

Troubled by Heterogeneity?

**Opportunities for Fresh Views
on Long-standing and Recent Issues
in Biology and Biomedicine**

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Troubled by Heterogeneity!

Audience = mix of:

Theoretical biologists

Philosophers of science

Historians & sociologists of science

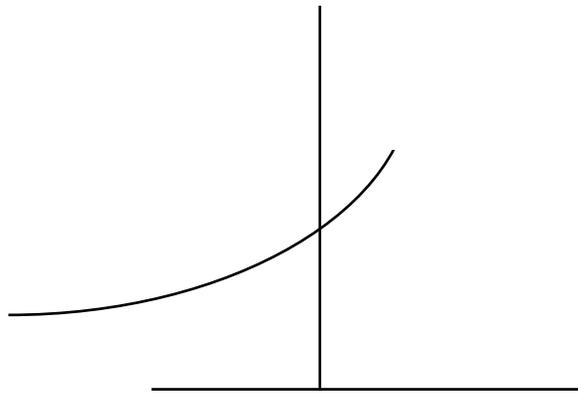
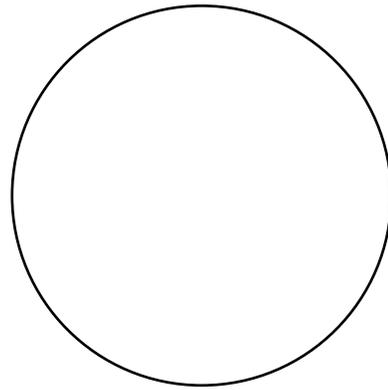
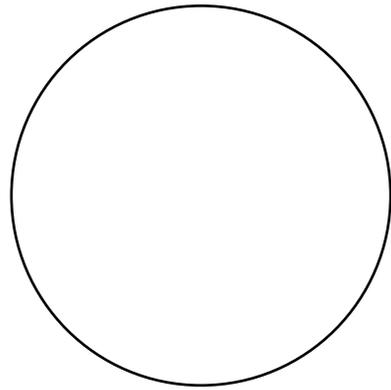
Life scientists

Policy makers

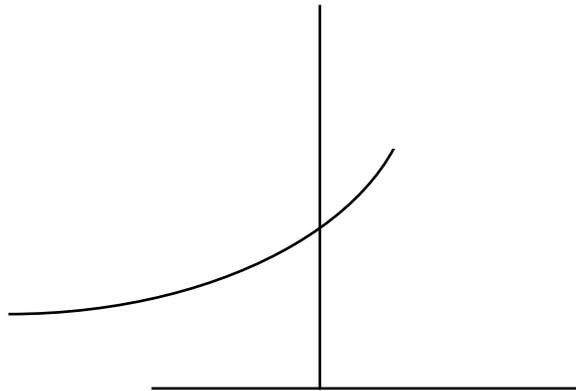
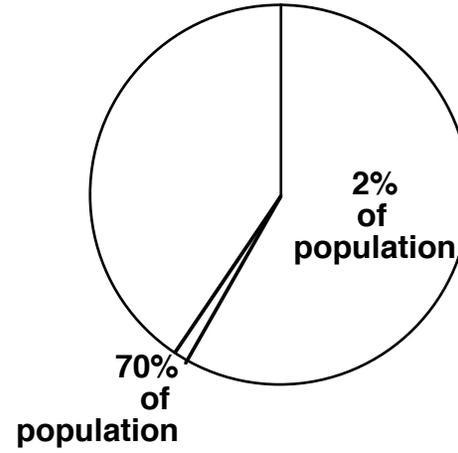
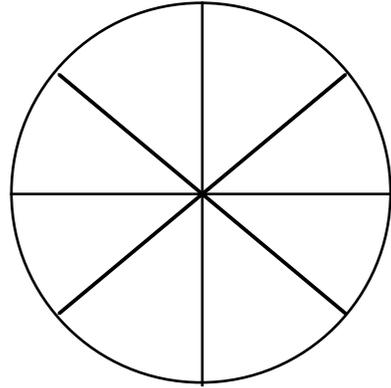
Prologue

**troubling environmental
studies with heterogeneity**

two islands



two islands



**analysis of causes &
implications of the analysis**

change qualitatively

**if uniform units are replaced by unequal
units**

that are subject to further differentiation

as a result of

**their linked economic, social & political
dynamics**

***Unruly Complexity* (U. Chicago Press, 2005)**

= **situations (*in ecology & STS & teaching*)**

- 1. heterogeneous components**
- 2. built up over time & subject to ongoing restructuring**
- 3. embedded in wider dynamics**

Unruly complexity in ecology ->

**Complexities of biosocial development
(especially social epidemiology)**

Unruly complexity in ecology ->

**Complexities of biosocial development
(especially social epidemiology) ->**

Un/troubled by Heterogeneity?

**Application of human heritability
if “underlying heterogeneity” is possible?**

Heritability

e.g. Heritability of IQ is 60–80%

meaning?

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- **variation among means of genetic varieties (averaged across all locations) > variation of means of locations (averaged over all varieties)**

**underlying heterogeneity =
heterogeneity of genetic & environmental
factors underlying development of trait**

Location → L1 L2 L3 L4 L5 L6 L7 L8

Twin Pair

↓
TP1

{ DZT

TP2

{ MZT AAbbccDDee // FghiJ

TP3

{ MZT

genetic factors
(pairs of alleles)

