

Introduction to Sex as a Biological Variable

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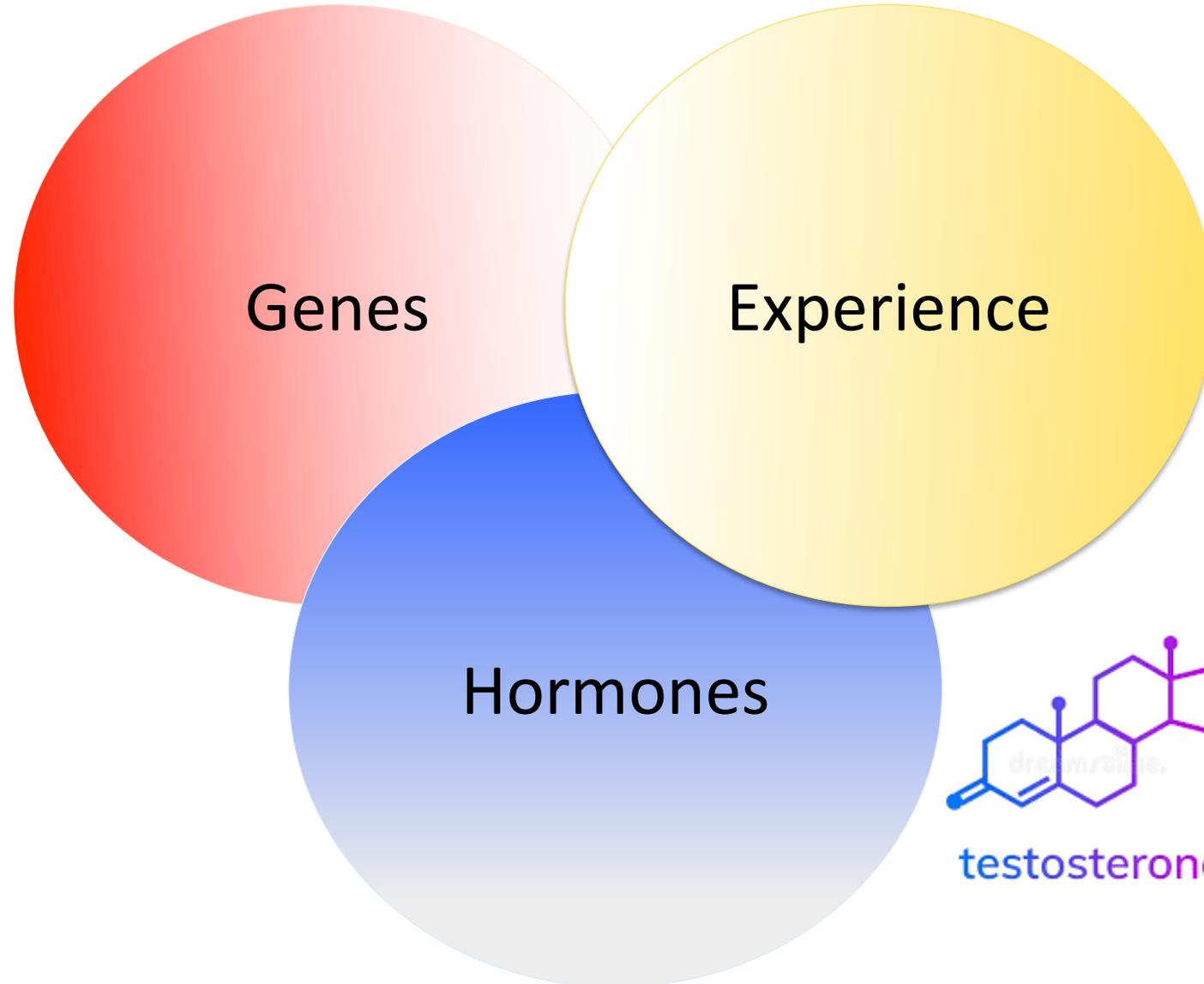
Professor and Chair

