accident or damage it does
  - Adhere to treatment
  - Learn from experience to adjust future behavior



Passive-patient model is dead wrong

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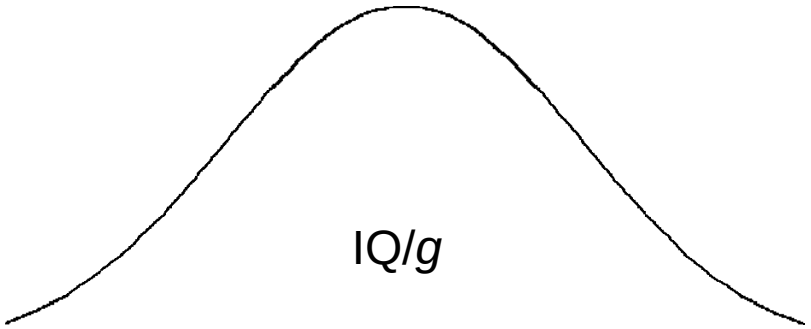
4. If yes, so what?



Alternative hypothesis for disparities in health:

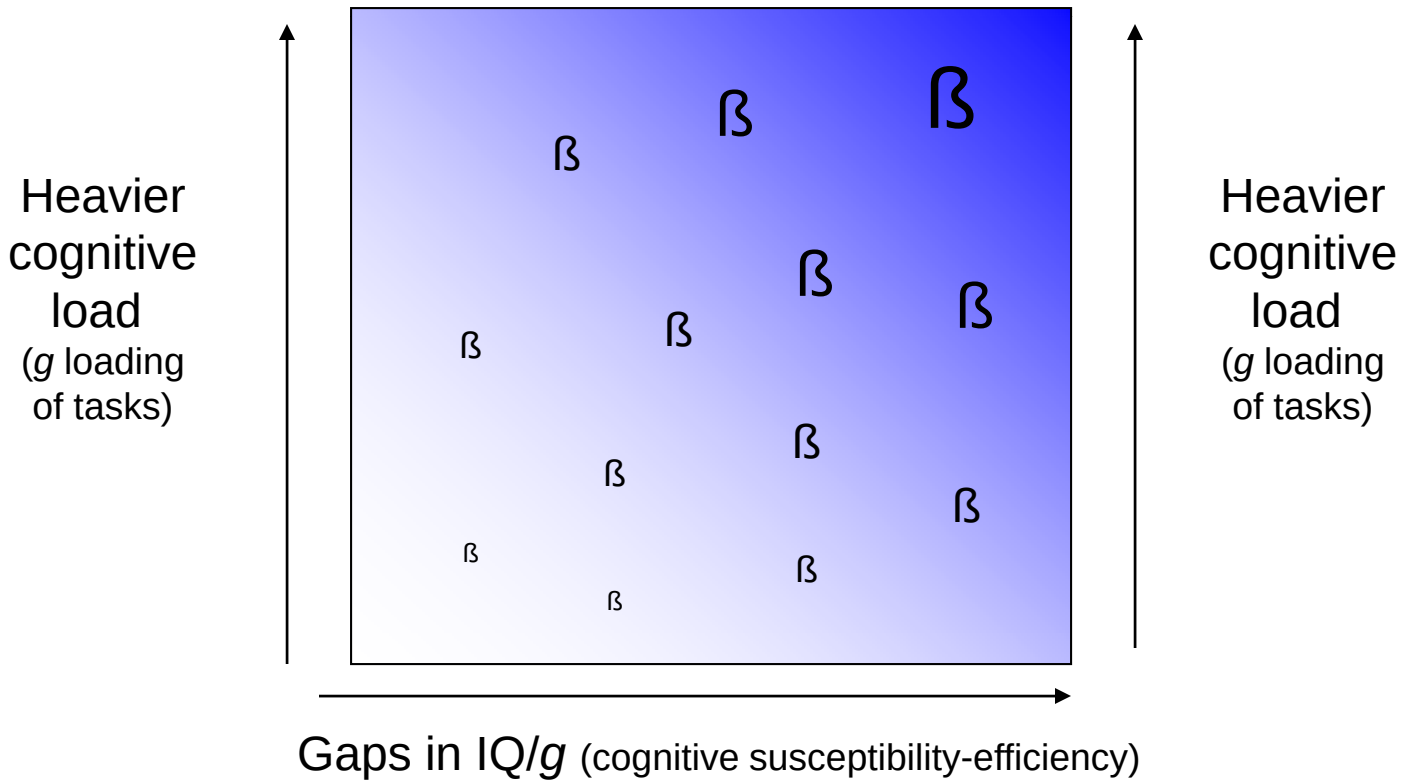
"Intelligence (*g*) differences are the "fundamental cause"

Two *g*–based levers ratchet up gradients*

- Bigger IQ differences (people) ⟹ susceptibility
- Heavier cognitive load (tasks) ⟹ burden

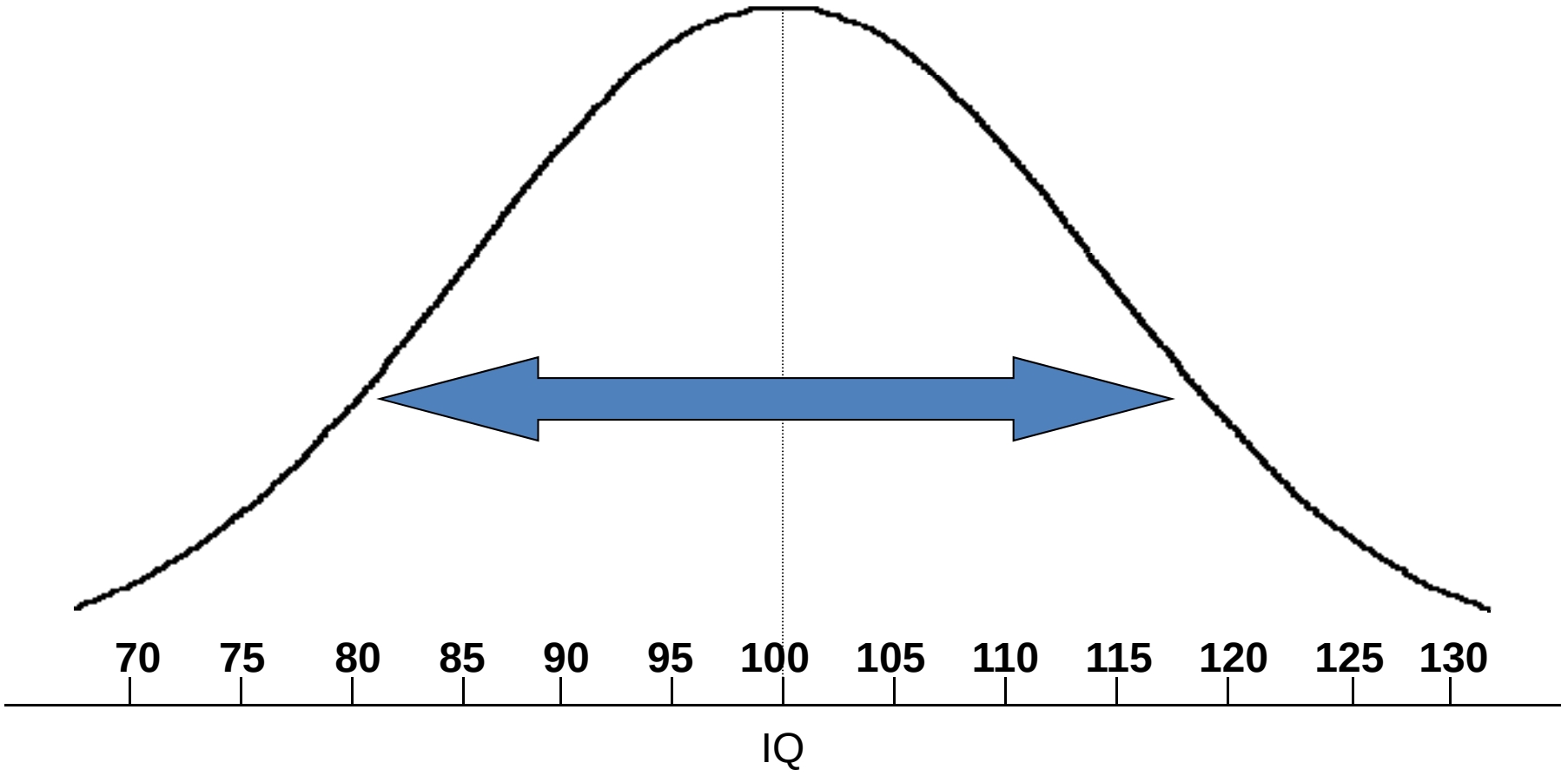
*Based on extensive research in education & employment