TP4

{ DZT

sequence of
environmental
factors

TP5

{ DZT

TP6

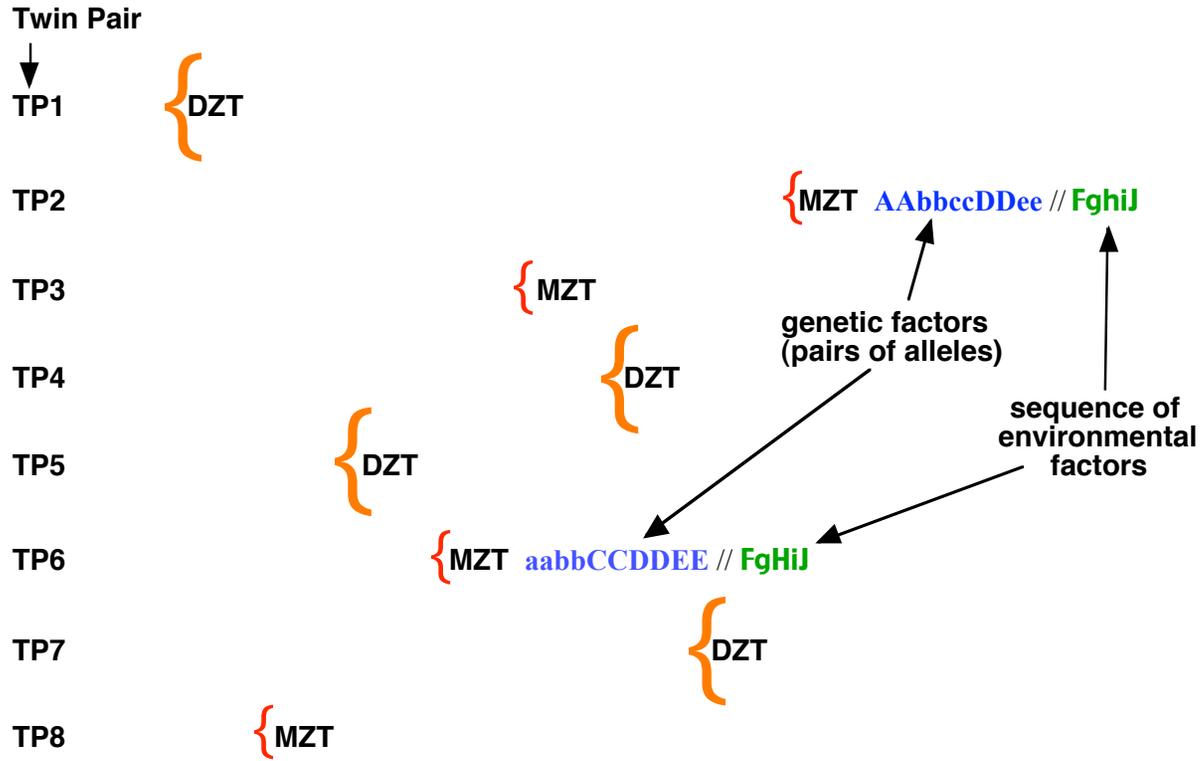
{ MZT aabbCCDDEE // FgHiJ

TP7

{ DZT

TP8

{ MZT



Application of human heritability if underlying heterogeneity is possible??

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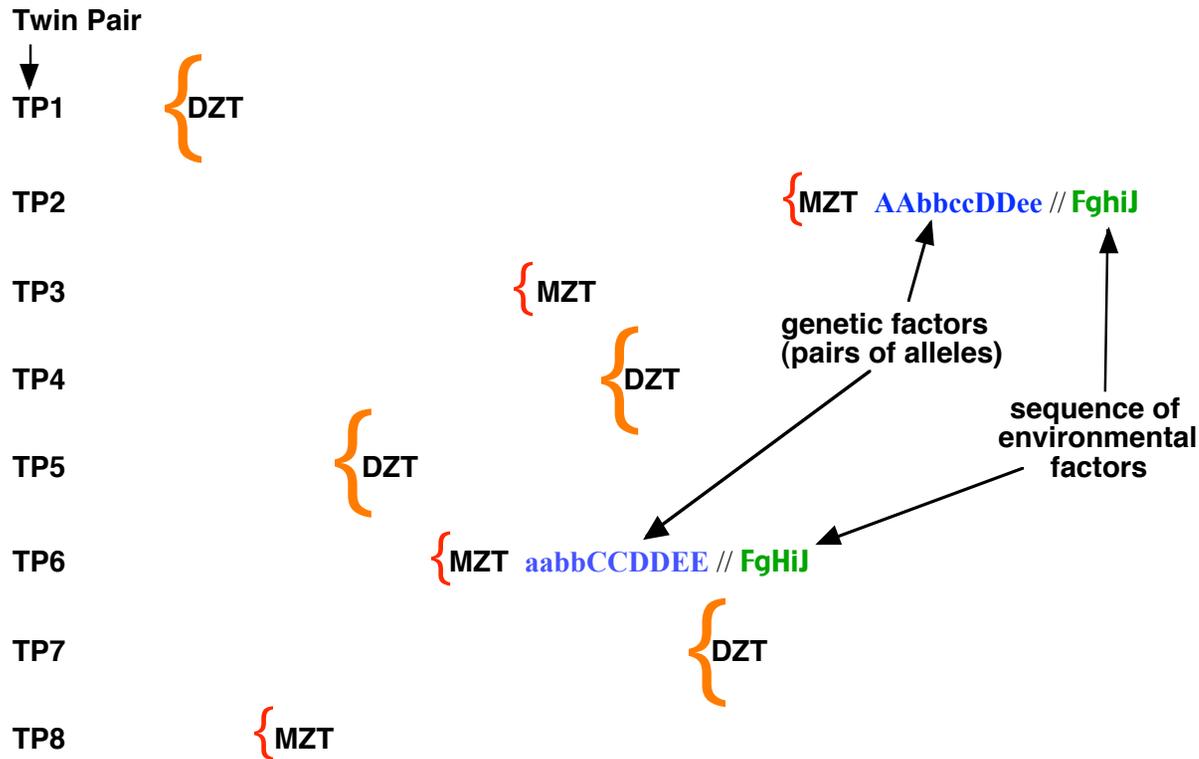
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Application of human heritability

if underlying heterogeneity is possible??

