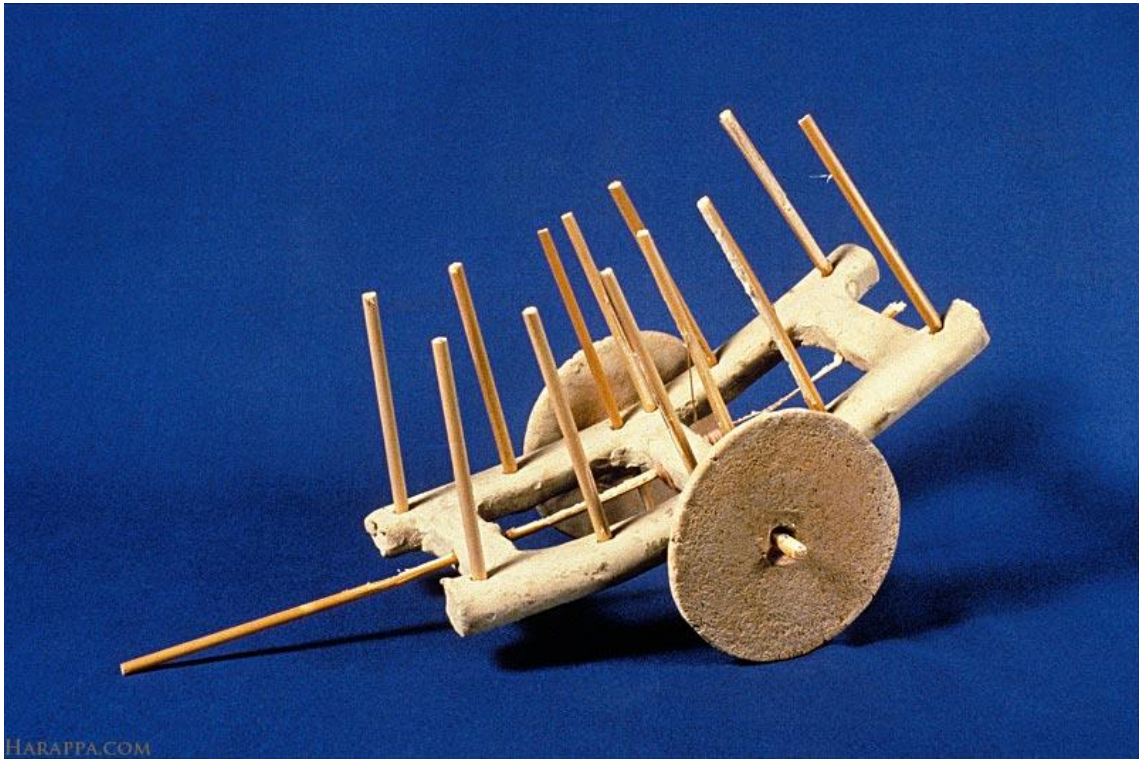
Staying human

Nisheeth

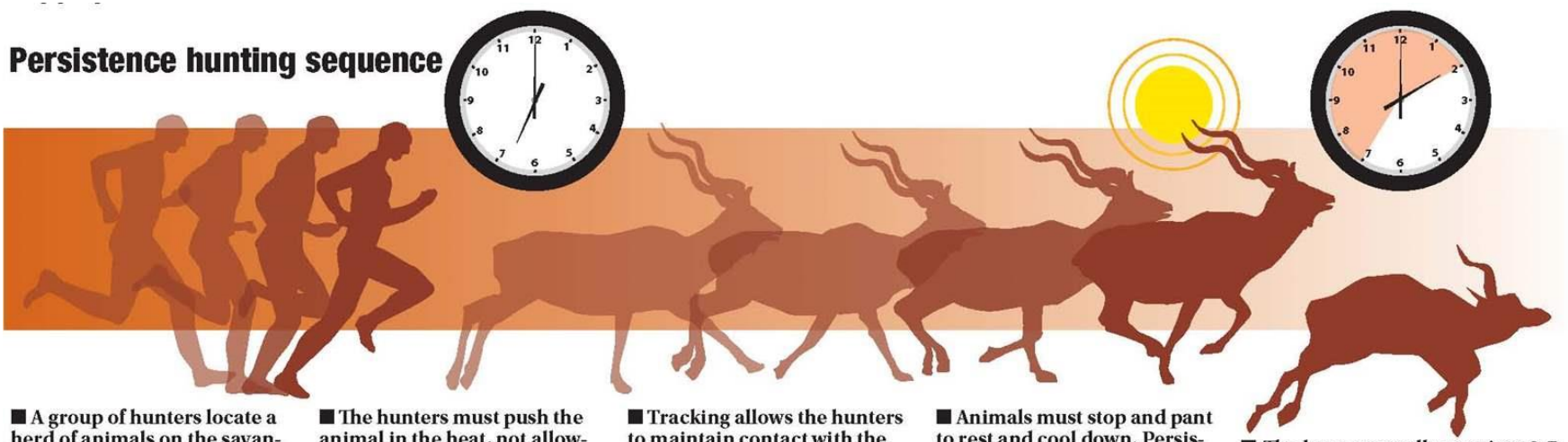
Overview

- Three stories
  - About shoes
  - About mice
  - About people
- Morals from the stories for human-centered computing

A uniquely human quality?



Born to run



■ A group of hunters locate a herd of animals on the savannah. An antelope is singled out and isolated, often a bull with heavy horns that will burden it with extra weight during the lengthy chase.

■ The hunters must push the animal in the heat, not allowing it to rest for any length of time. A team approach is often employed to keep the animal on the move, in the sun and away from the rest of the herd.

■ Tracking allows the hunters to maintain contact with the isolated animal. Physiologically, Homo sapiens are built to run long distances, animals are not. Man can cool through perspiration and hydrate on the run by carrying water.

■ Animals must stop and pant to rest and cool down. Persistence hunters keep their prey running in the sun until it collapses from heat exhaustion, often after the pursuit covers around 25 miles, about the distance of today's marathon.

■ The hunt generally requires 2-7 hours of persistence running.

