

Evolutionary Medicine

Recap: Staying alive

Staying alive long enough to reproduce was a challenge.

Strong selection for:

- Avoiding infection
- Avoiding trauma (from accidents, animals, weather)
- Coping with violence
- Finding safe, calorie-rich foods

Recap: Solving the omnivore's dilemma

- Content biases
 - sweet and bitter tastes convey information
 - caution toward plants, vegetables when young
- Context biases
 - Infants attend to relevant, not irrelevant, social cues
 - Infants more likely to take food from mother, native speakers
 - Learn safe flavors even in utero
- Culture (antibacterial spices, food modification, cooking)

Outline

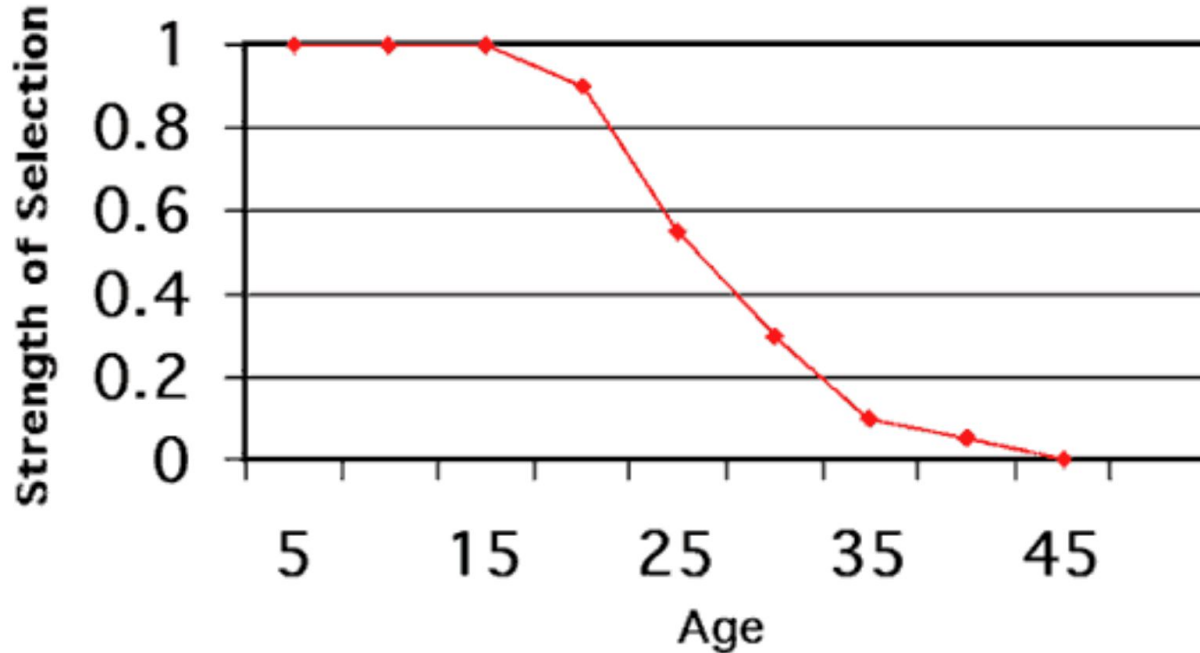
- **Why we get sick: An introduction to evolutionary medicine** (physical health this lecture, mental health next lecture)
- **Psychological adaptations to staying healthy**
 - The behavioral immune system
 - Disgust
 - Disease risk and social bias

Why do we get sick?

- **Trade-offs ?**
- constraints
- conflicts
- defenses
- smoke-detector theory
- novel environments

Evolutionary theories of aging

Senescence is the deterioration of the body with age.



late-life effects on survival have smaller effects on Darwinian fitness than at earlier ages.

Evolutionary theories of aging

deleterious alleles that are expressed at older ages can accumulate through mutation and not be selected out (e.g., Huntington's)

Antagonistic pleiotropy: (pleiotropy = gene that affects more than one trait):

Consider a gene positive in youth, deleterious when old:

will selection favor it?