- Undertake research w/o reference to trait's heritability
- Use high heritability => trait is potentially worthwhile candidate for molecular research
- Restrict attention to variation within a set of relatives
- Focus on heritability as a fraction of the variation (useful in ag. & lab. breeding)
- Restrict range of varieties or locations

**Underlying heterogeneity
not (yet) recognized as significant**

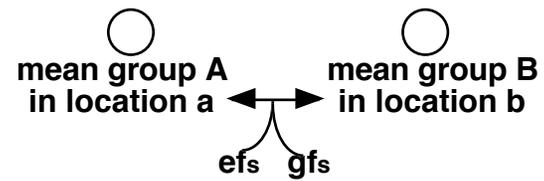
Underlying heterogeneity

not recognized as significant

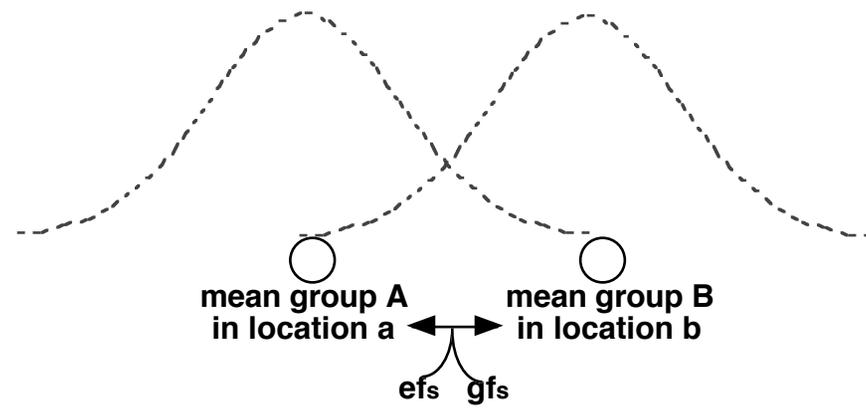
-> deeper social/historical & conceptual roots?

-> opportunities for fresh views on long-standing & recent issues in biology & biomedicine?

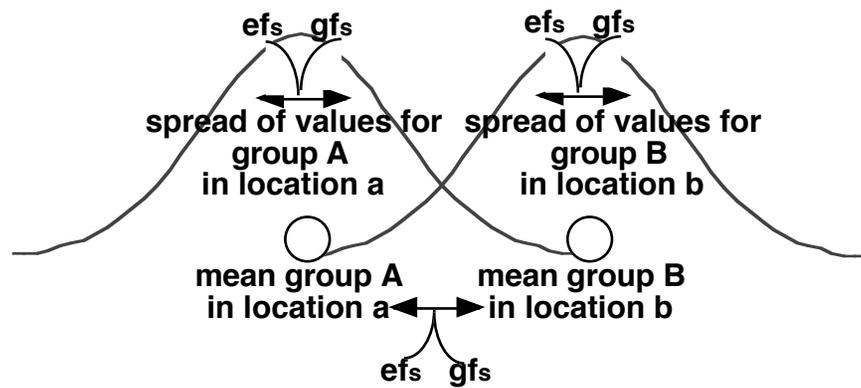
Conceptual: from typological thinking to recognizing possible underlying heterogeneity



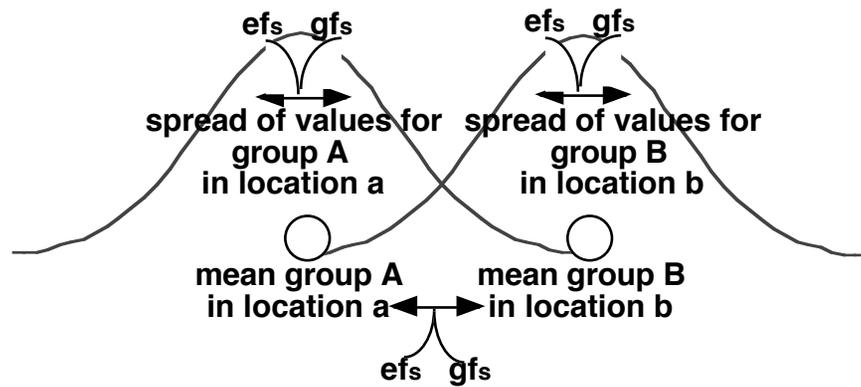
From typological thinking to recognizing possible underlying heterogeneity