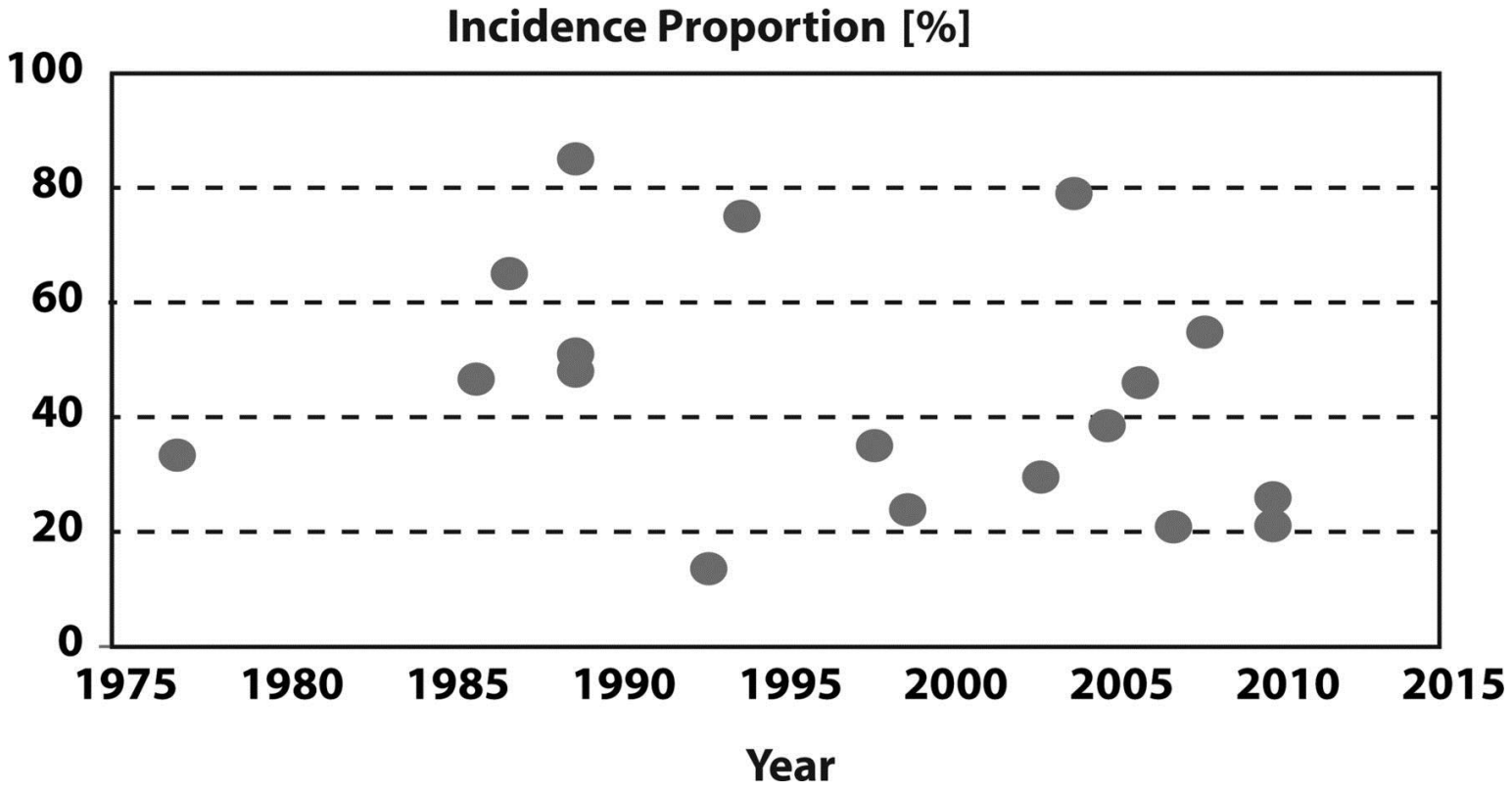
■ Ideally, temperatures should be above 90 degrees.

■ The hunt ends quietly, when the animal can no longer flee.

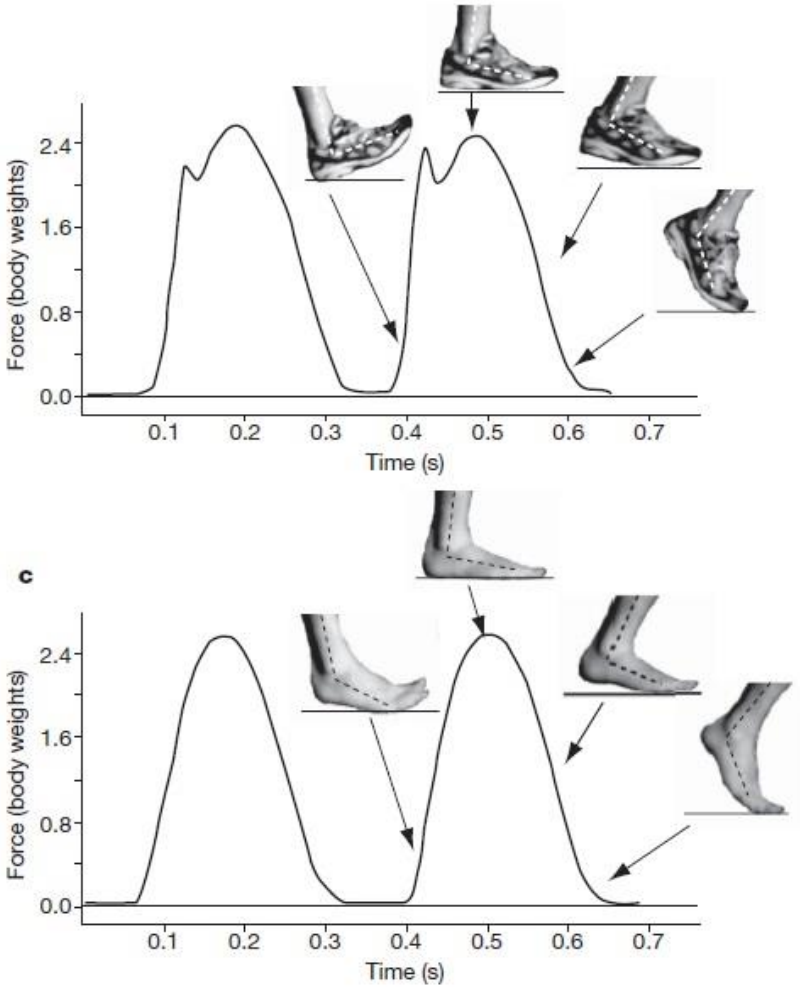
The evolution of running shoes

Foot Type	Alignment	Shoe Type
 High Arch	 Supination	Cushioning Shoe
 Normal Arch	 Neutral	Stability Shoe
 Flat Foot	 Pronation	Motion Control Shoe