Translated: A hypothesis about gradients



Background fact #1

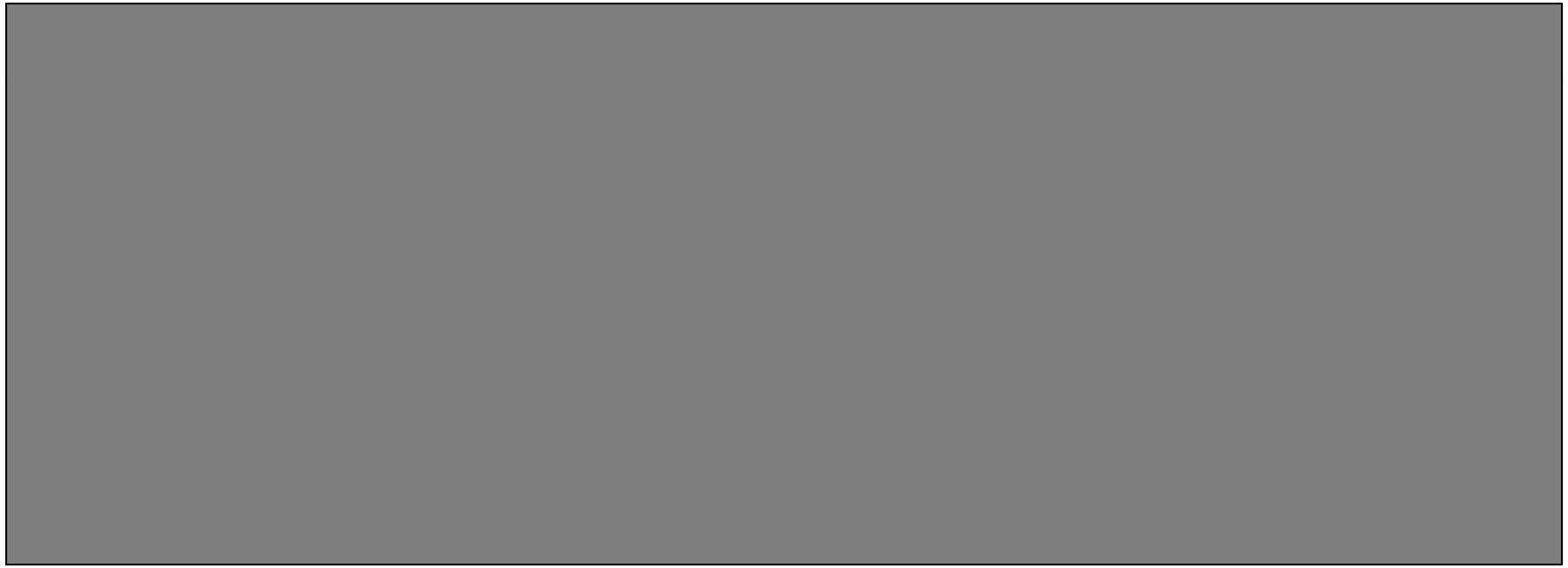
Great cognitive diversity is a biological fact about all populations



Background fact #2

IQ ≈ g (general mental ability factor)

- *g* is no longer a black box

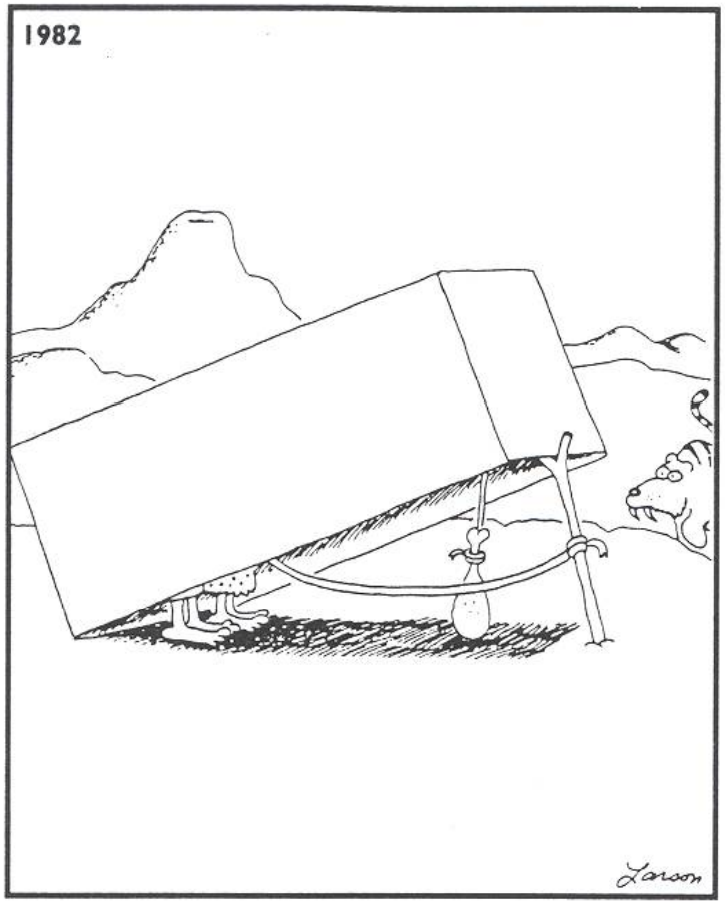


Background fact #2

IQ ≈ g (general mental ability factor)

- *g* is no longer a black box
- *g* is a domain-general facility for learning, reasoning, spotting & solving novel problems
    - o Higher *g* reduces susceptibility to error
    - o Gives bigger edge as task complexity (cognitive load) increases
    - o Allows one to exploit resources more fully & effectively (e.g., classroom instruction, medical treatments)

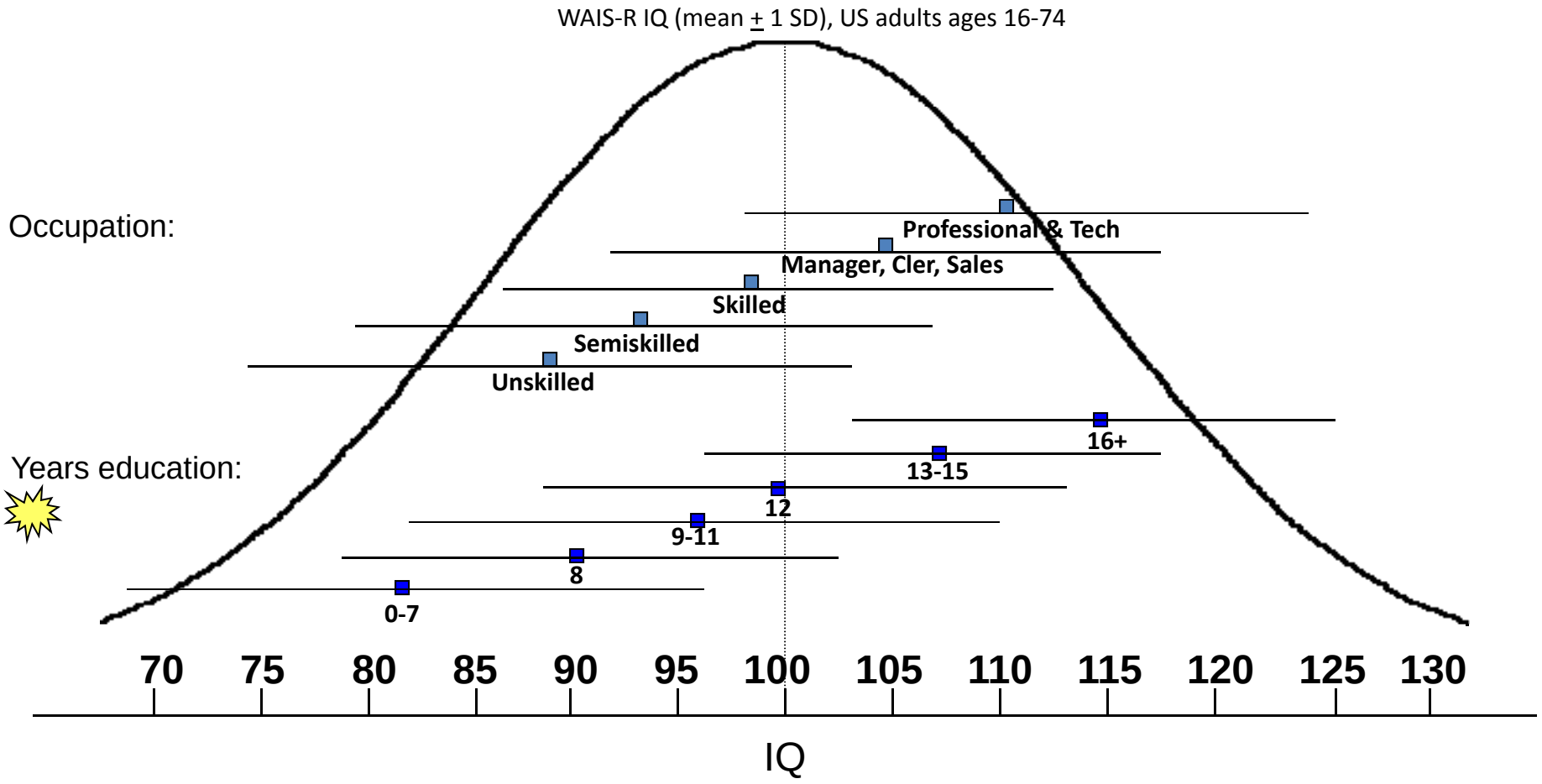
Gives an edge in planning; anticipating problems



"Shhhh, Zog! … Here come one now!"