From typological thinking to recognizing possible underlying heterogeneity

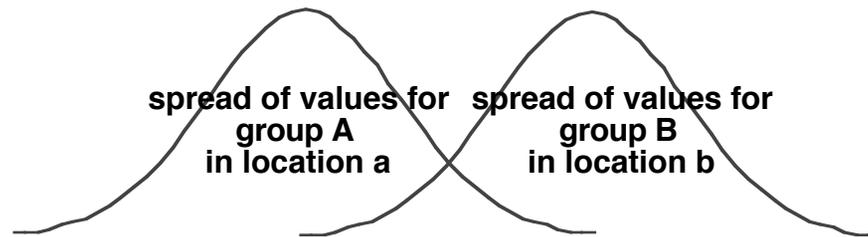


From typological thinking to recognizing possible underlying heterogeneity

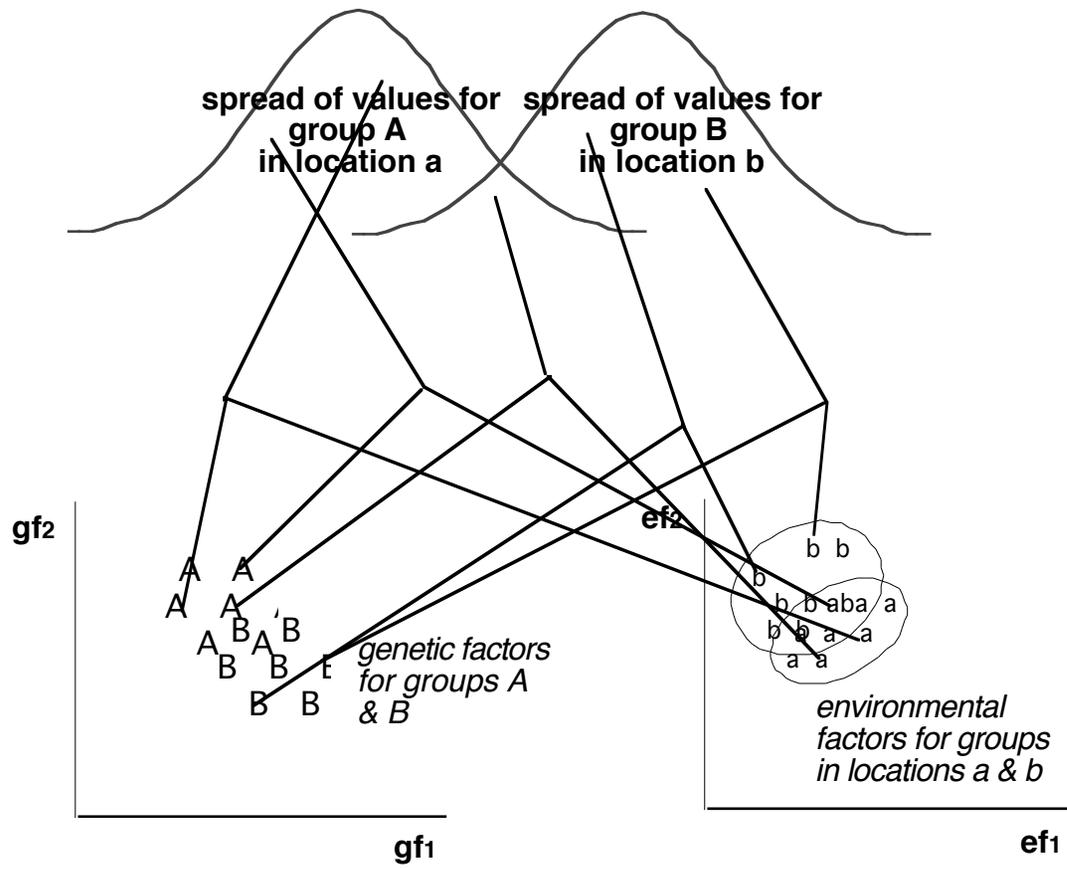


Q: Why treat observations this way?

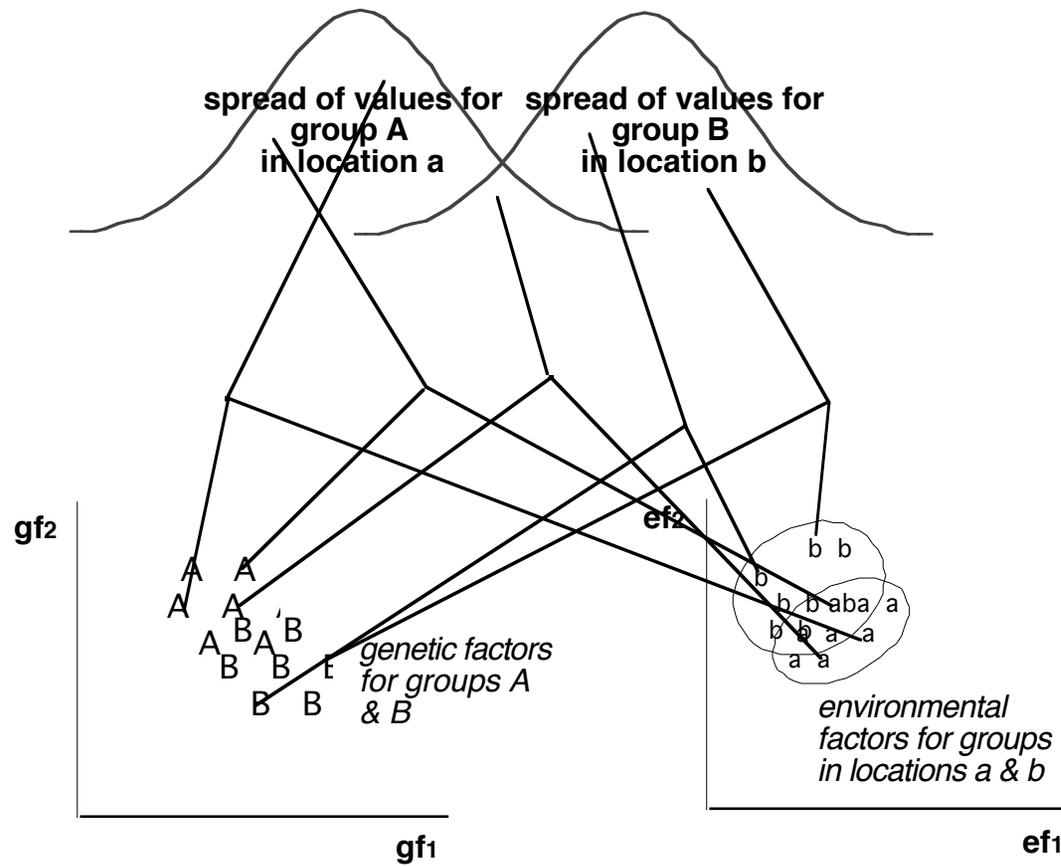
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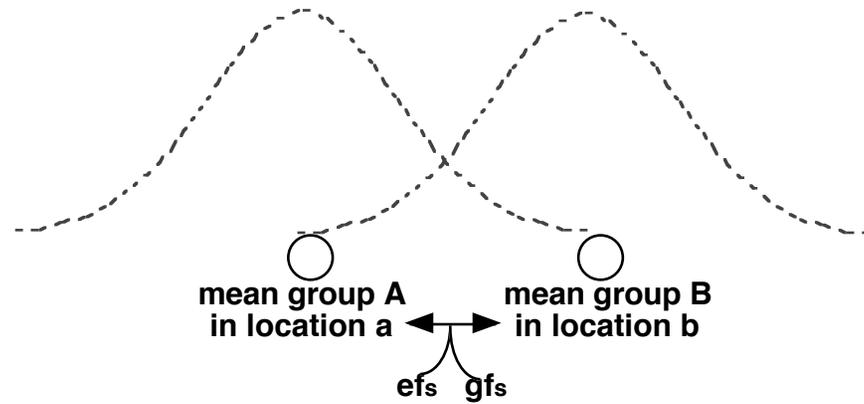
From typological thinking to recognizing possible underlying heterogeneity



Q: How to expose these factors?