Problem: Running injury rates stayed constant

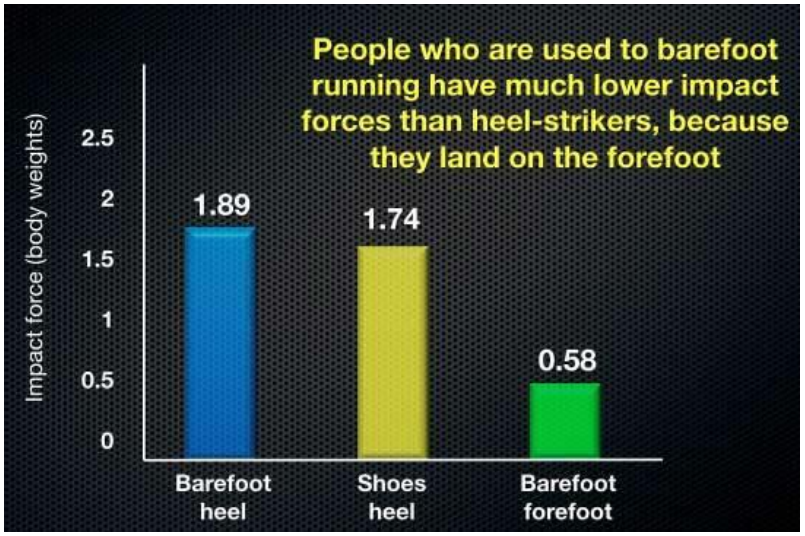


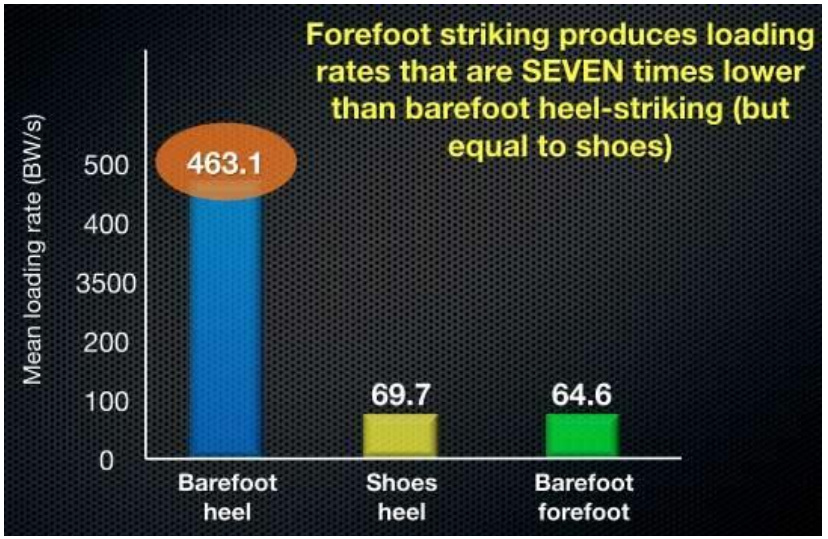
Answer



(Lieberman et al, 2009)

To be precise





It is slightly better to run barefoot with good biomechanics than in shoes with bad biomechanics

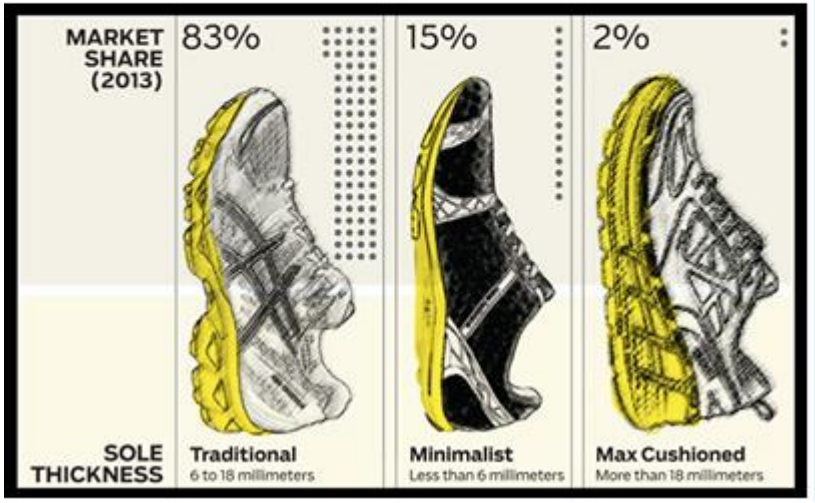
It is terrible to run barefoot with bad biomechanics

Nature doesn't let you run barefoot with bad biomechanics

Inevitable solution

Running Shoes by Market Share (2013): Traditional vs. Minimalist vs. Max Cushioned

illustration is from Running Insight



Morals of the story

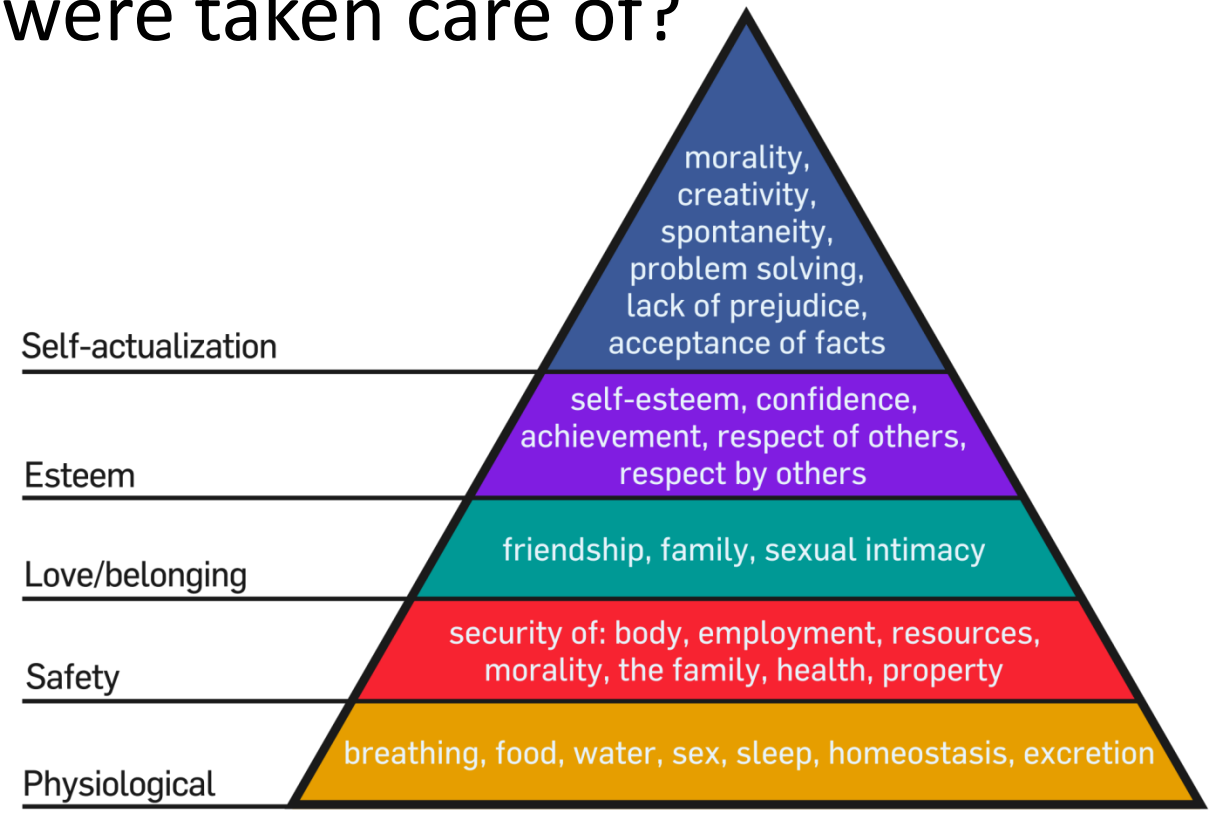
- Designing for comfort can cause unforeseen maladaptations
- Discomfort is an adaptive signal
- People adapt, in good and bad ways

Story 2

ABOUT MICE

Calhoun's rat utopia

- What would happen if all your basic needs were taken care of?