Department of Pharmacology

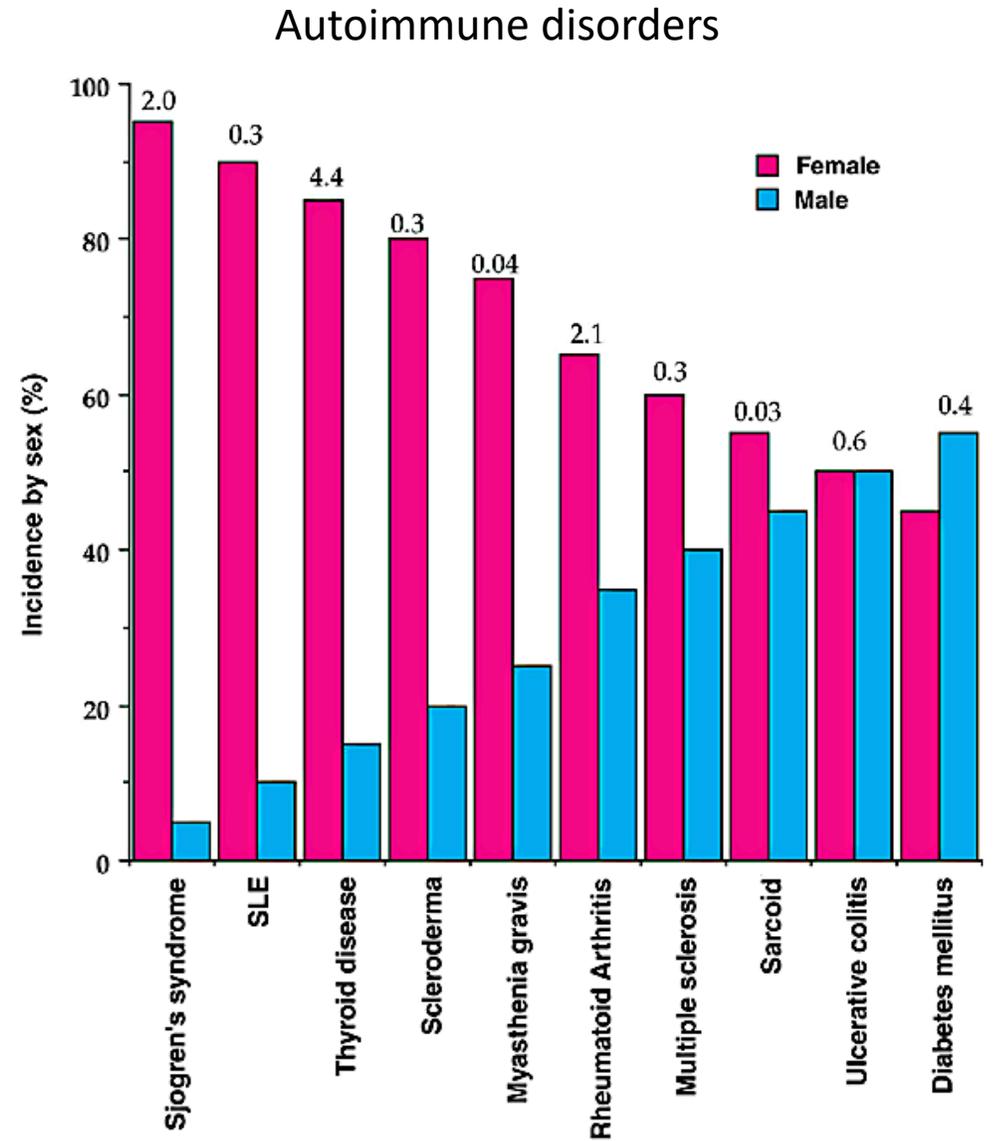
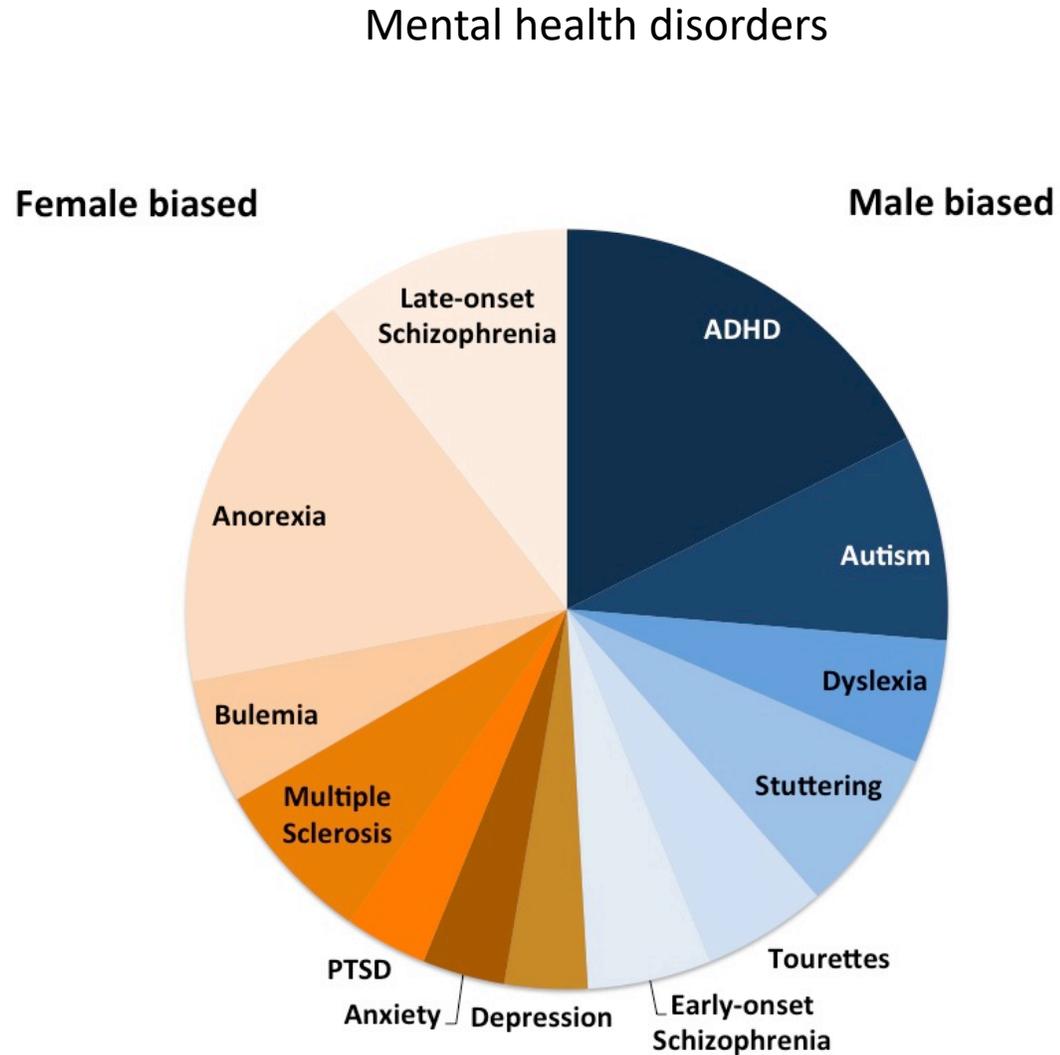
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Sex differences are determined by:

XY



And exert profound influences on health & disease



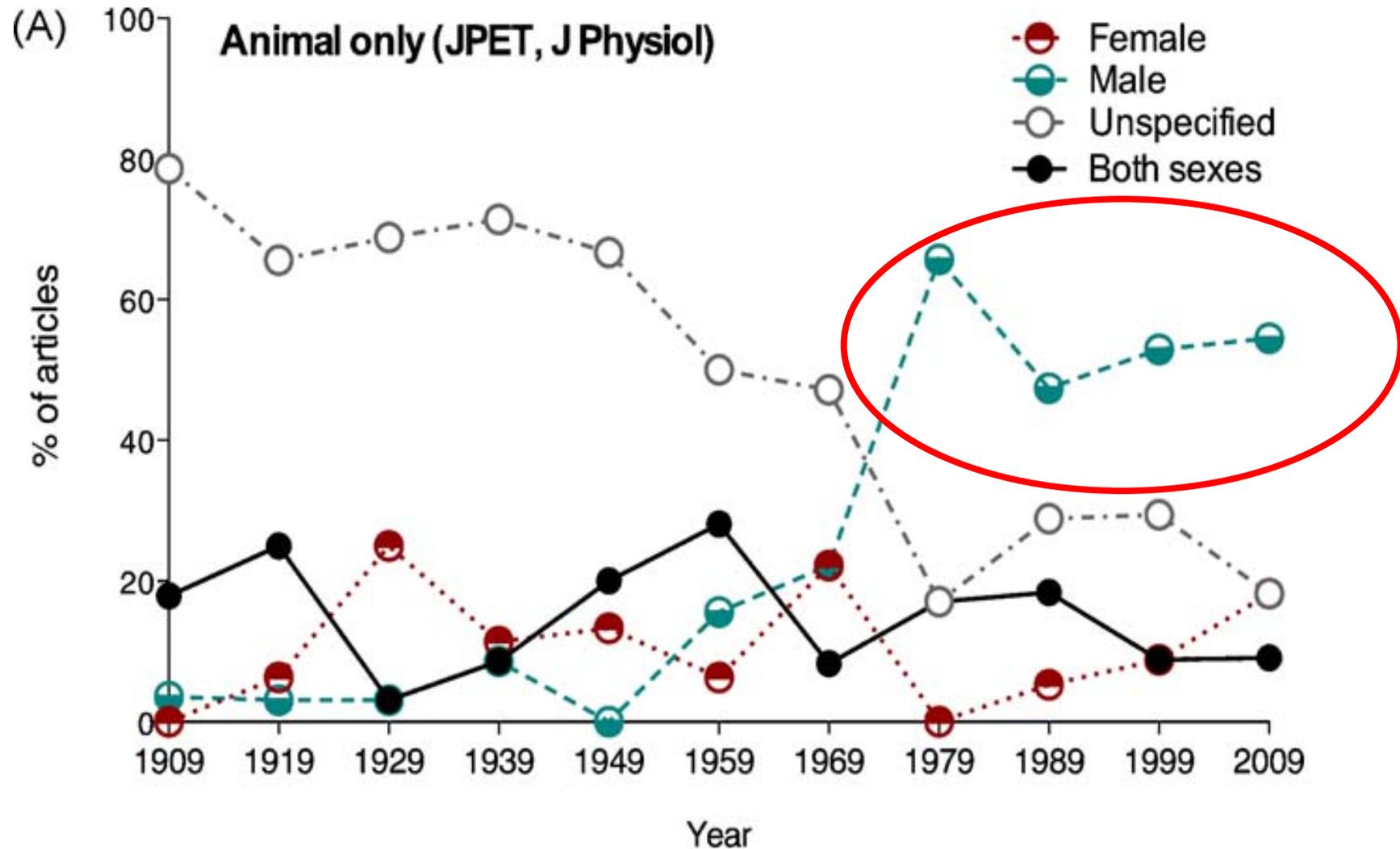
How do we separate the biological influence of sex from the cultural and environmental effects due to gender?