Evolutionary theories of aging

Antagonistic pleiotropy (examples):

- Testosterone in males
- tumor suppressor gene p53 (too much → aging, too little → cancer)?
- Enzyme for DNA repair: more in long-lived animals

Why do we get sick?

- Trade-offs: sickle-cell, senescence...
- **Constraints ?**
- Conflicts
- Defenses
- Smoke-detector theory
- Novel environments

Why do we get sick?

- Trade-offs: sickle-cell, senescence...
- Constraints: e.g., consequences of fetal undernutrition
- **Conflicts ?**
- Defenses
- Smoke-detector theory
- Novel environments

Why do we get sick?

- Trade-offs: sickle-cell, senescence...
- Constraints: consequences of fetal undernutrition...
- **Conflicts:** Cholera - profuse diarrhea spreads pathogen...
- Defenses
- Smoke-detector theory
- Novel environments

Conflicts (consider from the pathogen's perspective)

note:

From the perspective of the disease organism, no payoff to killing off its host.

increased virulence can be favored when it is associated with increased growth rate, and this increases rate of transmission

When might you expect greater virulence?

Conflicts (consider from the pathogen's perspective)

From the perspective of the disease organism, no payoff to killing off its host.

But increased virulence can be favored when it is associated with increased growth rate, and this increases rate of transmission

When might you expect greater virulence? Paul Ewald argues:

Pathogens spread via vectors (mosquitos, etc) and water

AIDS virulence and promiscuity ?

Why do we get sick?

- Trade-offs: sickle-cell, senescence...
- Constraints
- Conflicts
- **Defenses**
- Smoke-detector theory
- Novel environments

Why do we get sick?

- Trade-offs: sickle-cell, senescence...
- Constraints
- Conflicts
- **Defenses** (pain, nausea, fever, iron-withholding)
- Smoke-detector theory
- Novel environments

Why do we get sick?

- Trade-offs: sickle-cell, senescence...
- Constraints
- Conflicts
- Defenses
- **Smoke-detector theory** (false alarms by design, when cost of defense is low relative to cost of threat)
- Novel environments

Why do we get sick?

- Trade-offs: sickle-cell, senescence...
- Constraints
- Conflicts
- Defenses
- Smoke-detector theory
- **Novel environments ?**

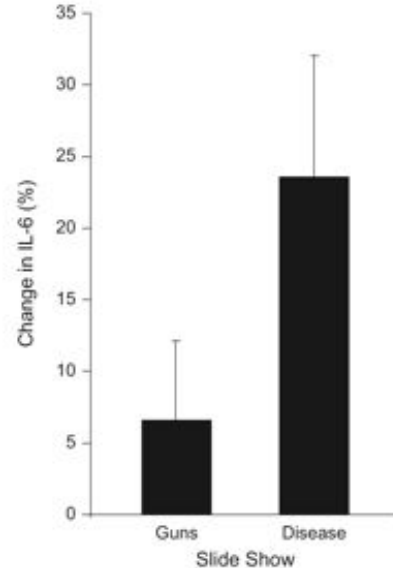
Why do we get sick?

- Trade-offs: sickle-cell, senescence...
- Constraints
- Conflicts
- Defenses
- Smoke-detector theory
- **Novel environments:** diabetes, allergies & asthma (?), SIDS (?)

The behavioral immune system

We have an evolved psychology to detect and avoid disease

Responses to threats are domain-specific



Participants exposed to slides of guns and of disease

Immune marker in white blood cells increased to disease only

The behavioral immune system: Disgust

We have an evolved psychology to detect and avoid disease

- disgust: expression in infants associated with bitter taste
- disgust is generalized later to other things
- what do you find disgusting?

The behavioral immune system: Disgust

We have an evolved psychology to detect and avoid disease

- disgust: expression in infants associated with bitter taste
- generalized later to other things -
- what do you find disgusting?
 - e.g: feces, rotten food, bodily secretions, signs of illness
 - Reduced by exposure, culturally modifiable

The behavioral immune system: Disgust

disgust face: clenched nostrils,

squinty eyes, pursed lips:

decreases sensory exposure?