Population Crowding in Deer

- In the early 1920's, a pair of deer was placed on a 150-acre island in Chesapeake Bay, USA.
- The deer population grew until the density reached about one deer per acre.
- Then the deer began to die off (in the absence of known predators) despite the presence of adequate food and water.

Post-mortem Findings

- On autopsy the dead deer were found to have areas of atrophy in the liver tissue, marked decrease in liver glycogen, and hypoglycemia.
- There was evidence of small brain hemorrhages and both congestion and hemorrhage of the adrenal glands and kidneys.
- These findings suggested what later was identified as *adrenal stress syndrome*.

Population stress in rabbits

- In a 1939 study, rabbits demonstrated rise and fall in population densities but when death rates and densities were high, they frequently entered into convulsive seizures or comatose states.

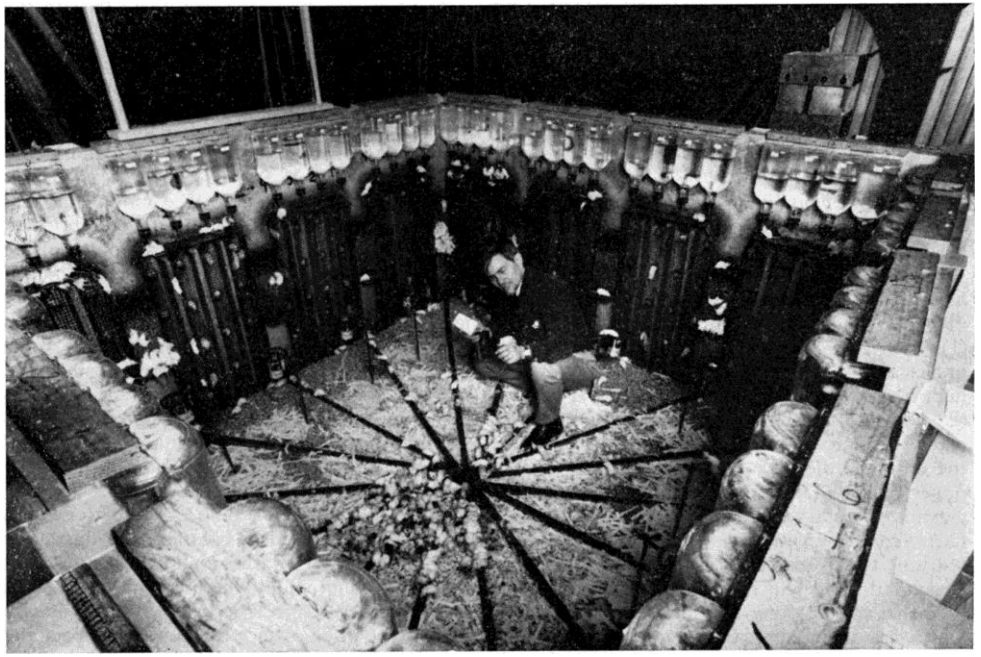
- Liver and adrenal pathology, as well as hypertension and hypoglycemia associated with *adrenal stress syndrome*, were observed.

Population Density and Behavior (Norway Rats)

- In 1962, John Calhoun found high stress, deviant behavior and high mortality rates in wild Norway rats in lab experiments.

Population Density and Behavior in mice

- Calhoun set up a large acre-wide stadium filled with pens for mice as an observatory for a larger experiment
- Food, water and nesting sites sufficient for 3840 mice
- Sanitation standards were maintained externally



Chronology of a utopia

- Day 0 → Four pairs of mice introduced into habitat
- Days 1 to 315 → Normal mouse society, high population growth, doubling every 55 days
  - Population = 620 on day 315
- Days 315 to 600 → Slower population growth, social breakdown
- Day 600 → Last surviving birth (population = 2200)
- Days 600 to 1120 → Females ceased reproducing, social breakdown intensified
- Day 1121 → Last surviving mouse in habitat died

Social breakdown

- Premature weaning of infants
- Wounding of children
- Increase in homosexual behavior
- Aggressive behavior by females
- Passivity of non-dominant males

Behavior changes in females

- Pregnancies were often aborted through miscarriage.
- Considerable disruption of normal pre- and postpartum maternal behavior (i.e., failure to build proper nests, nurse offspring and transport litters) occurred.
- Up to 25% of estrus females were so vigorously pursued by males that they did not survive.

Behavior changes in males

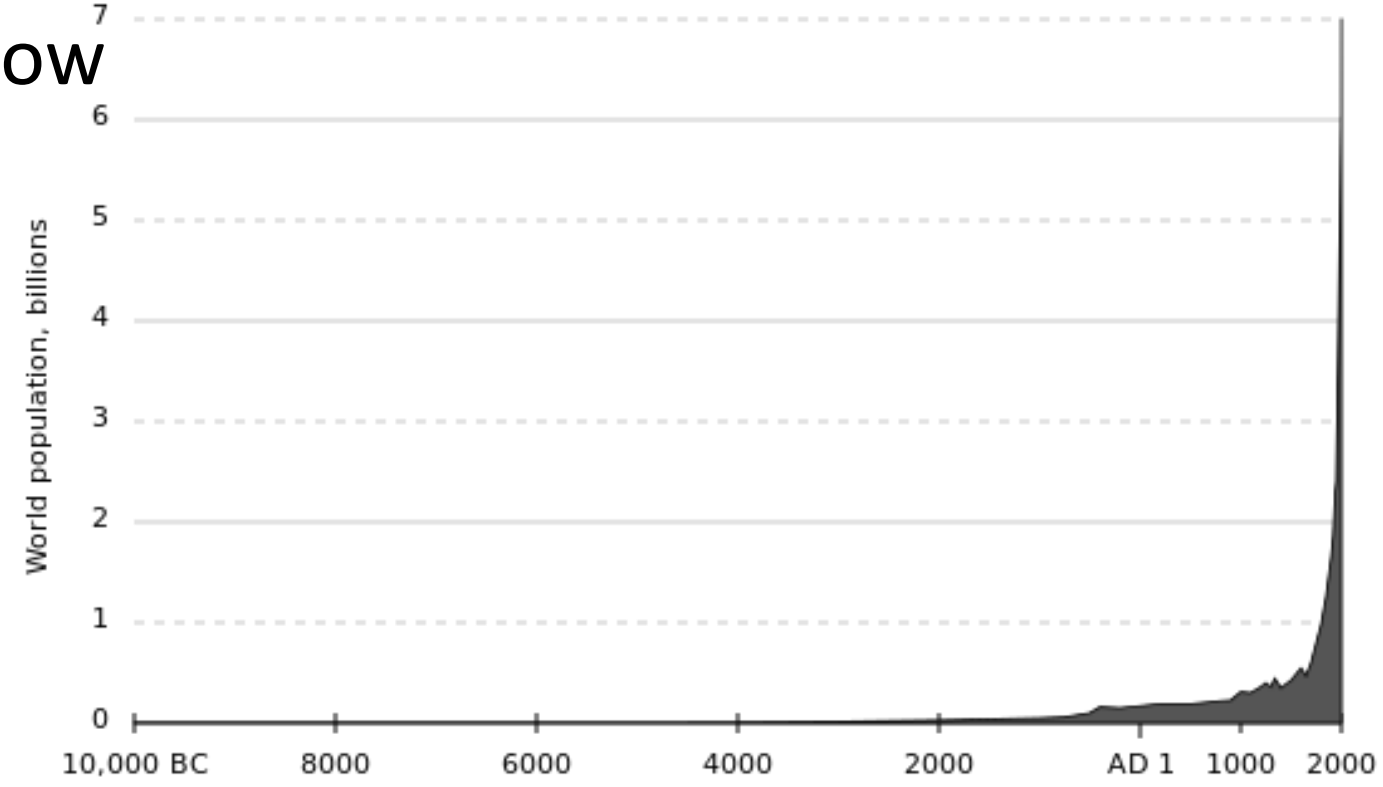
- Some animals became hyperactive, constantly fighting.
- These animals also became hypersexual and lost the ability to discriminate among estrus and non-estrus females, juveniles, and other males.
- Some became cannibalistic.
- Some became withdrawn, demonstrating no interest in social interaction
  - These mice spent the day eating, sleeping and grooming themselves
  - They were called, the ‘beautiful ones’ for lack of scarring on their fur