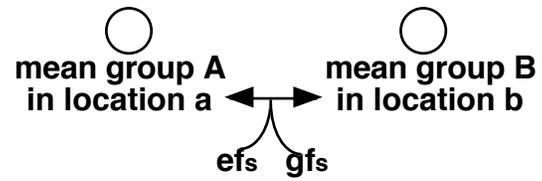
Social-historical underpinnings:

heterogeneity-control-infrastructure-participation

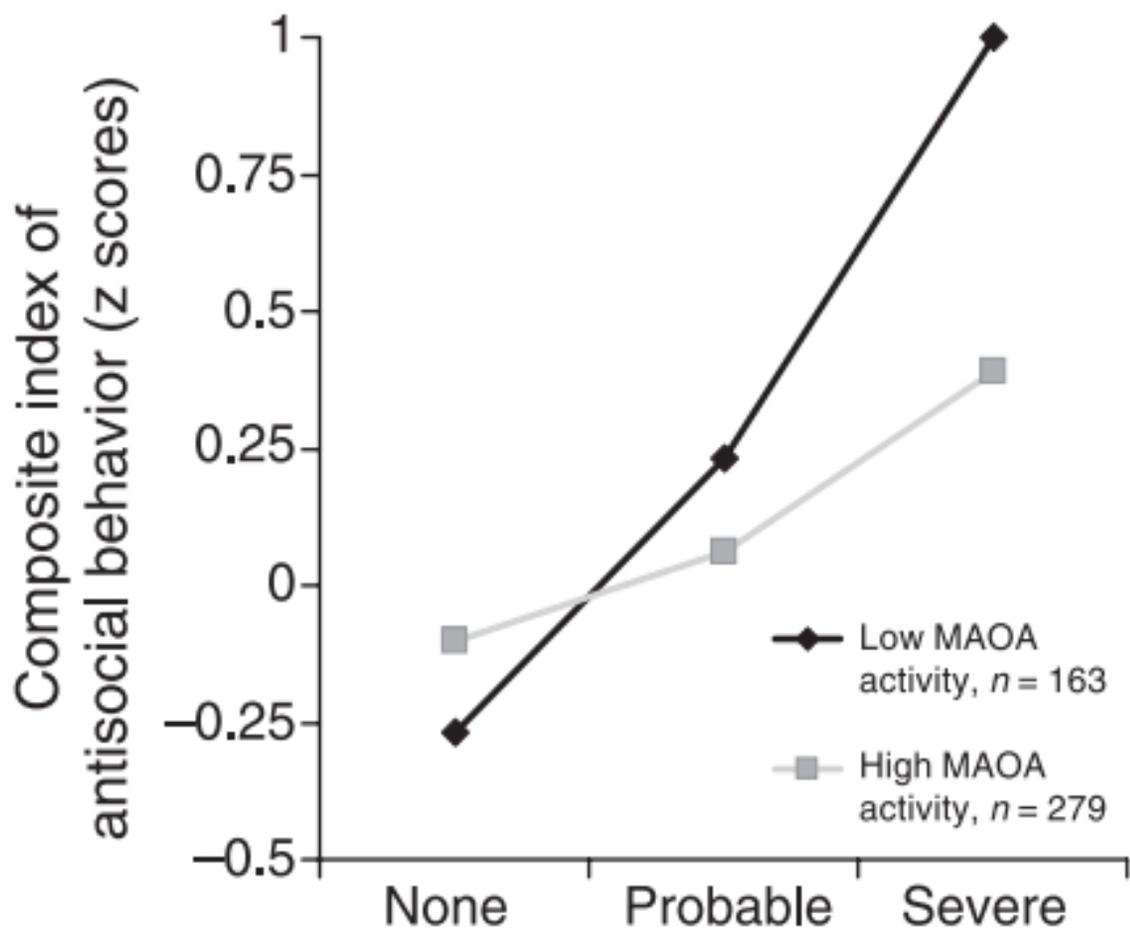


Social-historical underpinnings:

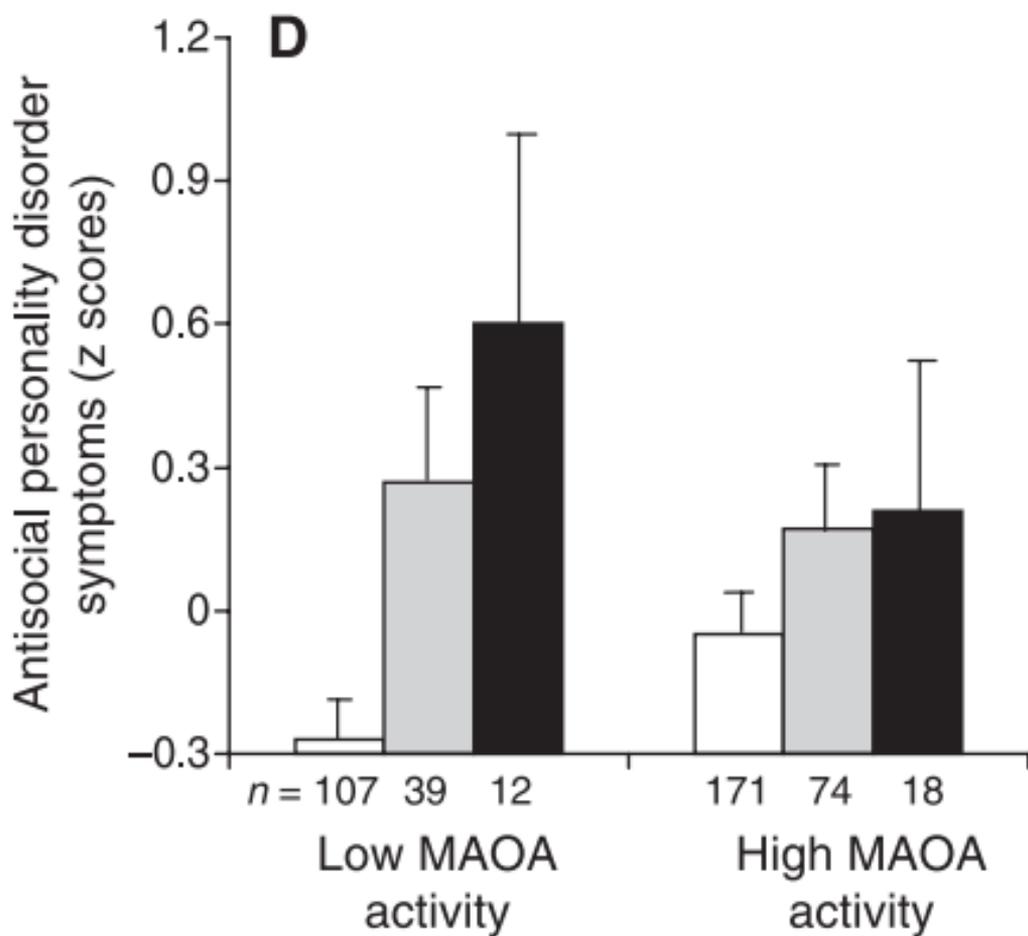
heterogeneity-control-infrastructure-participation