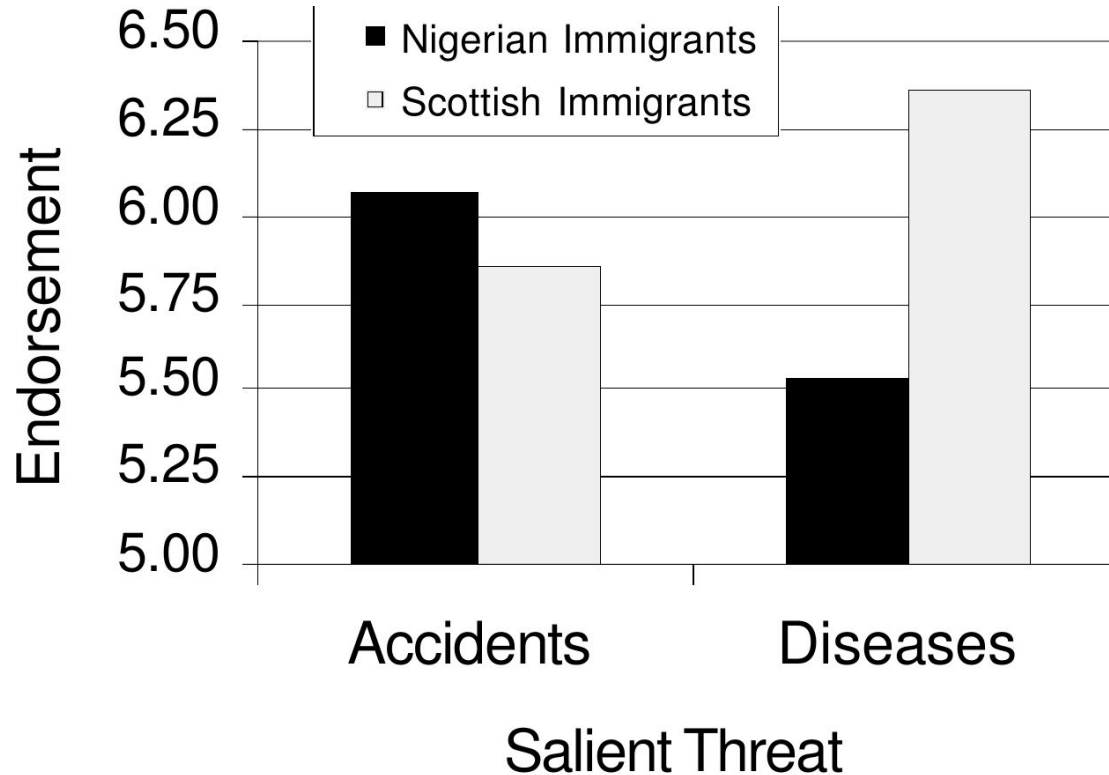
The behavioral immune system: Social bias

Does avoiding outsiders reduces exposure to novel pathogens?

Hypothesis: out-group bias greater among:

1. People primed to feel vulnerable to disease
2. People who naturally felt more vulnerable to disease
3. Women in early pregnancy