Morals of the story: Calhoun's conclusions

- Social breakdown was driven by all available social roles in the mouse universe being filled
- Lack of psycho-social integration meant some animals coped with crowding stresses by becoming deviant
- Prevalence of deviant behavior eroded reciprocal expectations that held the society together
- Lack of social binding created adverse conditions for reproduction
  - Mice taken from this habitat post day 500 and placed in a separate empty habitat also failed to reproduce

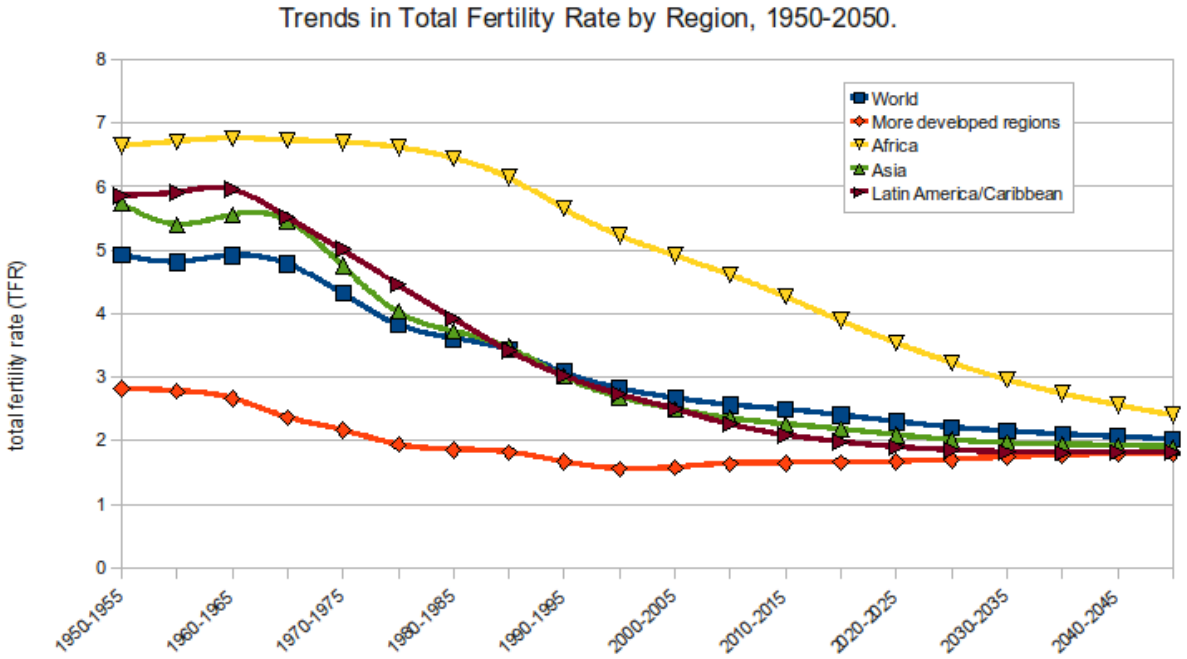
Human Population Density

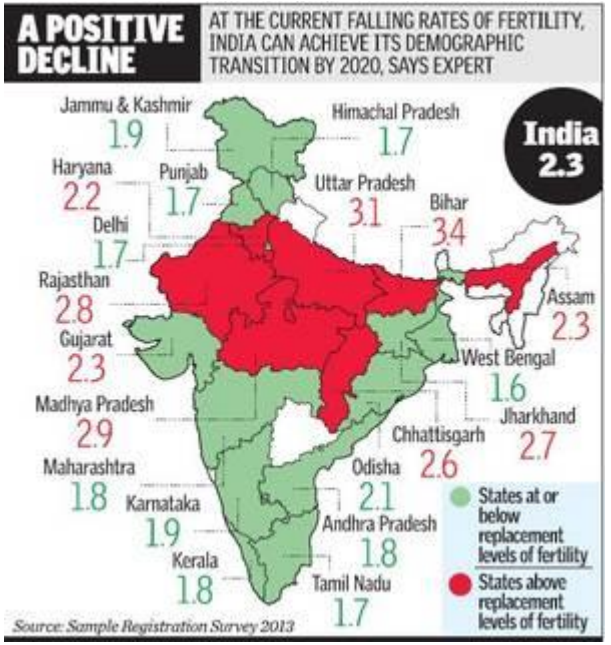
- A majority of people over 60 years old that have ever lived are alive now
- ~7% of all people that have ever lived are alive now