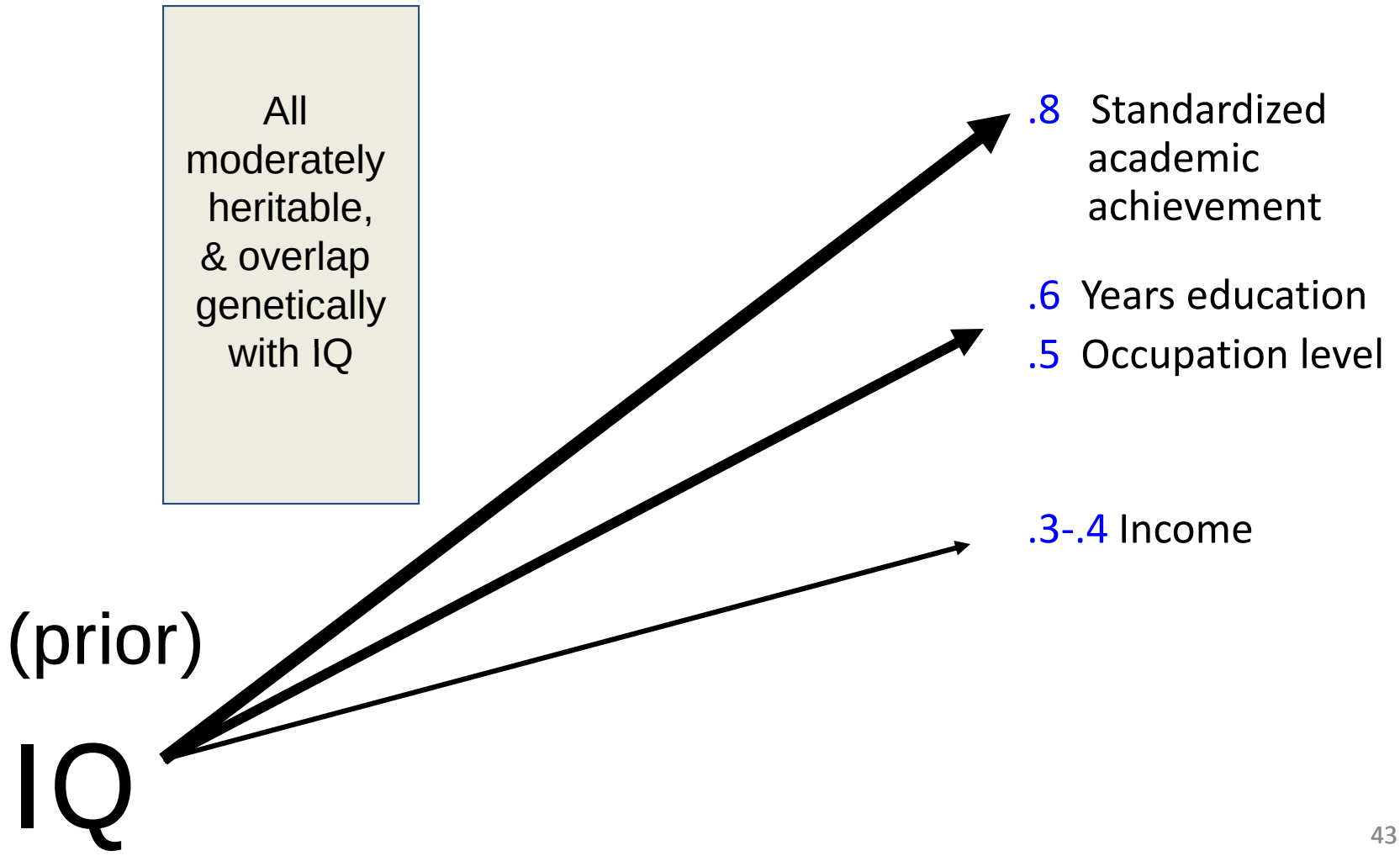
Background fact #3

Mean IQs differ by occupation level and years education



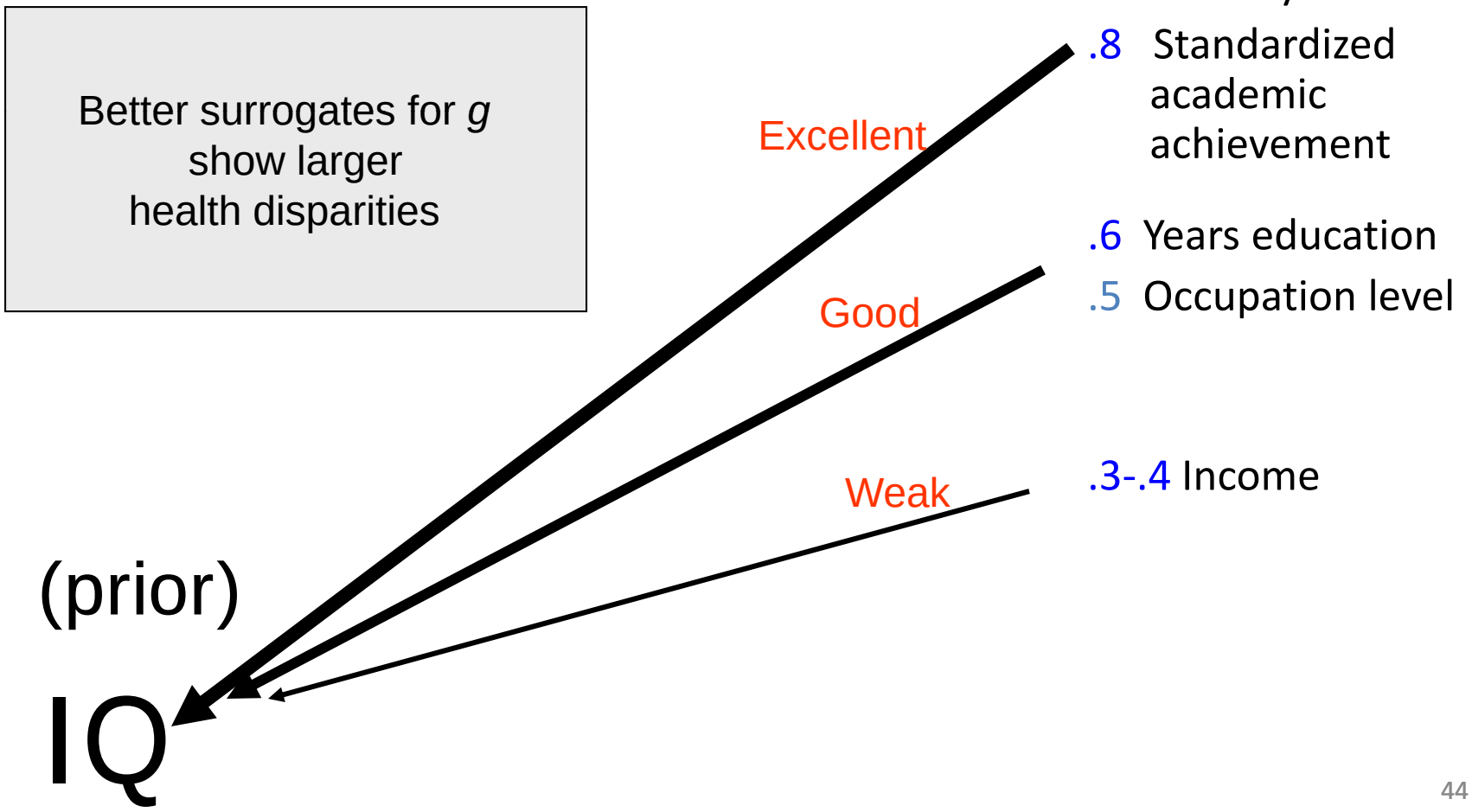
Background fact #4:

Some SES indicators correlate more with IQ

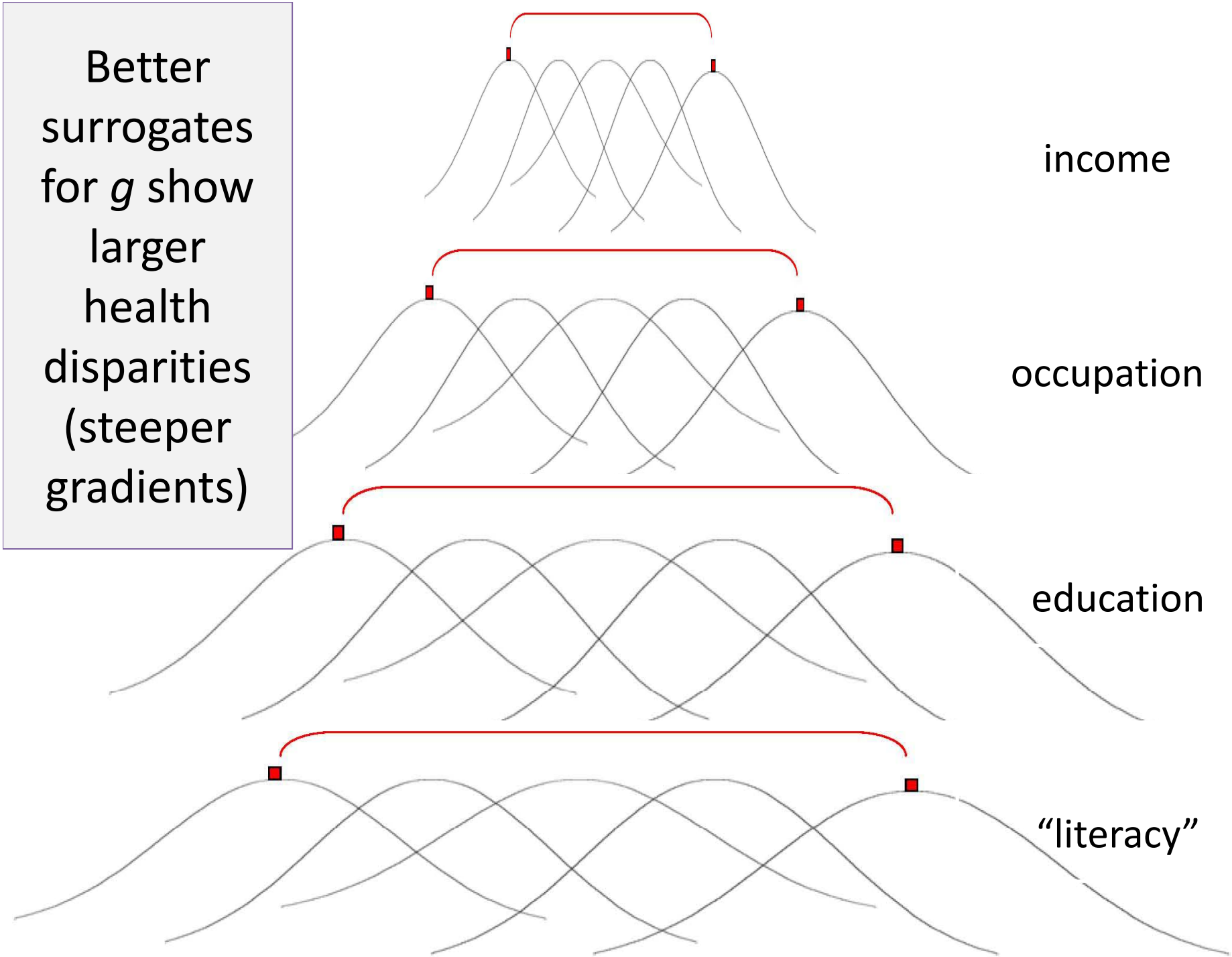


Background fact #4:

Conversely, some are better surrogates for IQ

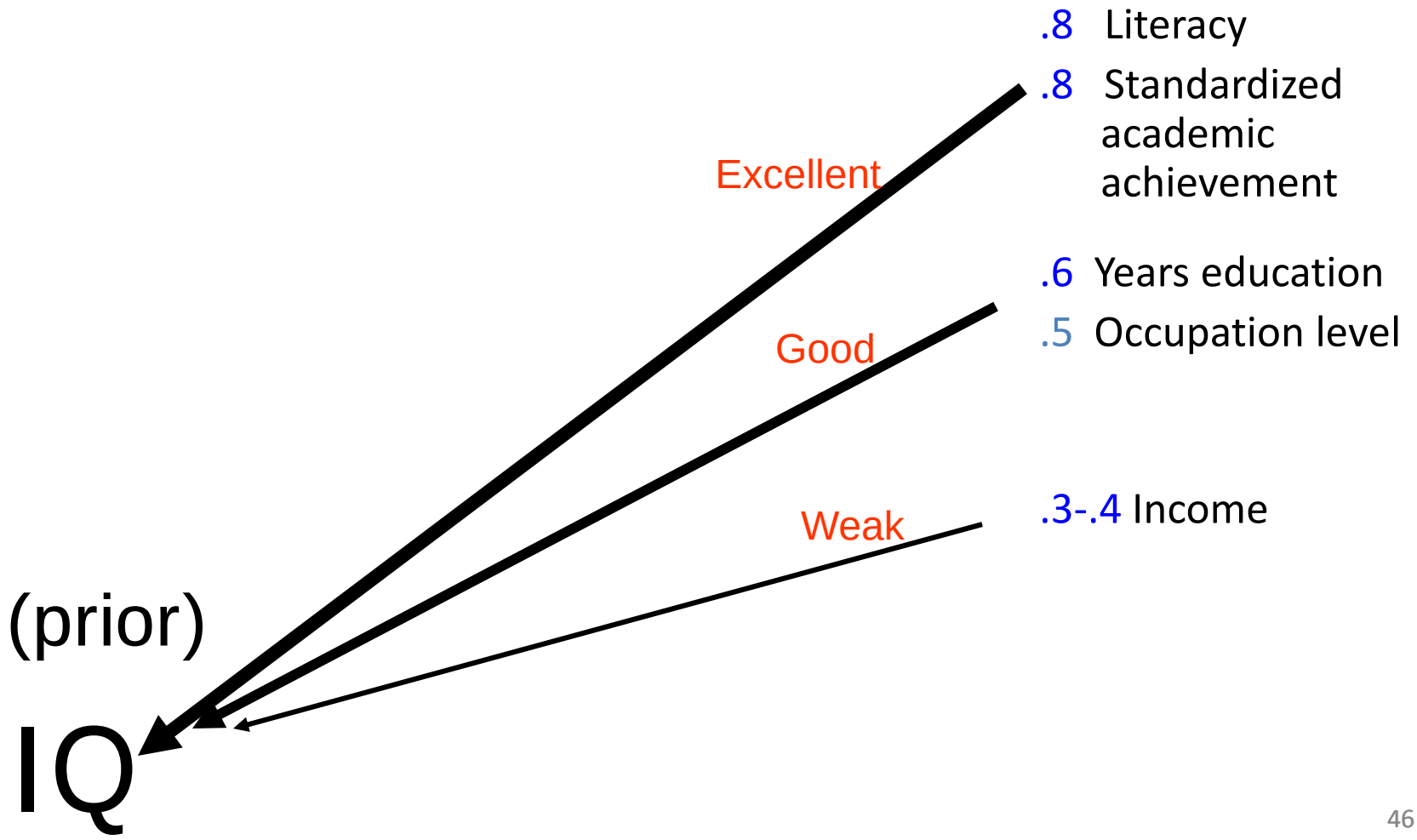


Better surrogates for *g* show larger health disparities (steeper gradients)



Background fact #4:

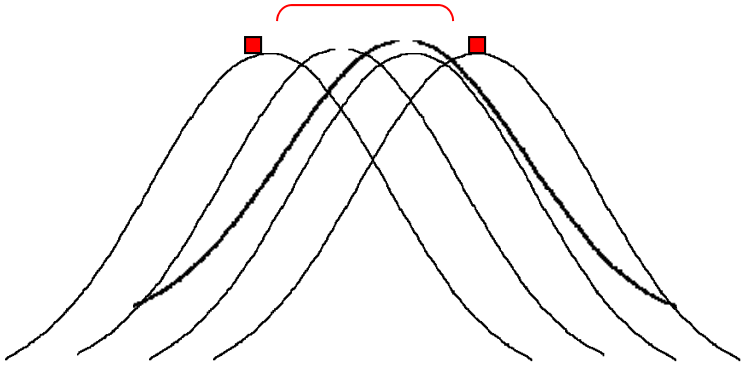
Cannot "control" for SES without
controlling away much of (genetic) *g* itself



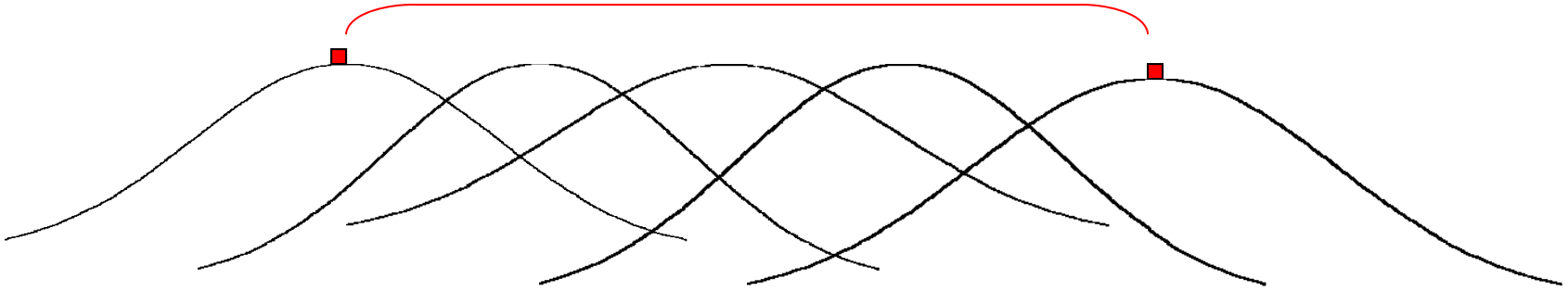
Background fact #5:

Task complexity increases gaps in performance

- Gaps small when learning & reasoning demands are light



- Gaps large when learning & reasoning demands are heavy



Common in schools & jobs

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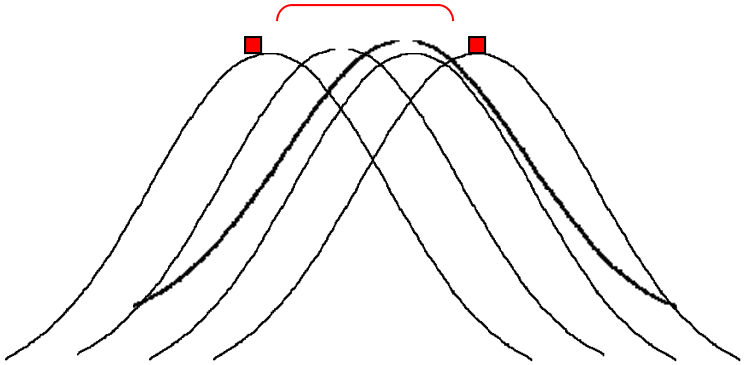
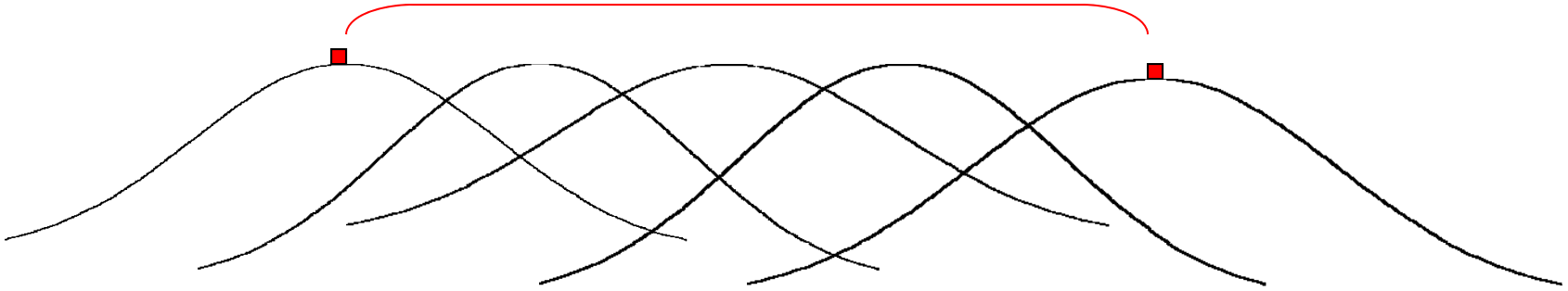
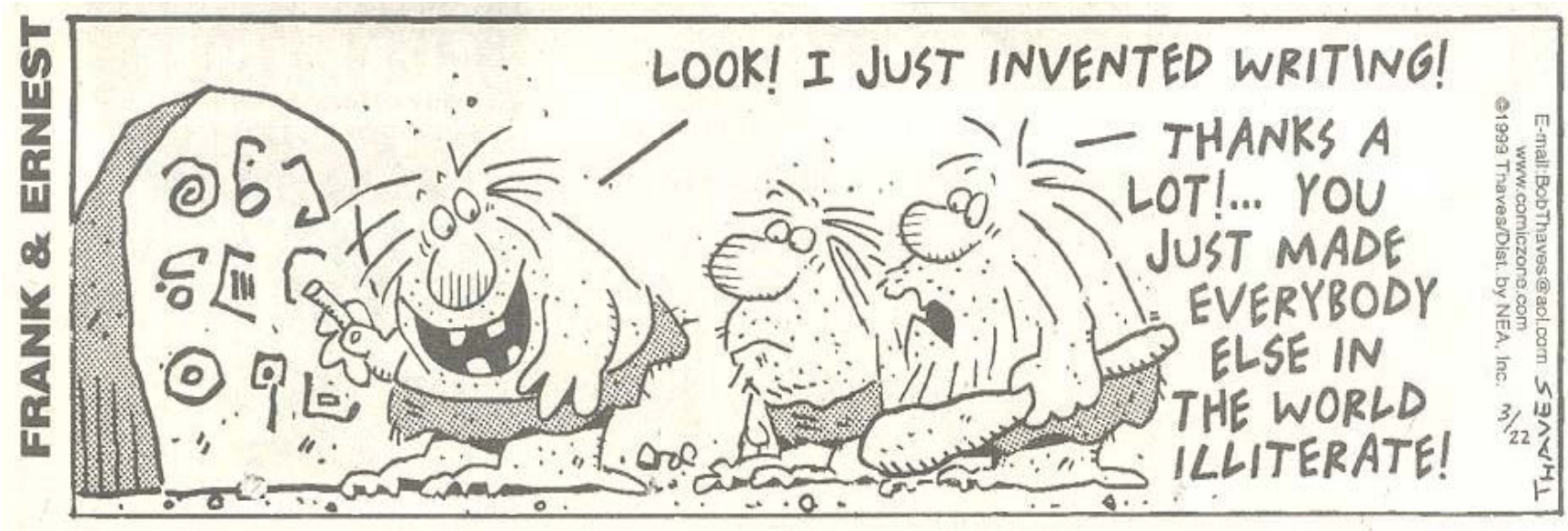


- Gaps large when learning & reasoning demands are heavy



Cognitive load brings out differences in cognitive susceptibility

New technologies make life increasingly complex, which puts yet higher premium on *g*



Preventive & curative care becoming increasing complex

Background fact #6:

People differ more than often assumed

U.S. Dept of Education 1993 survey of adult functional literacy
(nationally representative sample, ages 16+, N=26,091)

NALS Level	% pop.	Simulated Everyday Tasks Routinely able to perform tasks only up to this level of difficulty
5	3%	• Use calculator to determine cost of carpet for a room • Use table of information to compare 2 credit cards
4	17%	• Use eligibility pamphlet to calculate SSI benefits • Explain difference between 2 types of employee benefits
3	31%	• Calculate miles per gallon from mileage record chart • Write brief letter explaining error on credit card bill
2	27%	• Determine difference in price between 2 show tickets • Locate intersection on street map
1	22%	•Total bank deposit entry • Locate expiration date on driver's license

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(nationally representative sample, ages 16+, N=26,091)

NALS Level	% pop.	Simulate
5	3%	• Use calculator to • U
4	17%	• U • E
3	31%	• C • V
2	27%	• Determine differer • Locate intersectio
1	22%	•Total bank deposit • Locate expiration

Cognitive load brings out cognitive susceptibilities

Difficulty based on "process complexity"

- level of inference
- abstractness of info
- distracting information

Not reading per se, but "problem solving"

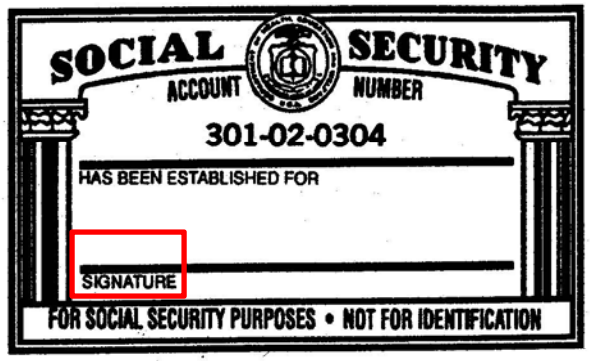
Item at NALS Level 1*

22% of US adults

78% of adults do better

- Literal match
- One item
- Little distracting info

Here is a Social Security card. Sign your name on the line that reads "signature."