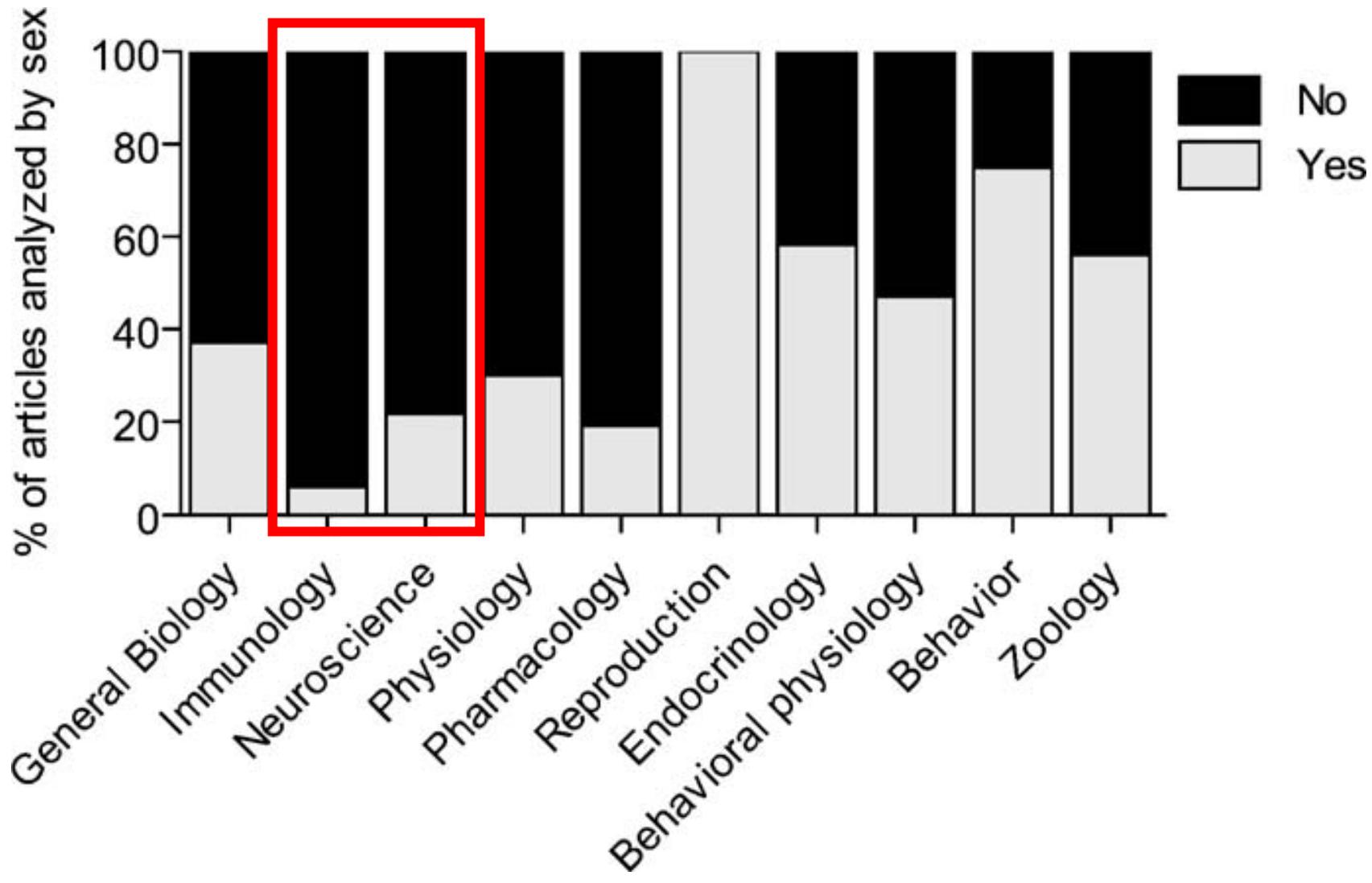
we use animal models



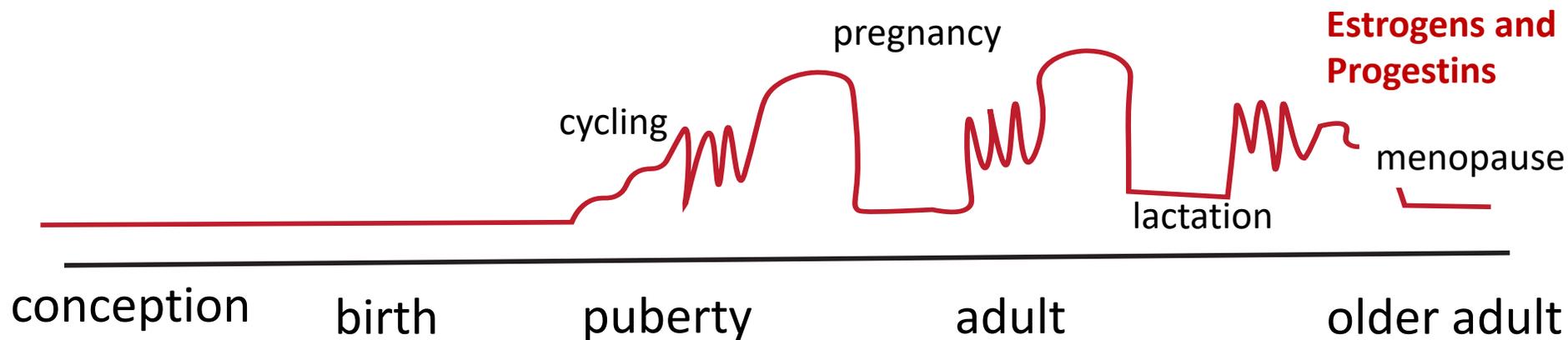
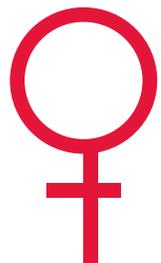