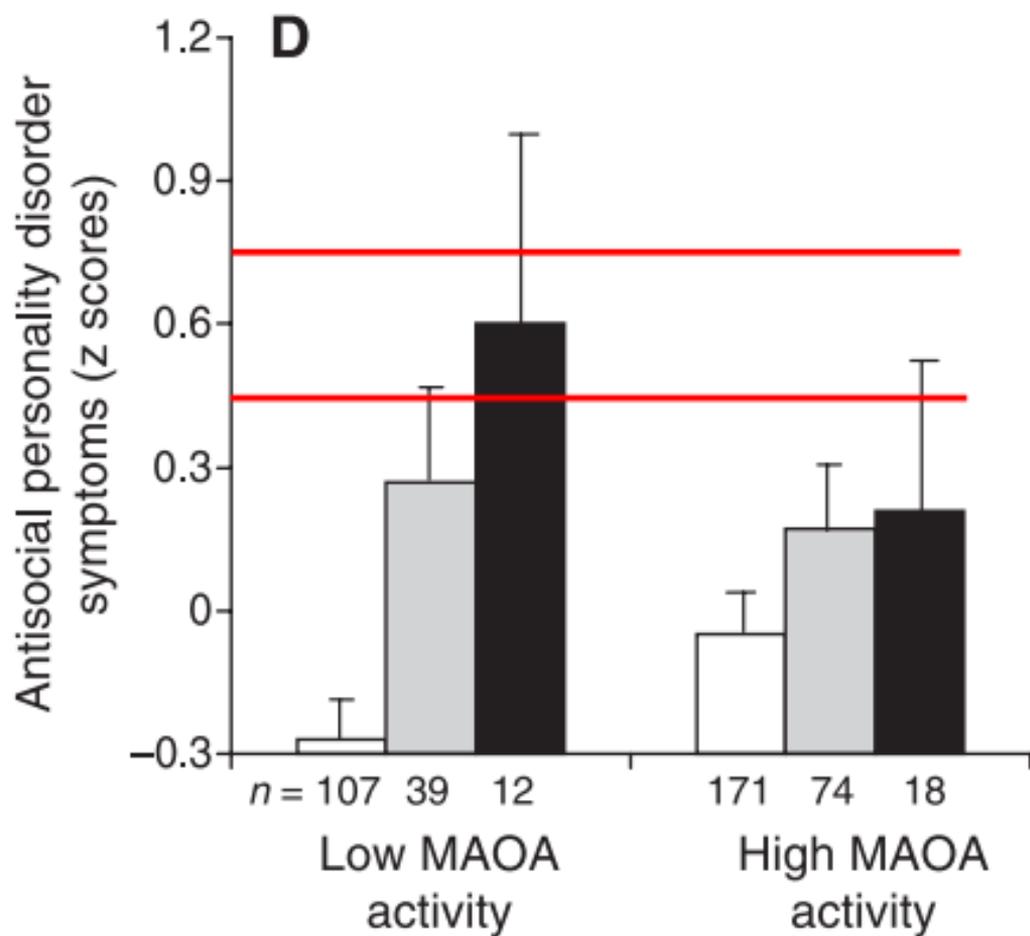


Caspi, A., et al. (2002)
"Role of Genotype in the Cycle of
Violence in Maltreated Children."
Science 297: 851-854.