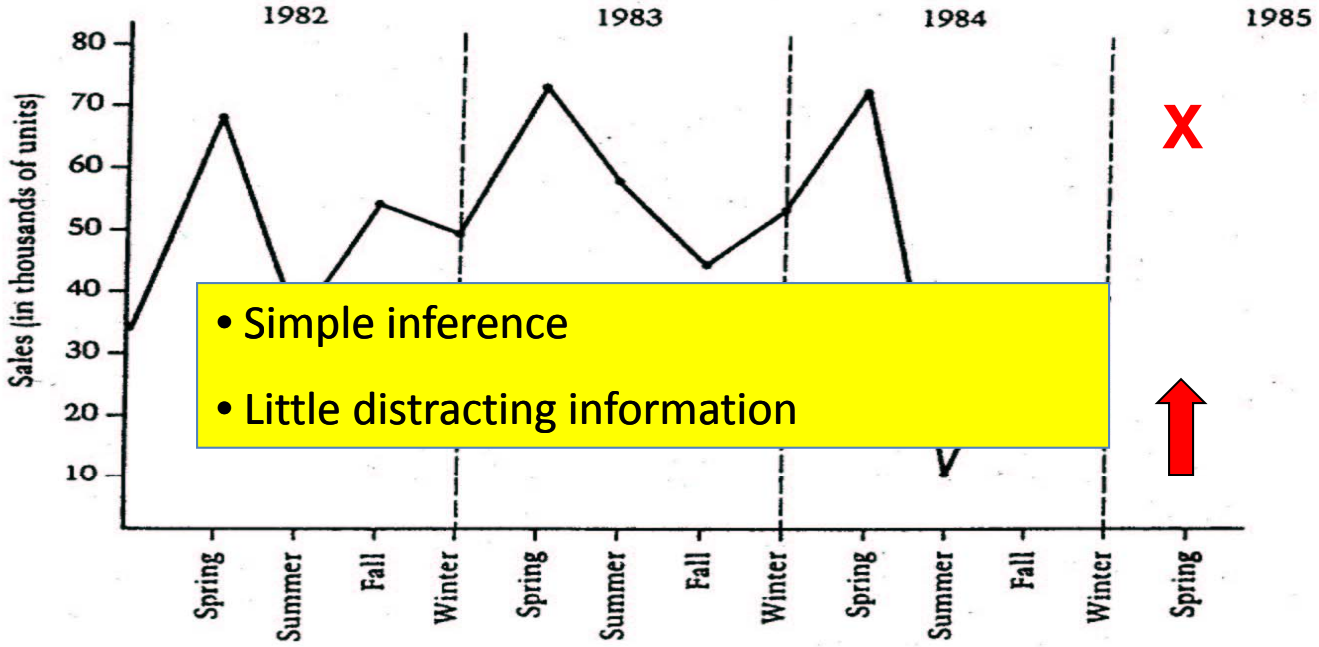


* 80% probability of correctly answering items of this difficulty level

Item at NALS Level 2

22% | 27% of US adults | 51%

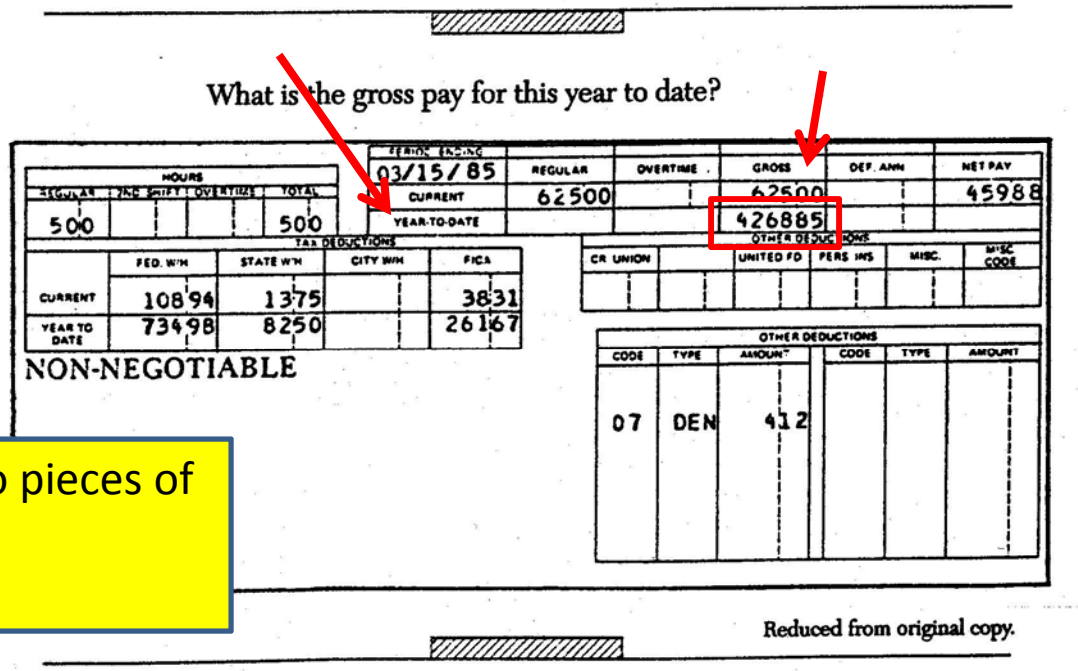
You are a marketing manager for a small manufacturing firm. This graph shows your company's sales over the last three years. Given the seasonal pattern shown on the graph, predict the sales for Spring 1985 (in thousands) by putting an "x" on the graph.



- Simple inference
- Little distracting information

Another item at NALS Level 2

22% | 27% of US adults | 51%

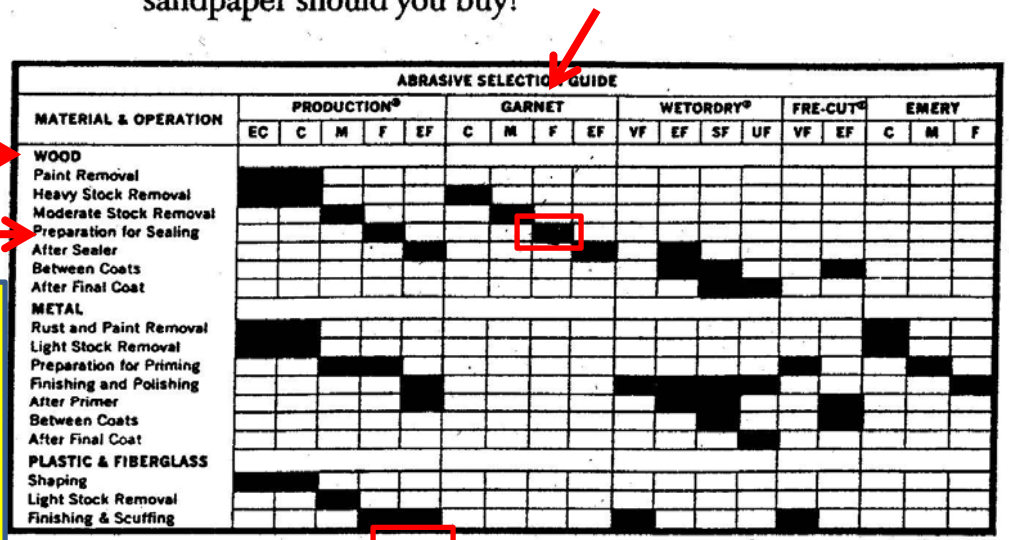


- Match two pieces of info

Item at NALS Level 3

49% | 31% of US adults | 20%

You need to smooth wood in preparation for sealing and plan to buy garnet sandpaper. What type of sandpaper should you buy?



ABRASIVE SELECTION GUIDE

MATERIAL & OPERATION	PRODUCTION®					GARNET				WETORDRY®				FRE-CUT®		EMERY		
	EC	C	M	F	EF	C	M	F	EF	VF	EF	SF	UF	VF	EF	C	M	F
WOOD																		
Paint Removal	■	■				■												
Heavy Stock Removal			■				■											
Moderate Stock Removal				■				■										
Preparation for Sealing					■				■		■							
After Sealer												■	■		■			
Between Coats																		
After Final Coat													■					
METAL																		
Rust and Paint Removal	■	■														■		
Light Stock Removal																		
Preparation for Priming			■	■										■			■	
Finishing and Polishing					■					■	■	■	■					■
After Primer																		
Between Coats											■	■			■			
After Final Coat													■					
PLASTIC & FIBERGLASS																		
Shaping	■	■																
Light Stock Removal			■															
Finishing & Scuffing				■	■					■				■				

EC = Extra Coarse C = Coarse M = Medium F = Fine VF = Very Fine EF = Extra Fine SF = Super Fine UF = Ultra Fine

SAFETY INFORMATION:

■ Wear approved safety goggles when sanding.

■ Use particle/dust mask or other means to prevent inhalation of sanding dust.

■ When using power tools, follow manufacturer's recommended procedures and safety instructions.