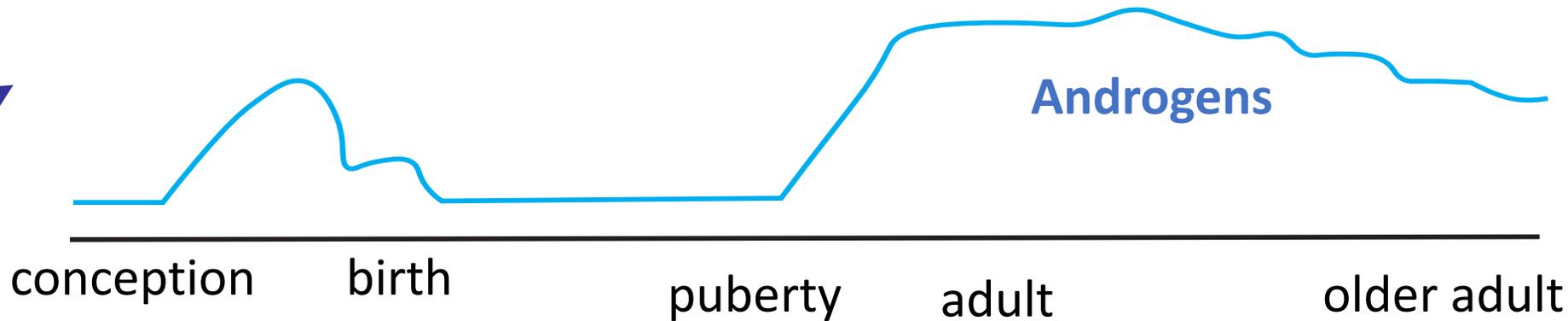
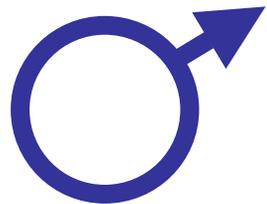
But we have a problem....