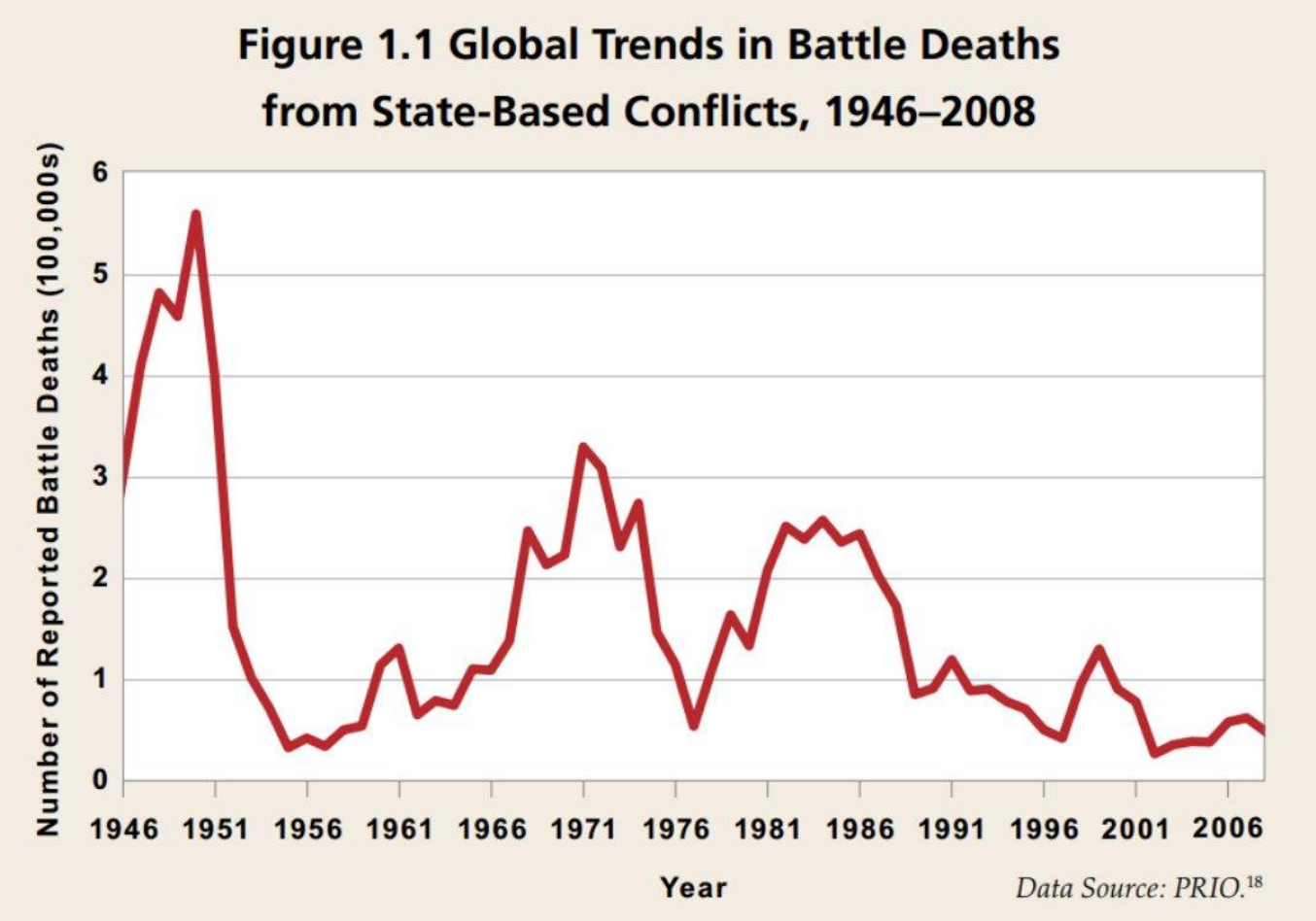
Trends in fertility

- Total fertility rates have drastically dropped





No compelling evidence of social breakdown



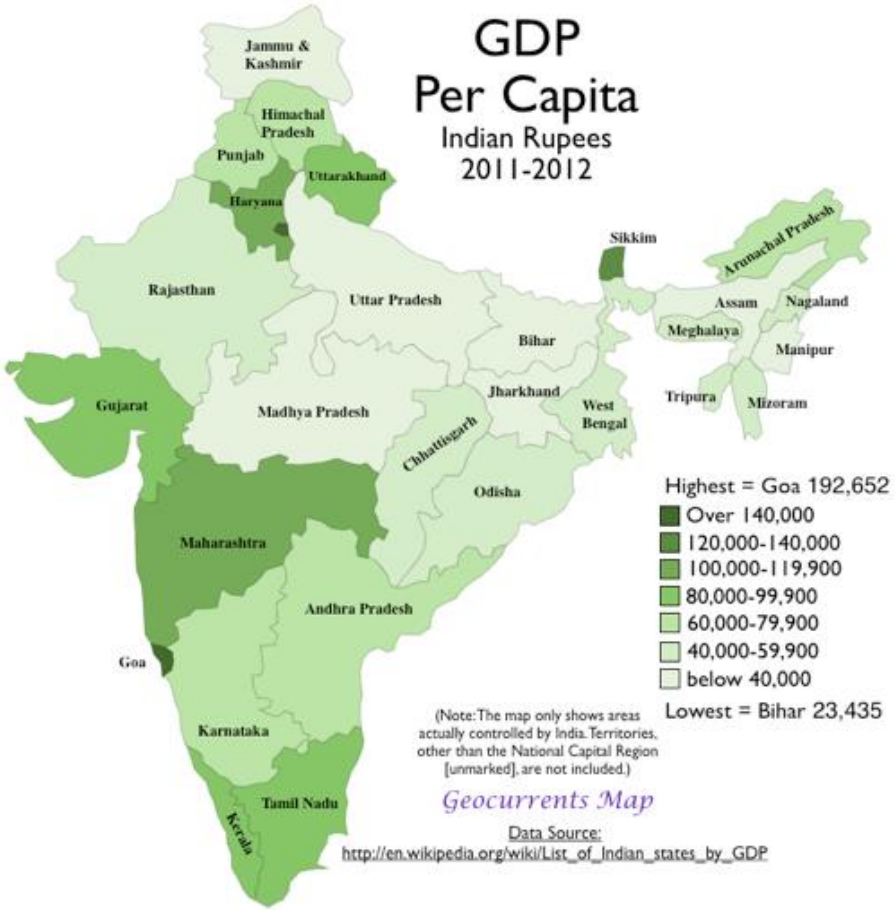
No population stress in humans?

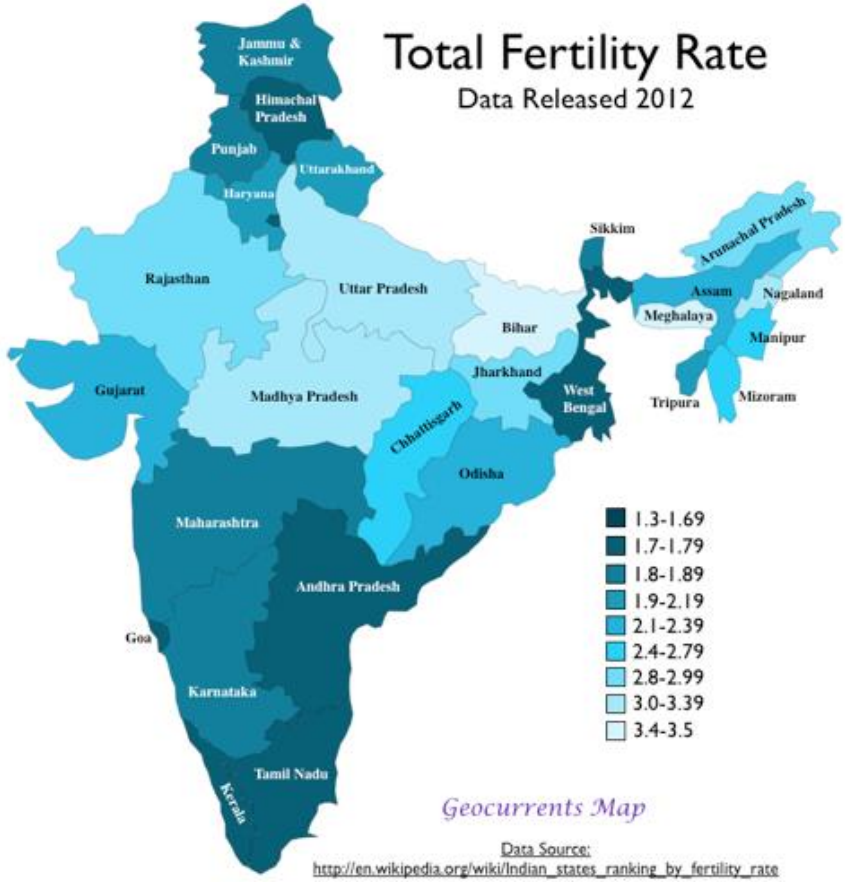
- Very few studies directly correlate stress of crowding with changes in the human brain.
- Compelling evidence now available to link neurological changes in human brains to prolonged exposure to general stress.
- What accounts for the missing crowding-driven stress?