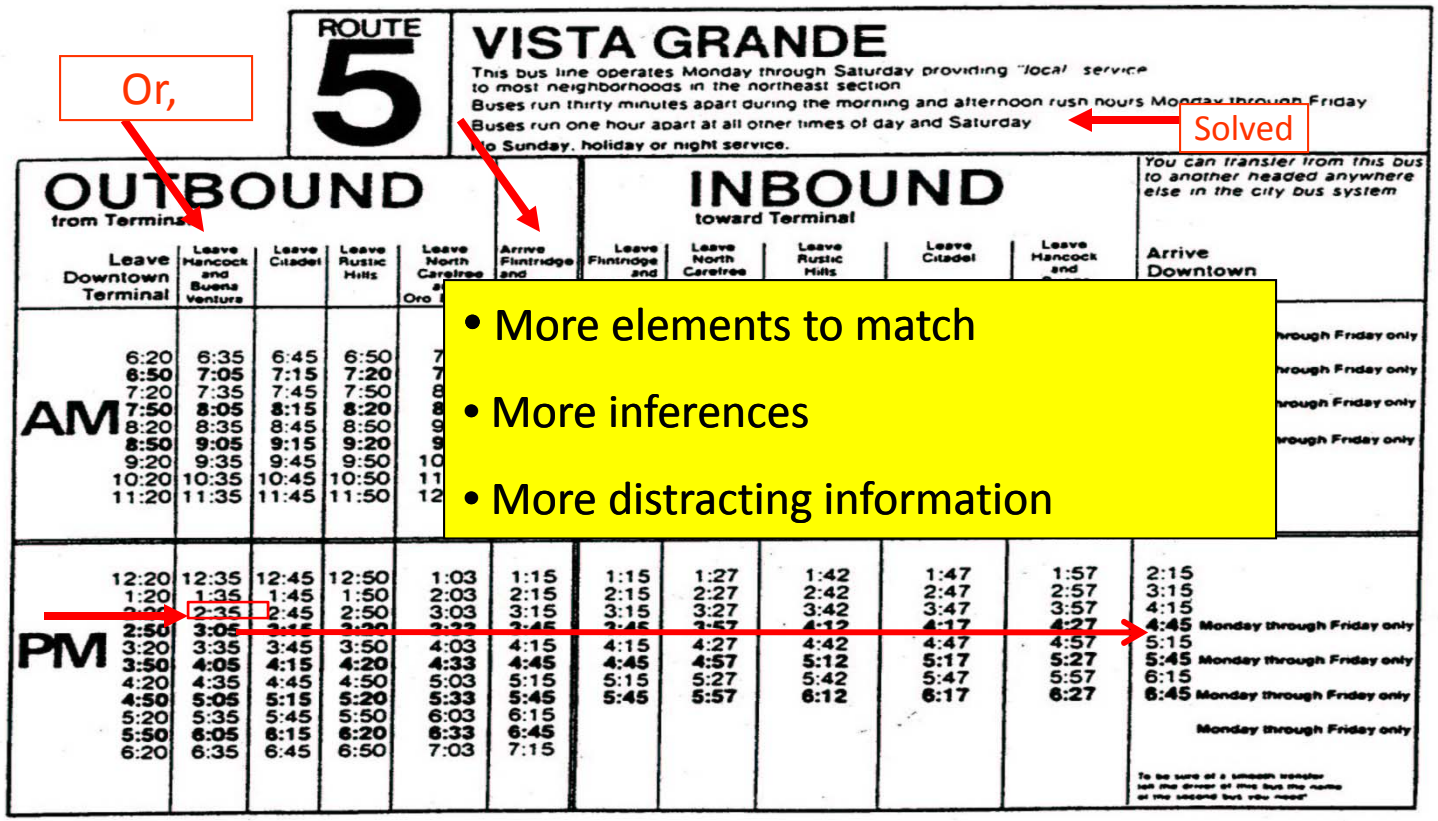
Reduced from original copy

- Cycle through complex table
- Irrelevant info

Item at NALS Level 4

80% | 17% of US adults | 3%

On Saturday afternoon, if you miss the 2:35 bus leaving Hancock and Buena Ventura going to Flintridge and Academy, how long will you have to wait for the next bus?



Item at NALS Level 5

97% — 3% of US adults

Using the information in the table, write a brief paragraph summarizing the extent to which parents and teachers agreed or disagreed on the statements about issues pertaining to parental involvement at their school.

- Search through complex displays
- Multiple distractors
- Make high-level text-based inferences
- Use specialized knowledge

Parents and Teachers Evaluate Parental Involvement at Their School

Do you agree or disagree that . . . ?

	Total	Level of School		
		Elementary	Junior High	High School
	percent agreeing			
Our school does a good job of encouraging parental involvement in sports, arts, and other nonsubject areas				
Parents	77	76	74	79
Teachers	77	73	77	85
Our school does a good job of encouraging parental involvement in educational areas				
Parents	73	82	71	64
Teachers	80	84	78	70
Our school only contacts parents when there is a problem with their child				
Parents	55	46	62	63
Teachers	23	18	22	33
Our school does not give parents the opportunity for any meaningful roles				
Parents	22	18	22	28
Teachers	8	8	12	7

Source: The Metropolitan Life Survey of the American Teacher, 1987

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5	3%	• Use calculator to determine cost of carpet for a room • Use table of information to compare 2 credit cards
[illegible]	[illegible]	[illegible]
2	27%	• Determine difference in price between 2 show tickets • Locate intersection on street map
1	22%	•Total bank deposit entry • Locate expiration date on driver's l

US Dept of Education: People at levels 1-2 are below literacy level required to enjoy rights & fulfill responsibilities of citizenship

Could teach these individual items, but not all such tasks in daily life

Agenda

1. What are “disparities”?
2. Why such a vexing puzzle?
3. Is human cognitive diversity the key to solving it?
4. **If yes, so what?**
   - **Mine the other 2/3 (cognitive susceptibility & cognitive load)**

Passive exposure matters

			SES differences predicted			
			Current SES stress model		Alternative *g* stress model	
Predictors			Time 1	Time 2	Time 1	Time 2
Exposure	Passive	**Ep**	+	+		
	Active	**Ea**				
Susceptibility	Biological	**Sb**	0	+		
	Cognitive	**Sc**				
Burden	Biological	**Bb**				
	Cognitive	**Bc**				
Health outcomes	Physiological	**Yp**	0	+		
	Behavioral	**Yb**				
mechanism			**Y = ∑Ep**			

But so does *g*-based self-exposure, susceptibility, & cognitive load

			SES differences predicted			
			Current SES stress model		Alternative *g* stress model	
Predictors			Time 1	Time 2	Time 1	Time 2
Exposure	Passive	**Ep**	+	+	+	+
	Active	**Ea**			+	+
Susceptibility	Biological	**Sb**	0	+	?	+
	Cognitive	**Sc**			+	+
Burden	Biological	**Bb**			?	?
	Cognitive	**Bc**			?	+
Health outcomes	Physiological	**Yp**	0	+	?	++
	Behavioral	**Yb**			+	+
mechanism			**Y = ∑Ep**		**Y = ∑E(S)(B)**	

6 (not 1) generators of health disparities, and multiplicative besides

			SES differences predicted			
			Current SES stress model		Alternative *g* stress model	
Predictors			Time 1	Time 2	Time 1	Time 2
Exposure	Passive	**Ep**	External			
	Active	**Ea**	Internal			
Susceptibility	Biological	**Sb**				
	Cognitive	**Sc**				
Burden	Biological	**Bb**	External			
	Cognitive	**Bc**				
Health outcomes	Physiological	**Yp**				
	Behavioral	**Yb**				
mechanism			**Y = ∑Ep**		**Y = ∑E(S)(B)**	

Some are multiplicative

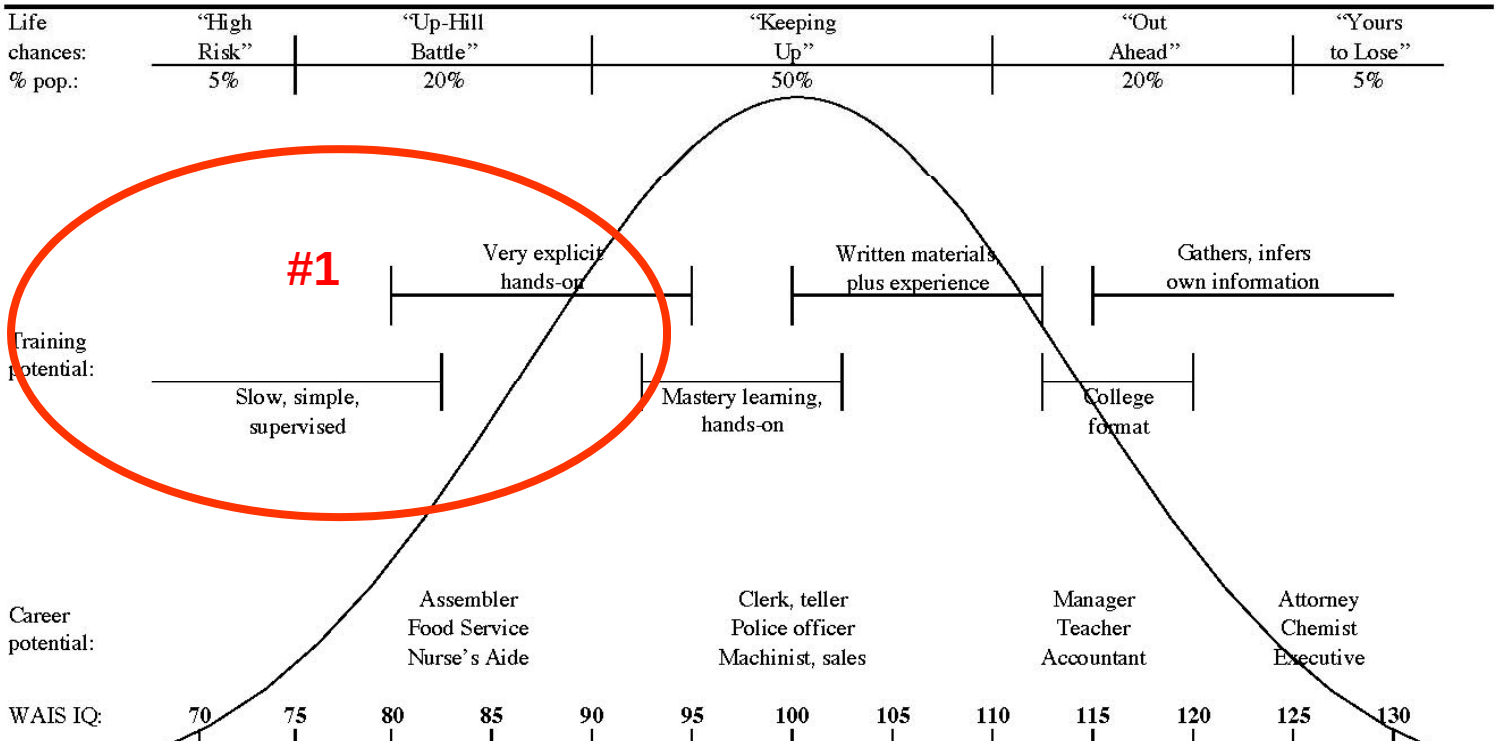
2 new points of leverage

			SES differences predicted			
			Current SES stress model		Alternative *g* stress model	
Predictors			Time 1	Time 2	Time 1	Time 2
Exposure	Passive	**Ep**	External			
	Active	**Ea**	Internal			
Susceptibility	Biological	**Sb**				
	Cognitive #1	**Sc**				
Burden	Biological	**Bb**	External			
	Cognitive #2	**Bc**				
Health outcomes	Physiological	**Yp**				
	Behavioral	**Yb**				
mechanism			**Y = ∑Ep**		**Y = ∑E(S)(B)**	