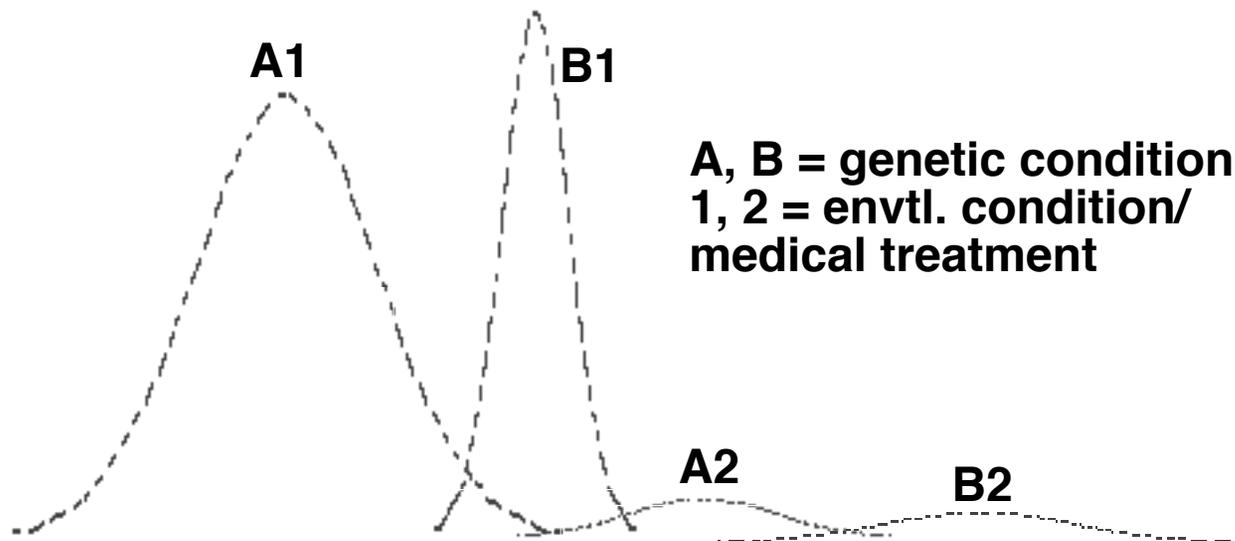


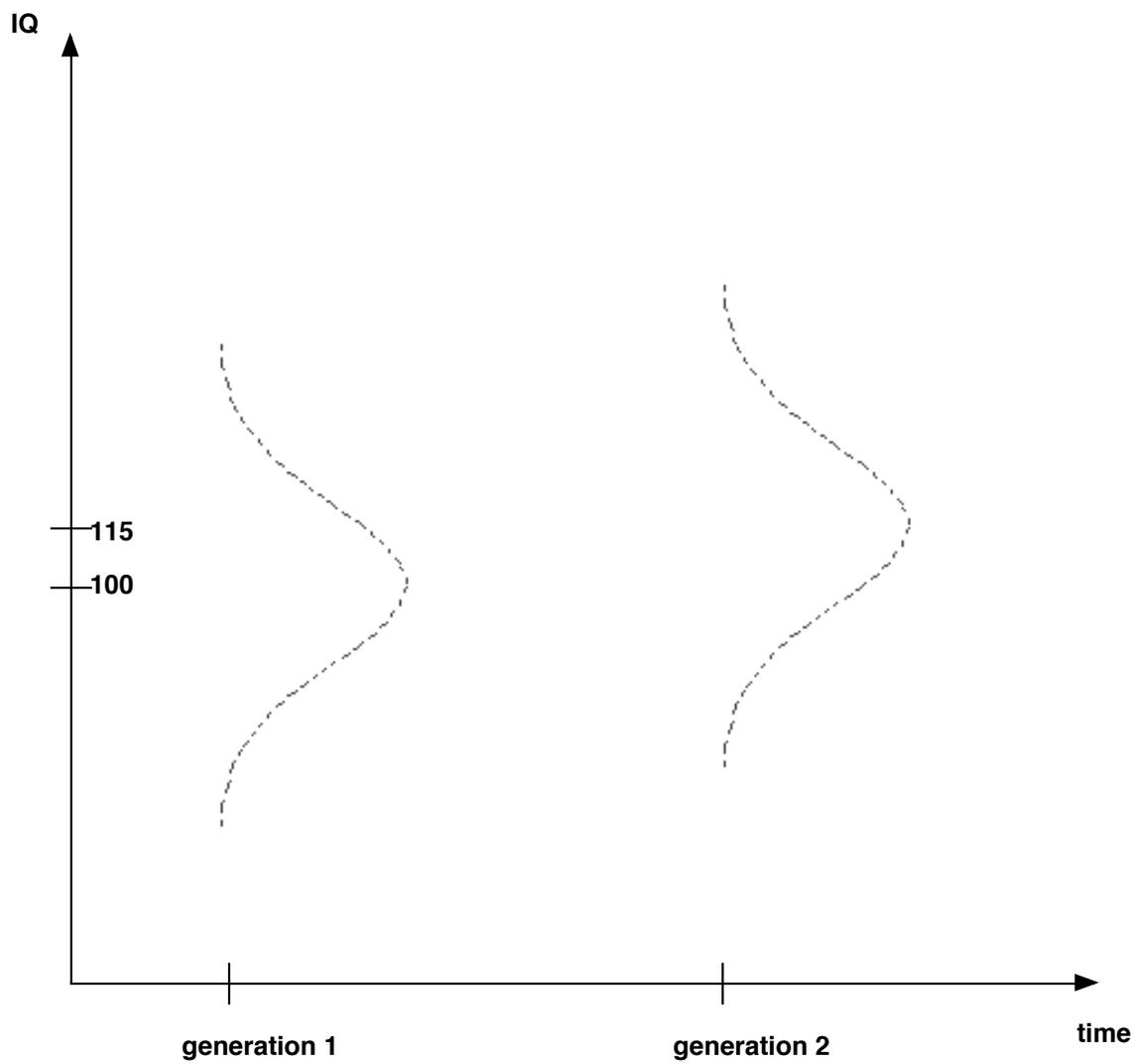
Childhood Maltreatment	MAOA	
	low	high
No or Probable	low anti- social	low anti- social
Severe	HIGH ANTI- SOCIAL	low anti- social