Story 3 (incomplete)

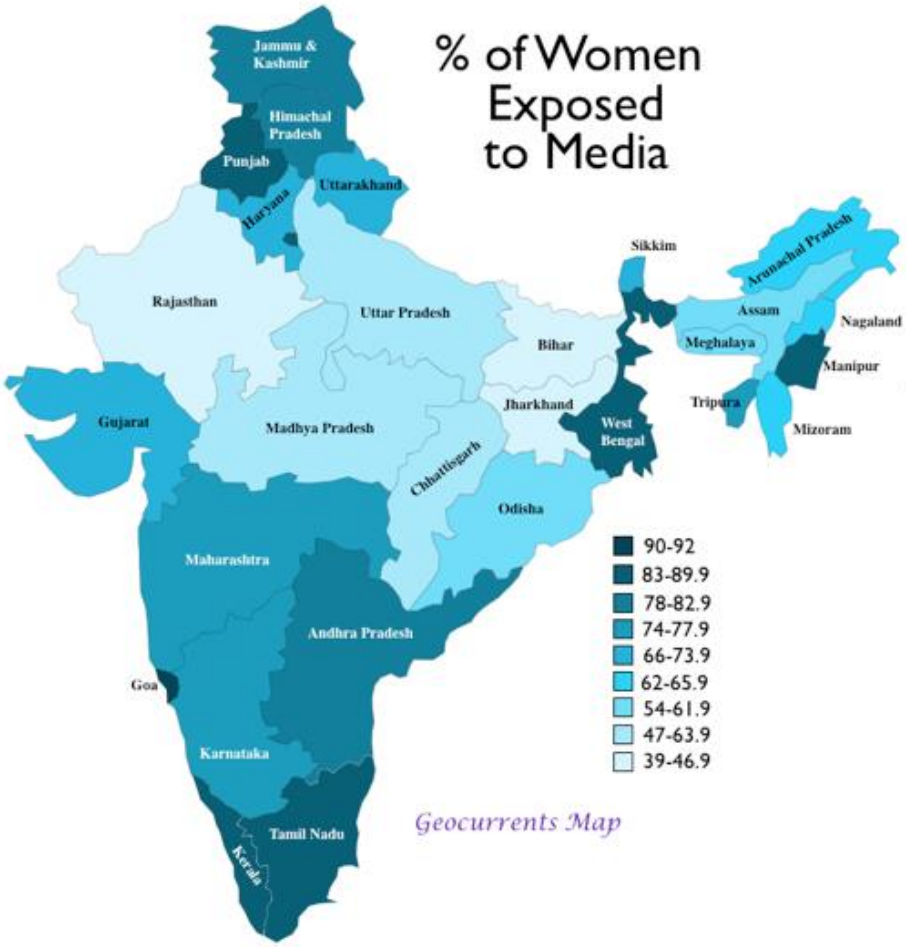
ABOUT HUMANS

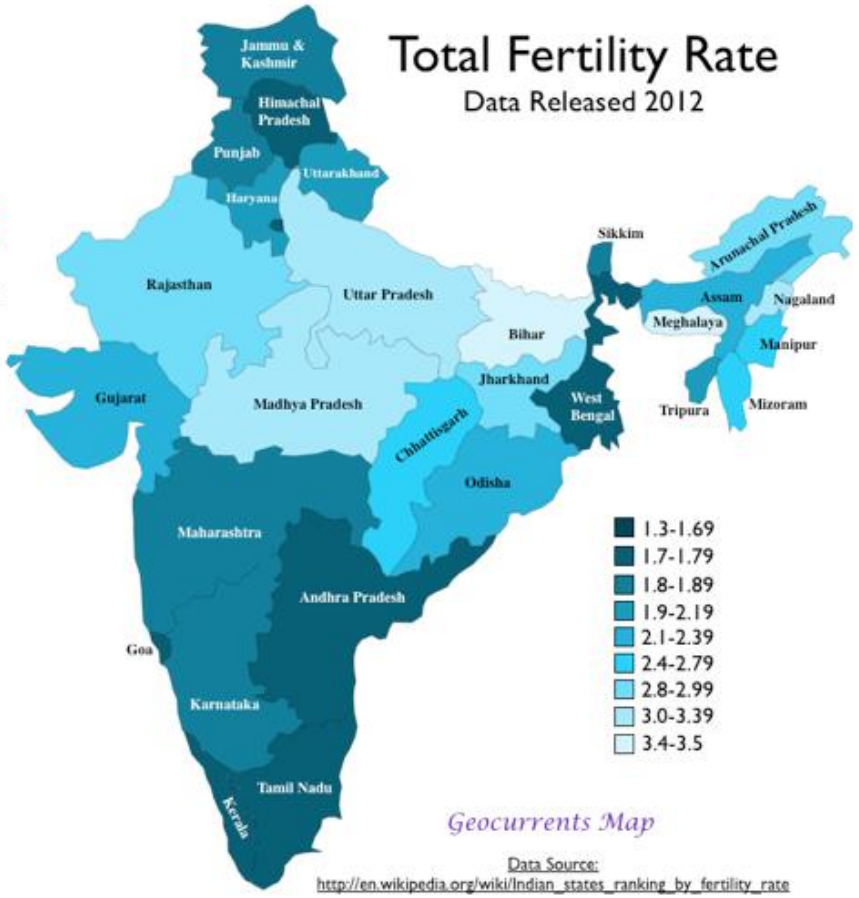
What has changed?