% of scientific studies on animals which analyzed for the influence of sex



Sex differences are established early and can vary across the life span

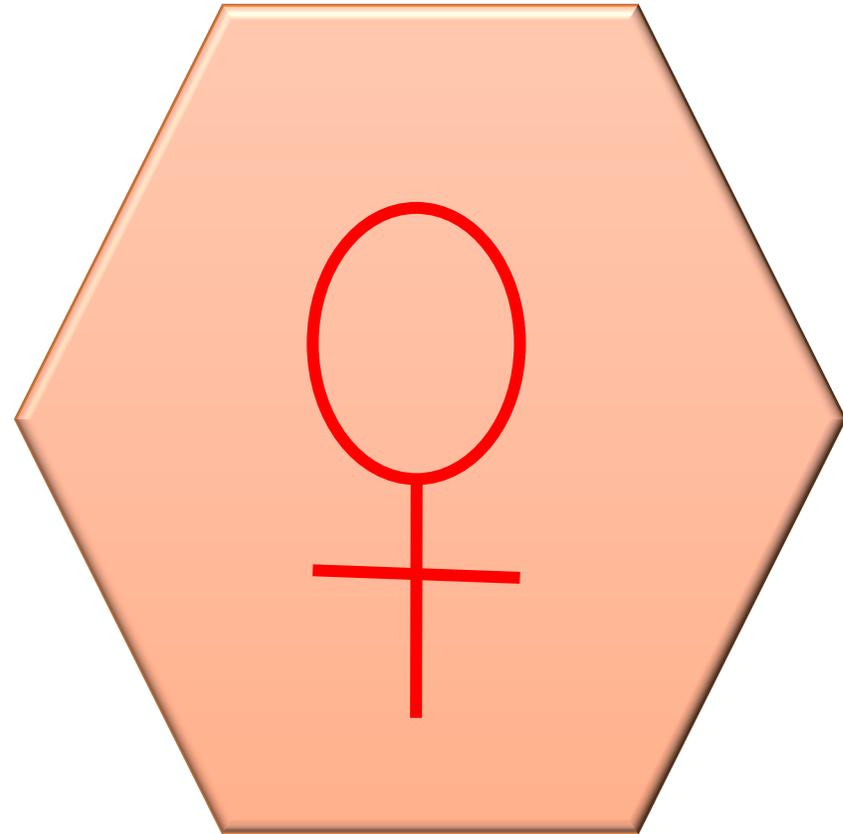
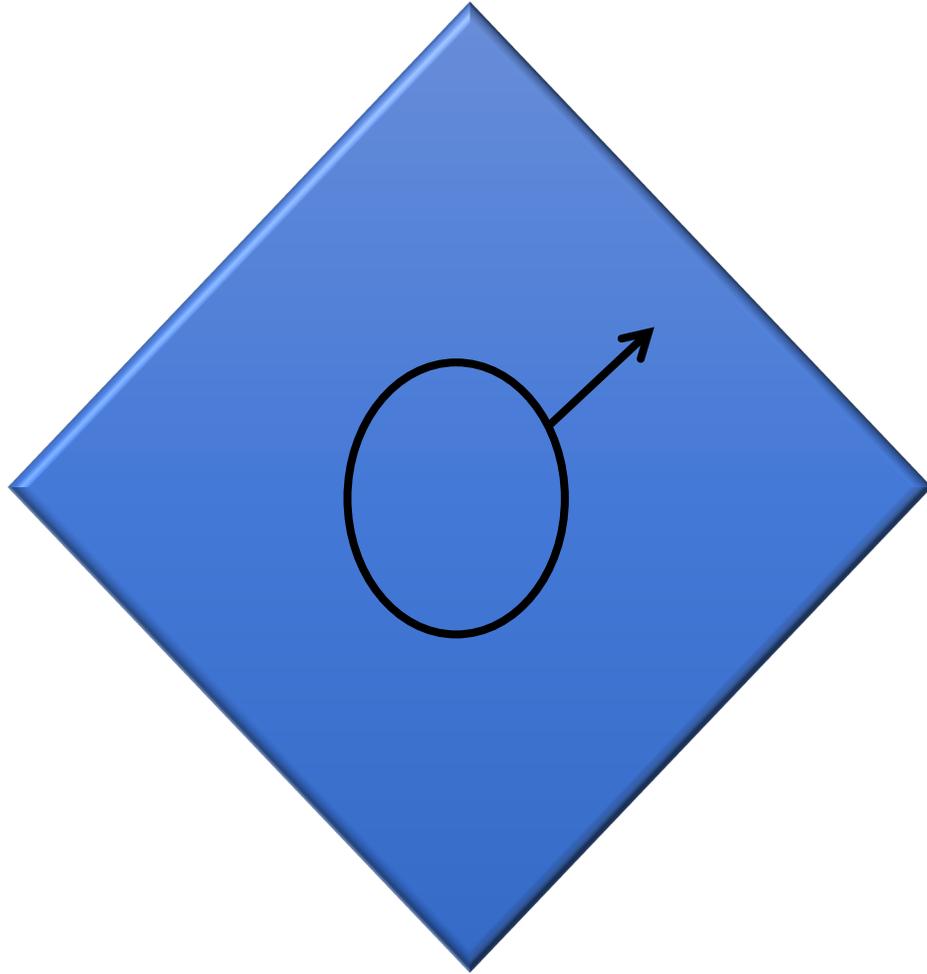


Not all sex differences are created equal

- Sex Dimorphism
- Sex Difference
- Population Frequency
- Latent Sex Differences
- Context Dependent Sex Differences