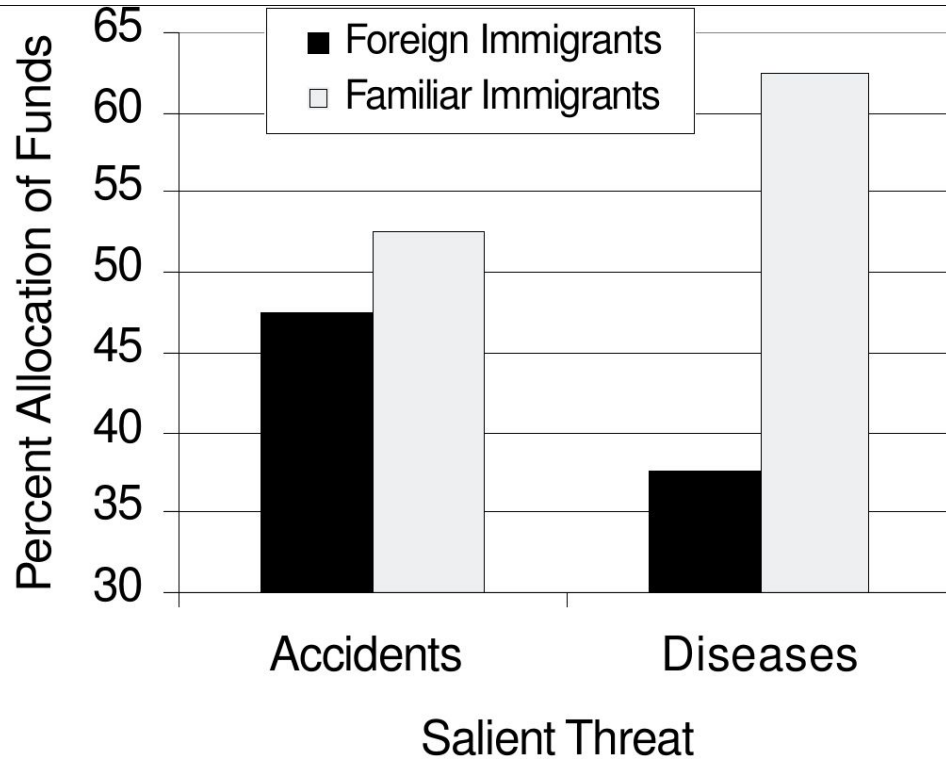
The behavioral immune system: Social bias



Shown a slideshow:
Images of accidents vs. disease

Then asked opinion:
“The Vancouver Government should allow [Nigerian/Scottish] immigrants to live in Vancouver”

The behavioral immune system: Social bias



Shown a slideshow:

Images of accidents vs. disease

Then asked:

how much would they allocate toward an immigration advertising budget.

Randomly assigned to hear that immigrants were from a familiar country (Taiwan) or an unfamiliar one (Mongolia)

Faulkner et al.

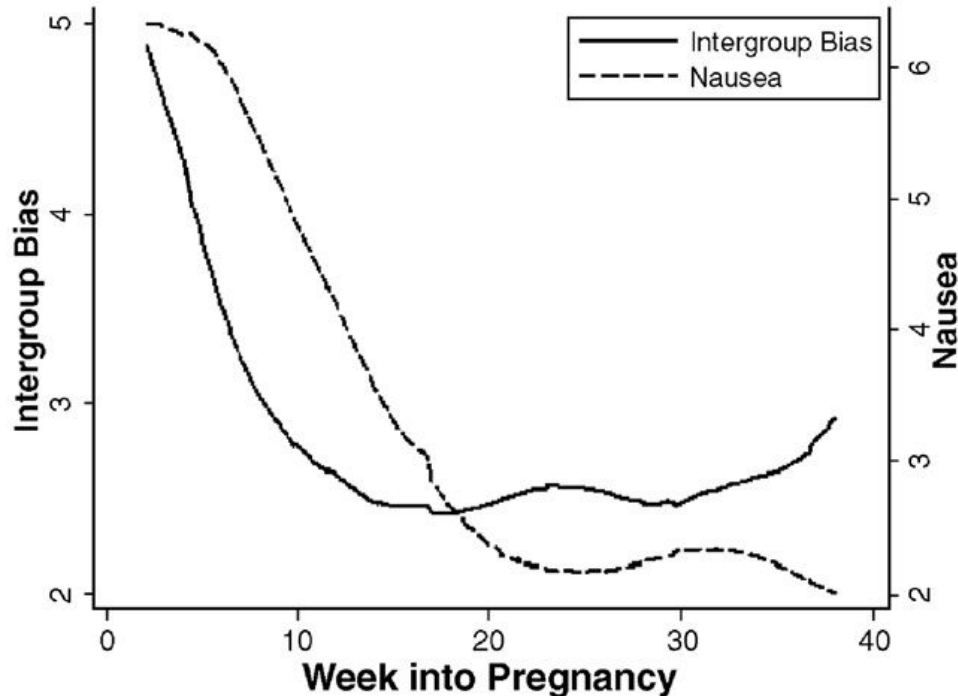
The behavioral immune system: social bias