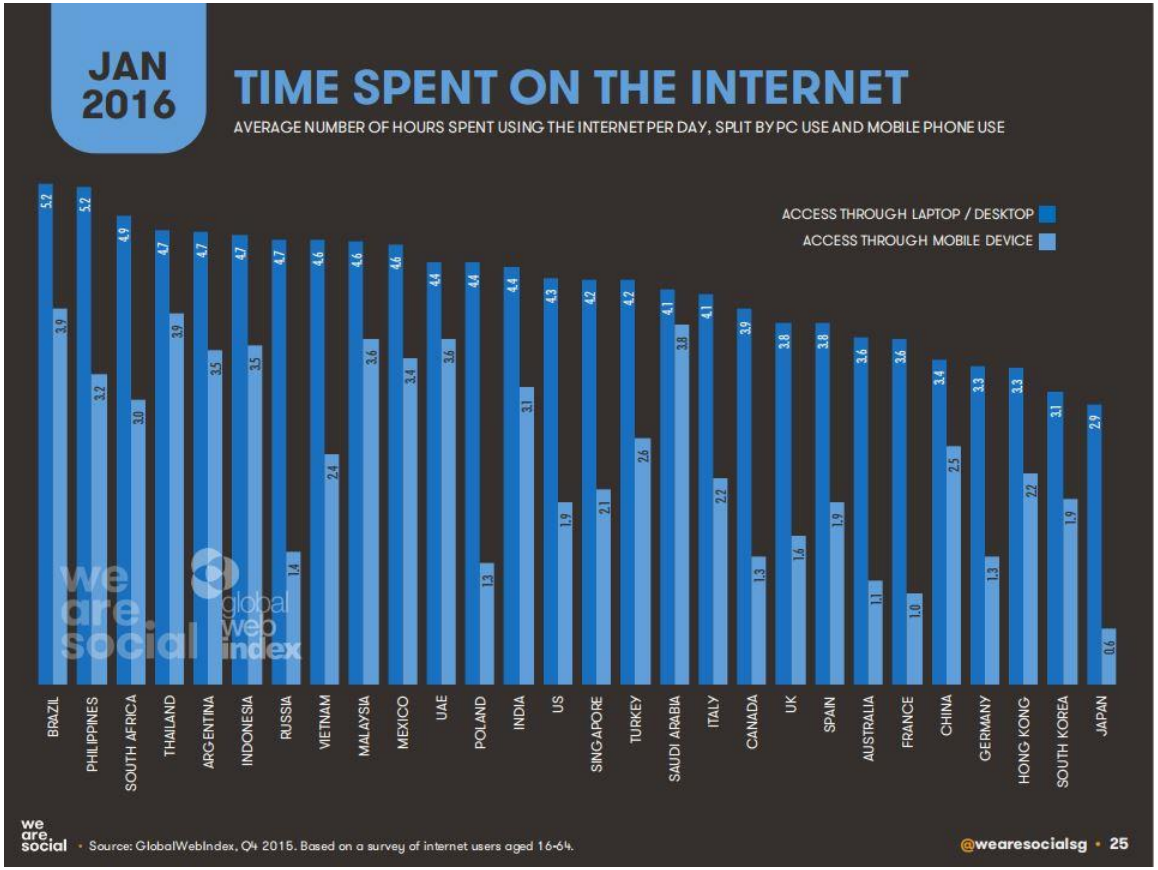


The TV hypothesis





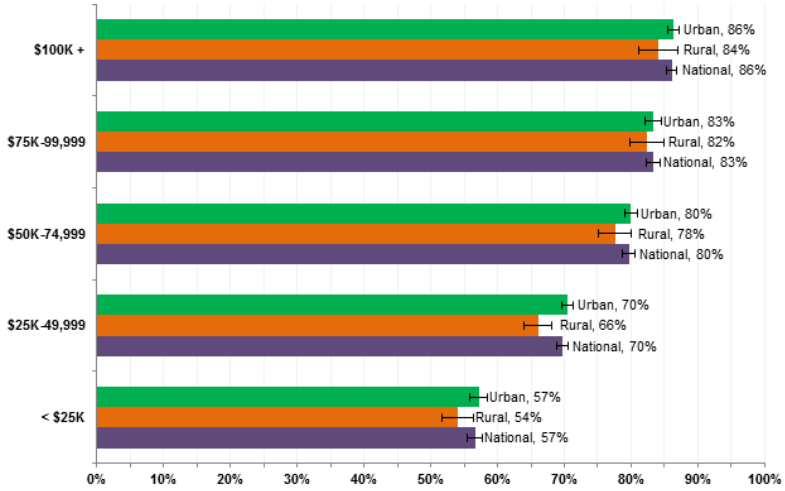
A hidden revolution



Internet users spend on average 6 hours a day using the internet

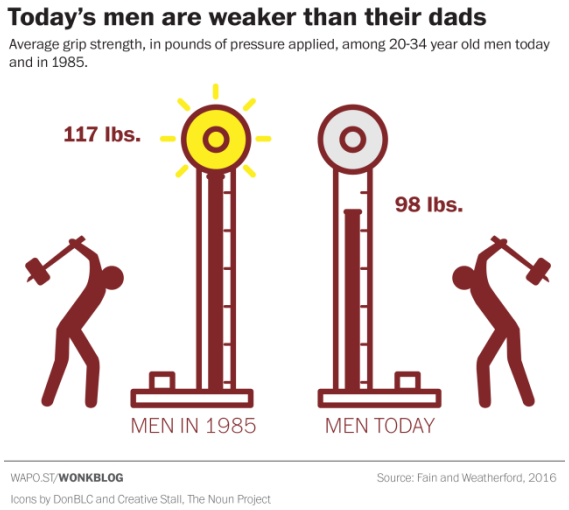
Hypothesis

- Is digital disembodiment the way humans are coping with crowding?
  - Physical location becomes irrelevant
  - Creation of new social niches less costly
  - Resource and energy-efficient
- Can this be shown?
  - No evidence yet

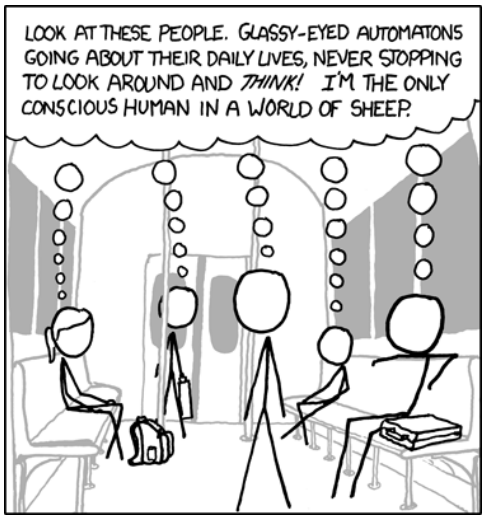


Implications

- Human-computer interactions are the glue keeping society from breaking down?
- Real-world implications of society moving into digital space?



Sedentariness, addiction



Anomie, loneliness

Winner-take-all markets, inequality, unemployment

Human-centered computing

- Tools
  - Statistics, probability
  - Machine learning, algorithms, data structures
- Concepts
  - Search
  - Recommendations
  - Human-like interaction
- Vision
  - Trying to design user interfaces responsive to genuine human needs
  - Designing for convenience is not always a great idea
  - Premature optimization is the root of all evil