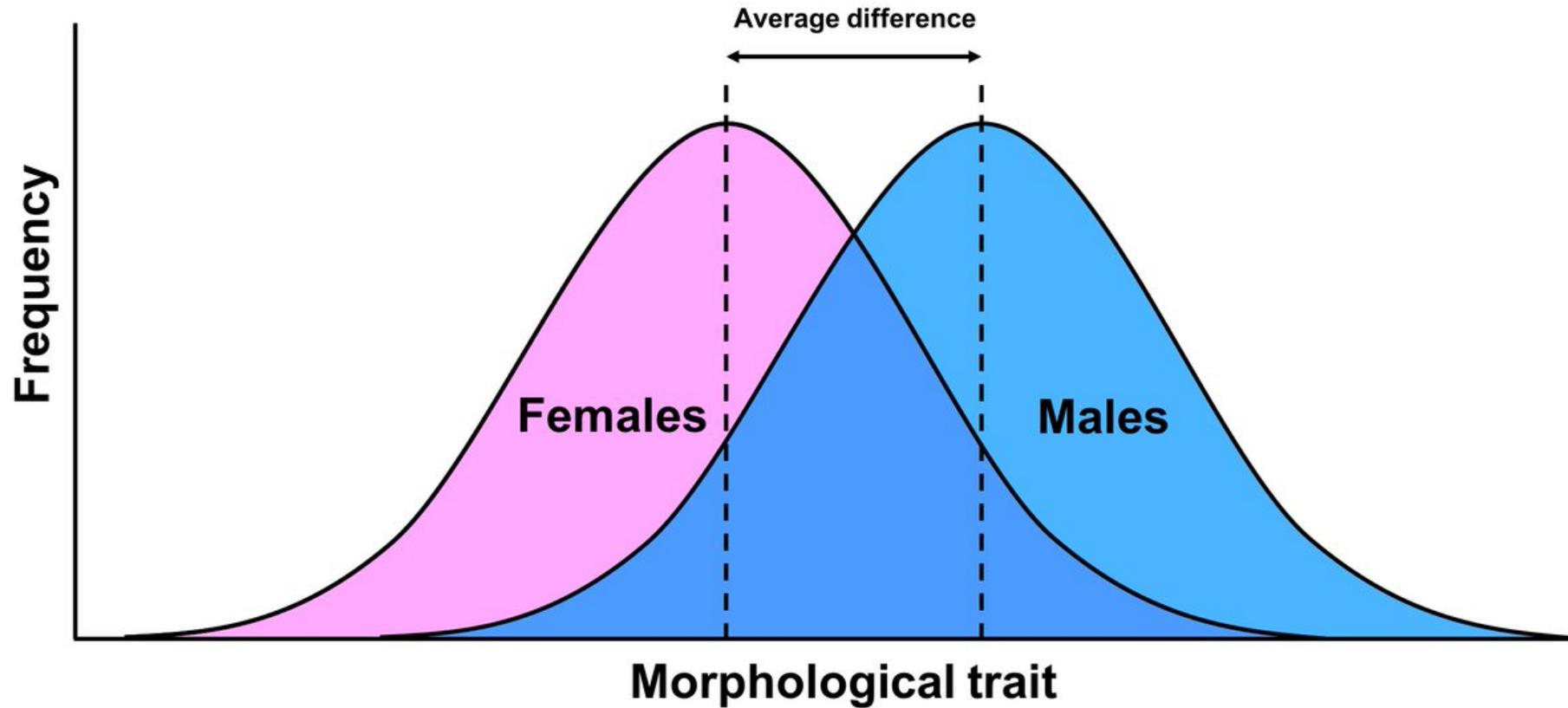


Sex Dimorphisms – two forms



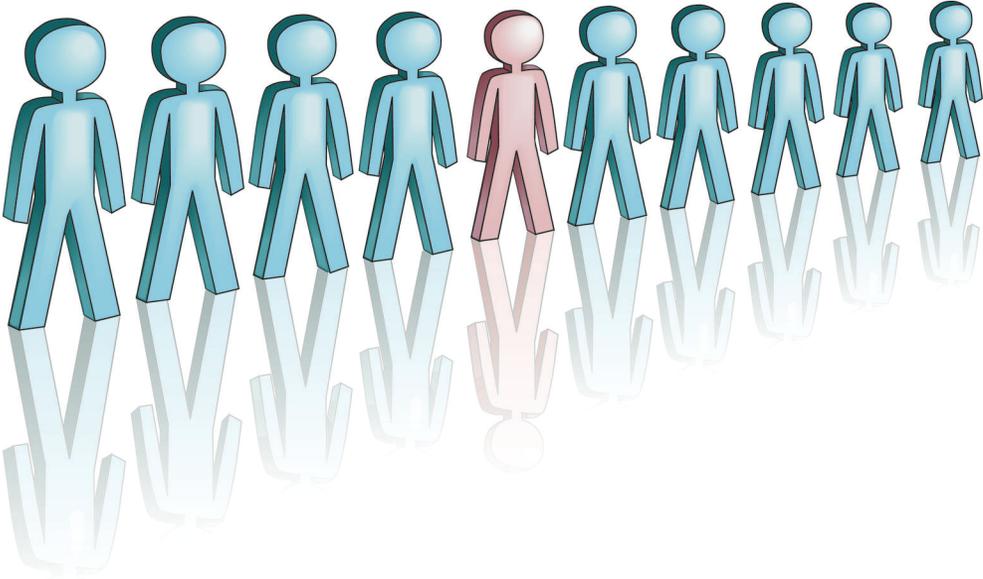
Examples: Symptoms of a heart attack, hormone dependent cancers