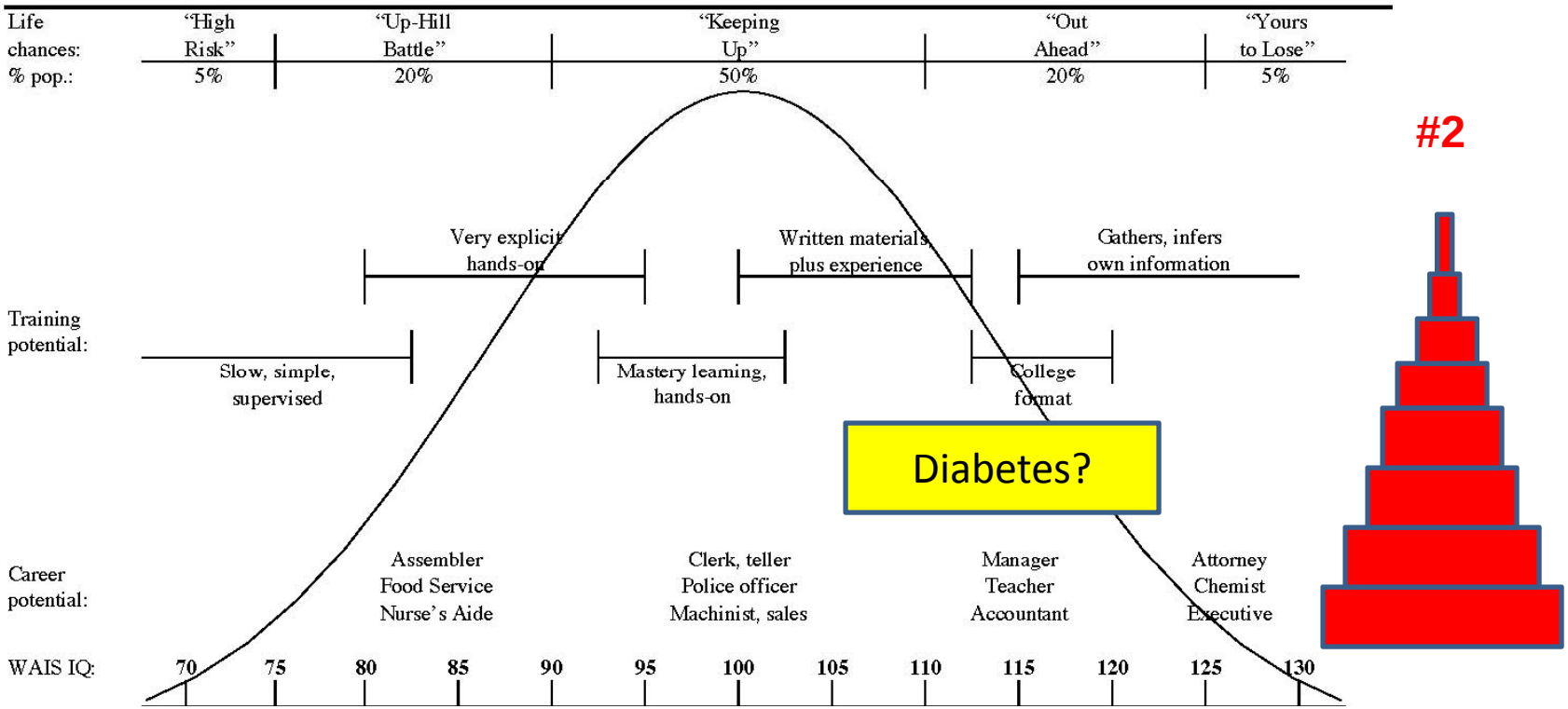
Respect diversity of needs

Lighten the load

Need appreciate differential cognitive <u>needs</u>



Need appreciate size of cognitive burdens



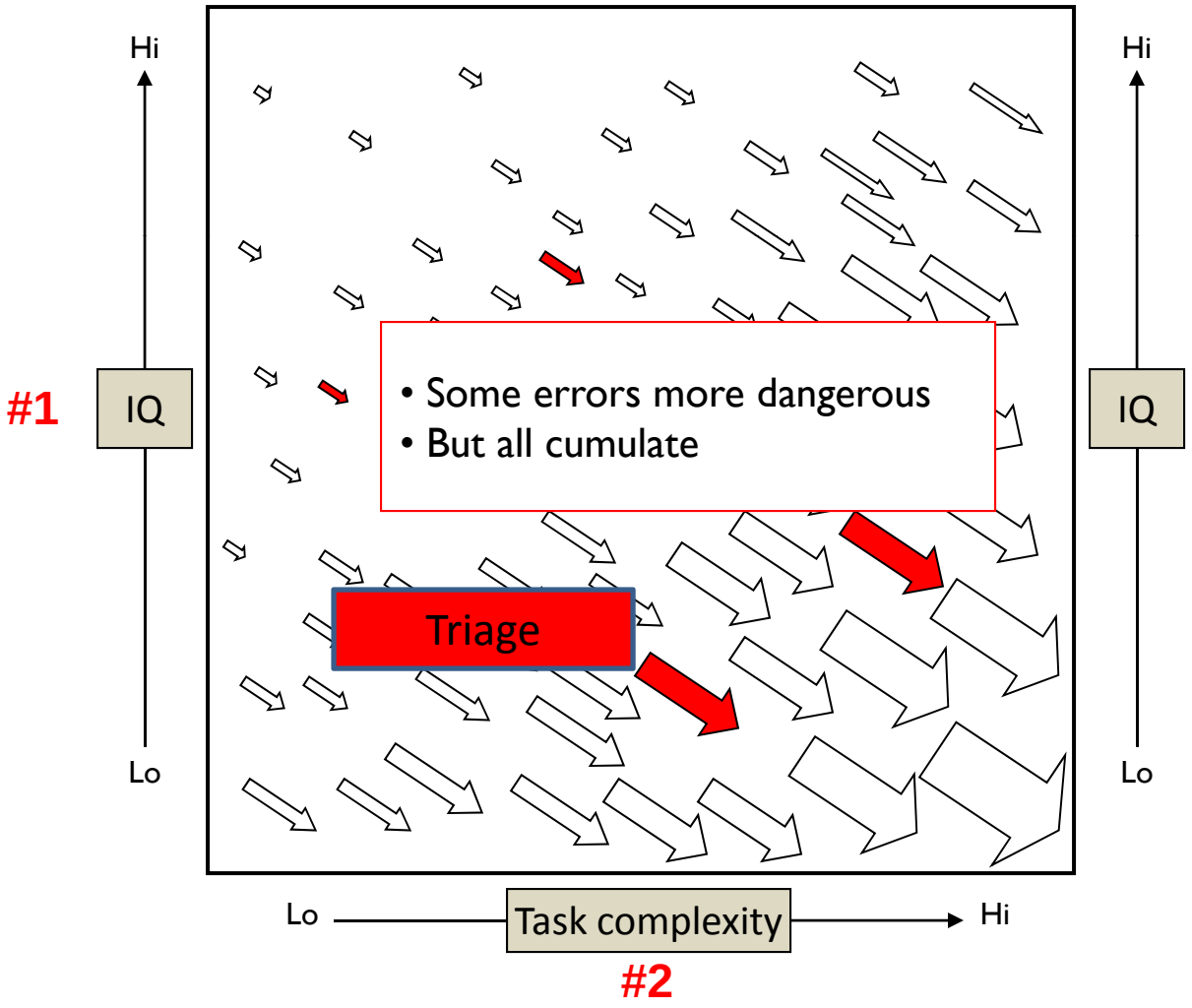
#2

Diabetes?

Example: Do job analysis of chronic diseases

Guidance for providers?

E.g., Matrices of cognitive risk



Error rates to expect by
#1 patient susceptibility
#2 task cognitive load

Conclusions

- Key mechanisms unrecognized
- Mechanisms highly exploitable
- Huge opportunity costs
  - For national policy
  - For clinic practice
  - For vulnerable populations

Thank You

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