Individual differences by self-report:

people who feel more vulnerable to disease > more ethnocentric

people more sensitive to disgust > more xenophobic, ethnocentric

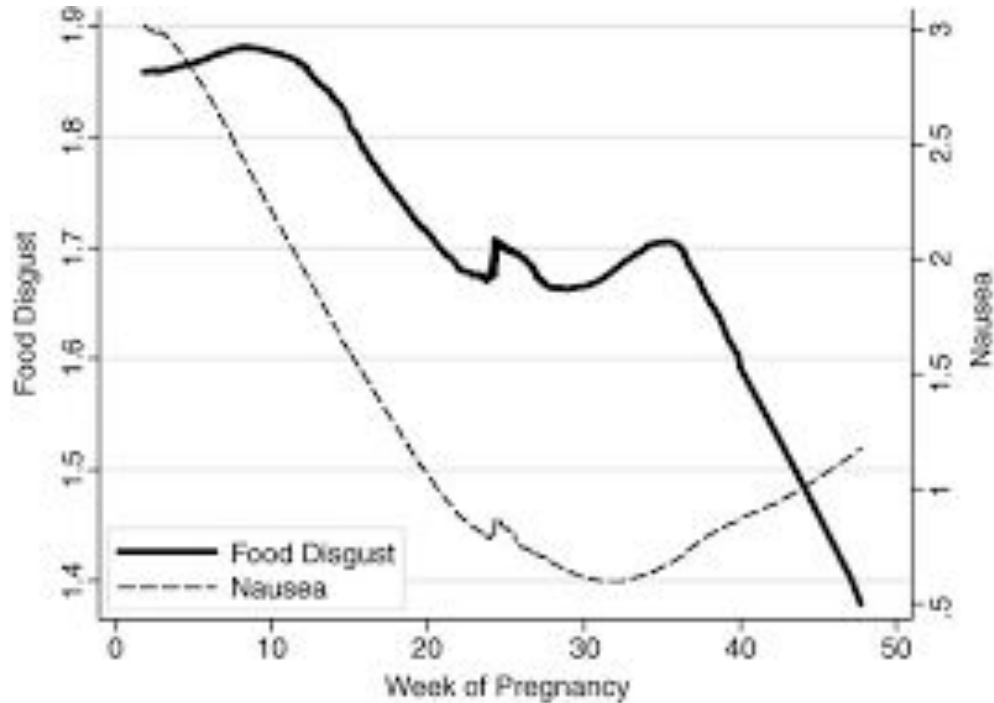
The behavioral immune system: Pregnancy, nausea, & social bias



Solid line: relative attraction for the American over the foreign target.

Dashed line: self-reported nausea.