Sex Difference – vary along a continuum

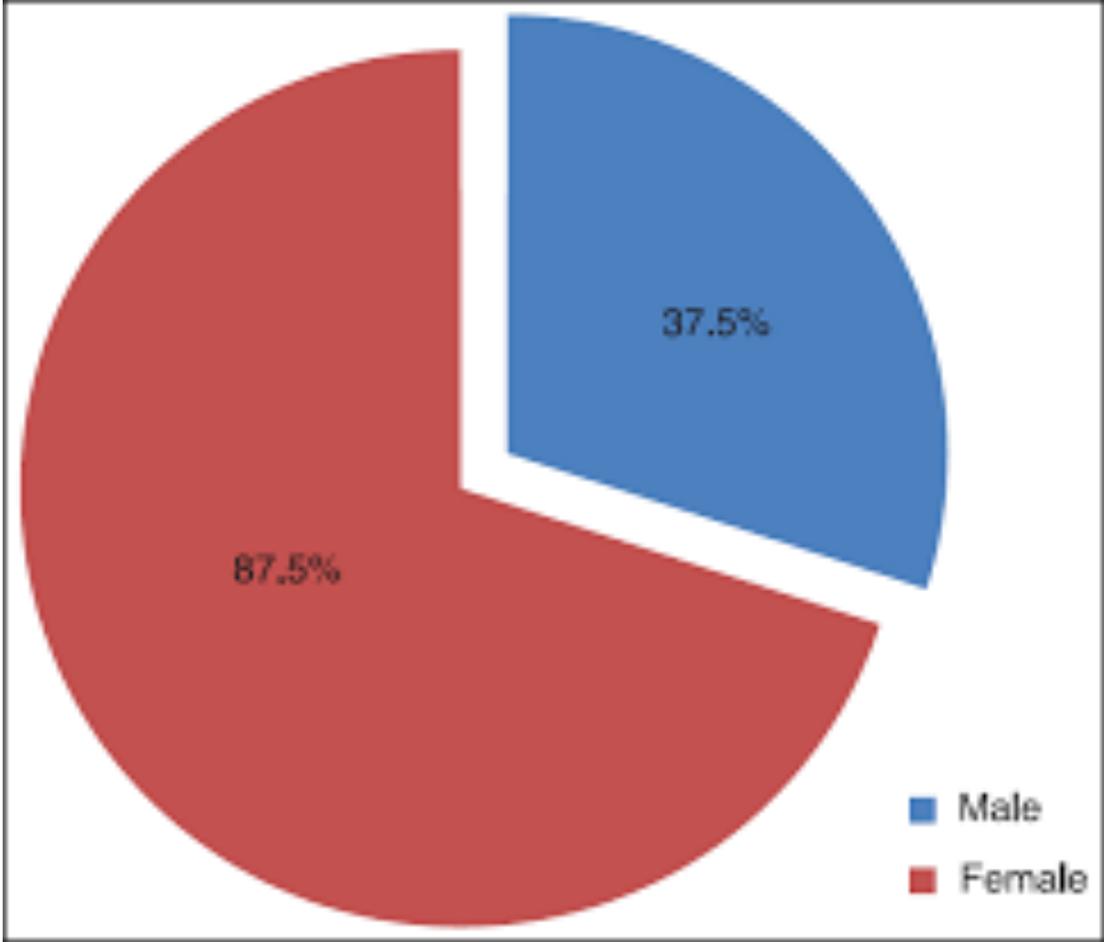


Examples: bone density, cholesterol

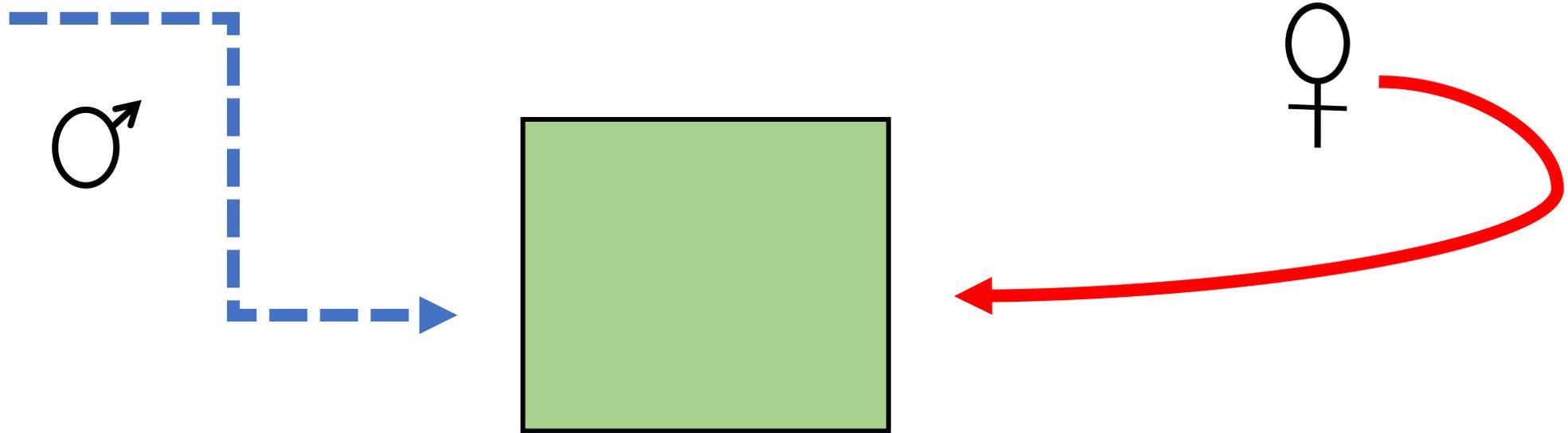
Population Frequency varies for same condition



Examples: Alzheimer's,
Parkinson's Diseases



Latent Sex Differences – different route to the same endpoint



Example: Cellular mechanisms regulating pain, immune response to infection

Context Dependent Sex Differences



Examples: Impact of stress on learning, response to drugs of abuse

The Power of Studying Both Sexes

- Discover fundamental biological principles not otherwise evident.
- Avoid deleterious effects of therapies based on one sex
- Expand the impact of research findings to a broader population
- Enhance the health of both sexes