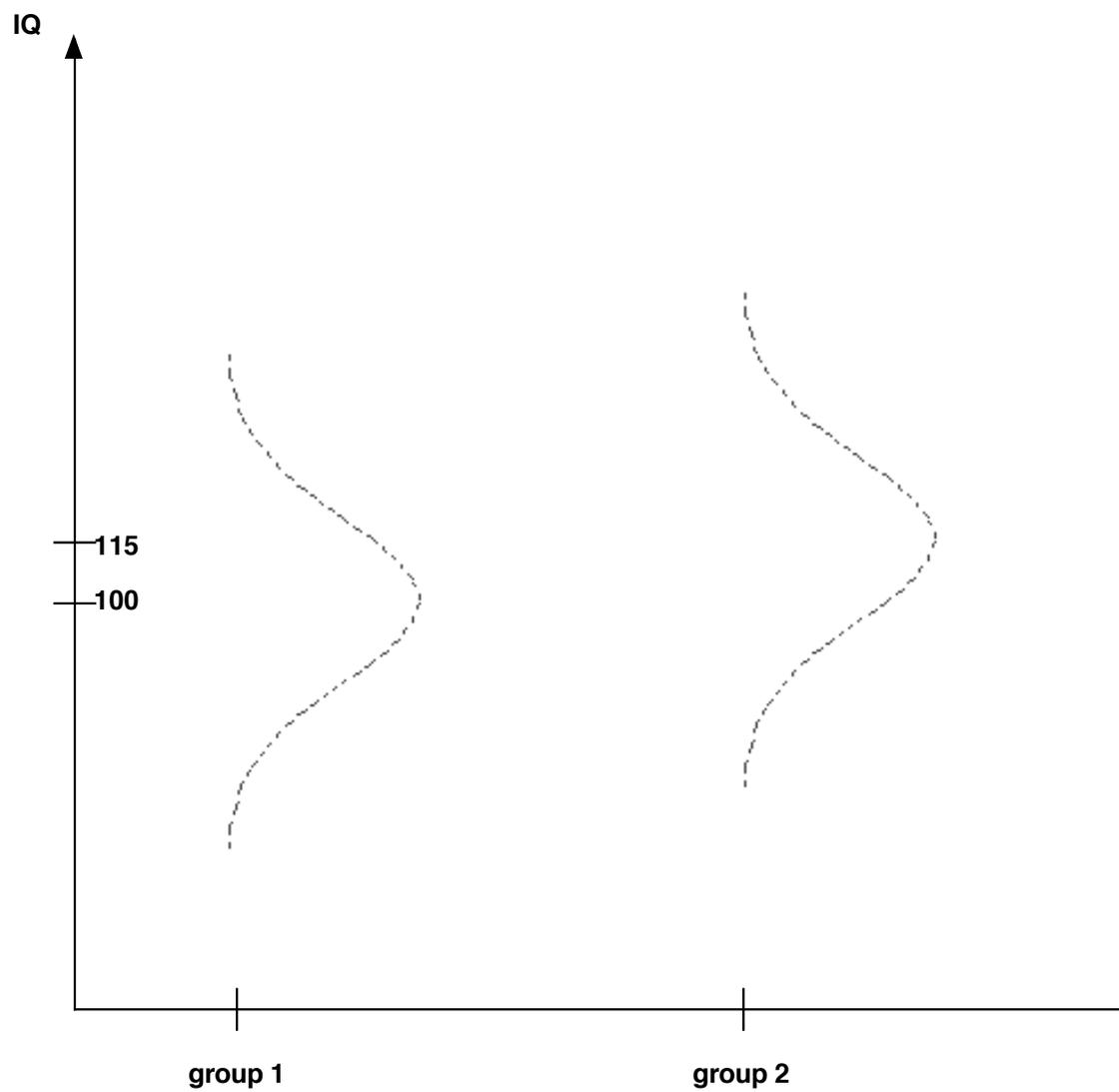




Childhood Maltreatment	MAOA	
	low	high
No or Probable	low anti- social	low anti- social
Severe	HIGH ANTI- SOCIAL	low anti- social







P/H

PKU posed
~~PKU~~ Consider
~~diagnosis~~

low IQs & other deficits

teratogenic
~~metabolic~~ ~~causes~~
fetus

diagnosis & care

neo natal

diet

hard to maintain

improvement

decrease

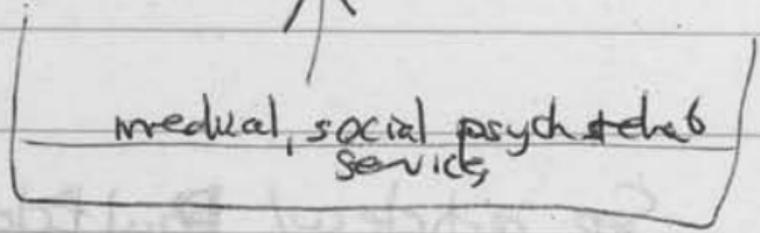
improvement

social support

mandated testing

subsidy + drug classification (till 1972)

religious & ethnic identity



wider social context

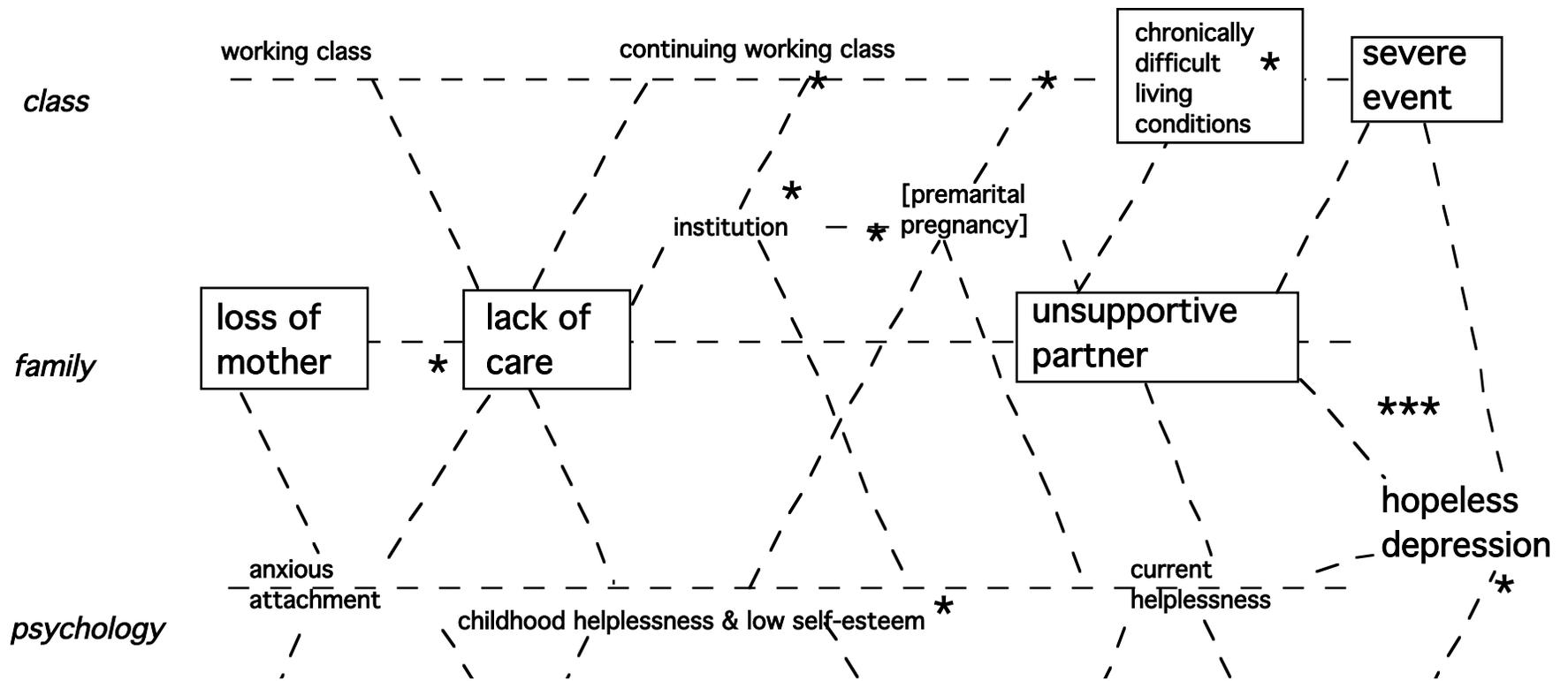
bio-medical vs psychological curing + care of change

0

s/6

teenager

young adulthood



*hypothetical
genetics/
biochemistry*

* = point of
possible
intervention



Troubled by Heterogeneity?

Theoretical biologists?

Philosophers of science?

Historians & sociologists of sci.?

Life scientists?

Policy makers?

research and application of resulting knowledge

not troubled by  *pay more attention to*

variation, particularity, heterogeneity

to the extent that

populations are well controlled

 possibilities for participation

*established and
maintained through*

inviting more attention to

considerable effort or social infrastructure