The behavioral immune system: Pregnancy, disgust, & social bias

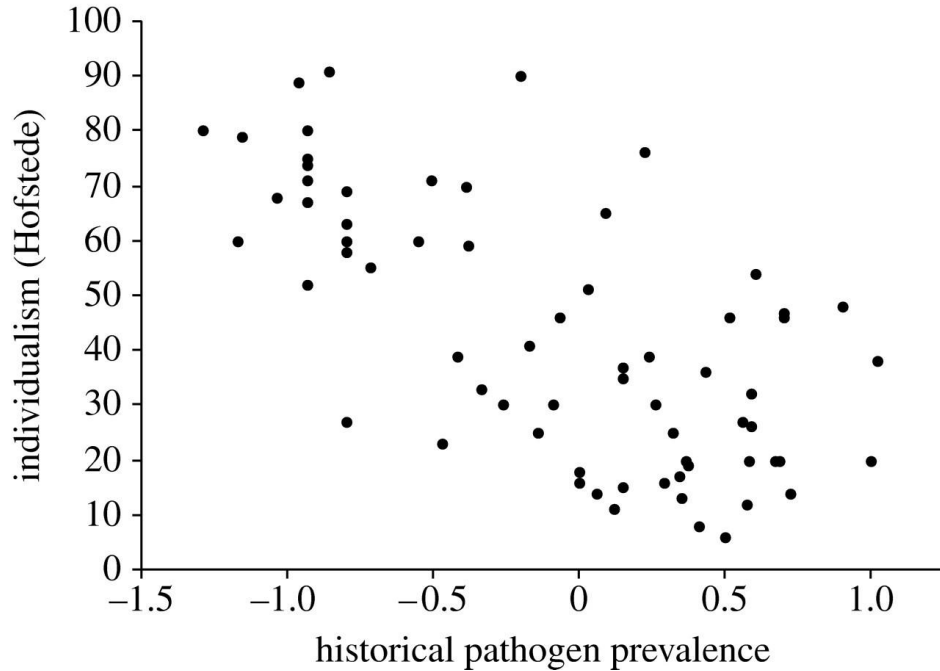


Group bias & pathogen prevalence

Are people who live in areas with high pathogen loads more ethnocentric & xenophobic? Do they hold more collectivist values?

Some evidence supports; but non-experimental data is problematic

Pathogen prevalence & collectivism



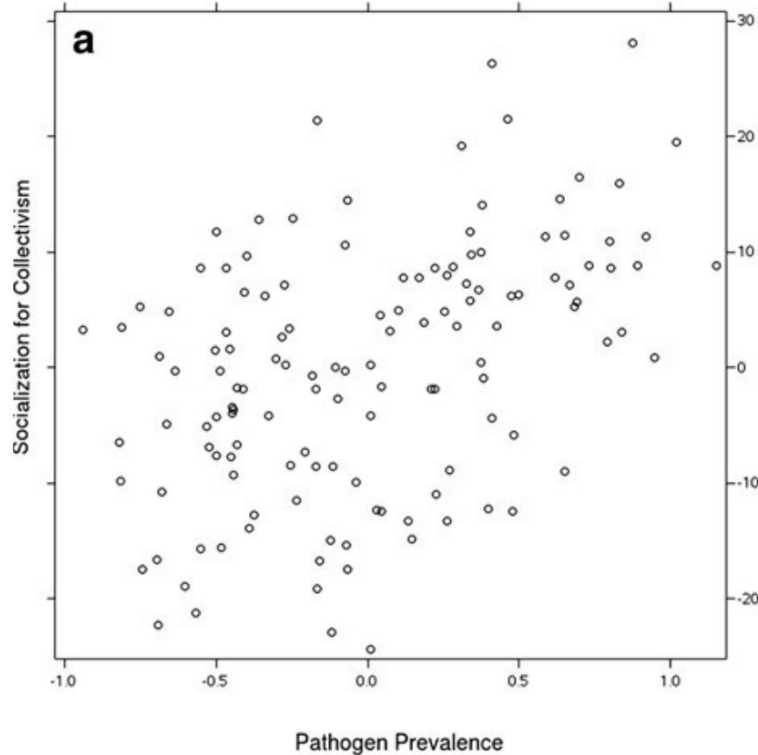
Collectivist societies:

- Make stronger distinctions between coalitional in-groups and out-groups, wary of outsiders
- Place stronger values on conformity

Hypothesis is that both protect against disease.

Each point is a country

Pathogen prevalence & collectivism



Socialization for obedience vs. self-reliance

(But not all results were consistent)

Each point is a small-scale non-industrial culture

Summary: Evolutionary medicine

- Why we get sick: illness from an evolutionary perspective
 - defenses, trade-offs, novel environments, smoke-detector principle, etc.
- The behavioral immune system
 - domain-specific
 - disgust: elicited by things that might make you sick
 - sensitivity to disease may enhance group bias