SHIELD: Quantitative Research Methods for School Health Leaders
Session 1: Intro to Research methods, measures and study questions

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The Proposed Course Layout

Date/Topic *Course begins 10/14/16*	**Subtopics**	**Assignments Due**
Session #1 (October): Intro to Research methods, measures and study questions	• What makes for a strong research question & how do we construct a testable question? • How do you "measure" a kid's exposures and health outcomes? • Theory: Do you have one?	N/A
Session #2 (November): The Basics of Study Design (Part I)	• How do we quantify the health of populations? Distributions, percentages, rates, ratios. • Creating data tables that communicate • How does the health of a population differ from the health of an individual?	Study Question
Session #3 (December): Study Design, (Part II)	• Sources of data (primary & secondary) & the structure of a dataset. • Sampling: Who gets in your study and how? • The concept of "statistical power:" How many people do I need in my study?	Descriptive statistics exercise
Session #4 (February): Study Design, (Part III)	• Experimentation versus observation: What are your options for study design? • The idea of the counterfactual: Replicating the "perfect" study, "confounders" and minimizing "bias." • Mediation and moderation: Mechanisms and contexts	Study sample plan Study measures
Session #5 (March): Statistics (Part I)	• Testing whether groups are (really) different from each other: Chi Squares, T-Tests, ANOVAS. • P-values, confidence intervals: What are the chances this wasn't just a random finding?	Study design first draft
Session #6 (April): Statistics (Part II)	• Measures of association (Odds ratios, risk ratios, rate ratios): Deciding whether a "cause" is related to an "effect." • Regression: Accounting for many factors all in one analysis	Study design with statistical plan
Session #7 (May): Design + Statistics = Results	• Interpreting our findings • Disseminating our findings (Publication & beyond)	Results (draft)
Session #8 (June): Course Finale	• Presentations of findings • Next steps	Results (revision) Dissemination plan

Goals for the course

- Build skill/confidence around conceptualizing research
- Make the most of the research materials/resources available to you

- Create a good research question
- Find appropriate data/create appropriate data
- Identify good "exposures" and "outcomes" for research
- Create a study design
- Analyze data (or communicate your needs to your analyst! If you're lucky enough to have one. ☺)
- Summarize and present your findings
- Disseminate your research!

Format

- Develop a research project
- Meet monthly
- Interact online through course website
- Homework! (Trying things out on your own)
- Ongoing work on a research project
- Development of a dissemination plan

Most of research methods is....

- Common Sense.
- The right tools.

I. research questions & hypotheses

How do you go from "a thing you're interested in" to a strong research question that you can find an answer to?

- School attendance
- Nurse visits and school attendance

- Participation in a school-based fitness program
- Participation in a school-based fitness program and weight loss

- Often we're interested in associations or cause & effect: But we need questions even more specific than this, and we need a question mark! (?)

Research Questions & Hypotheses

- Writing a strong, a priori research question =

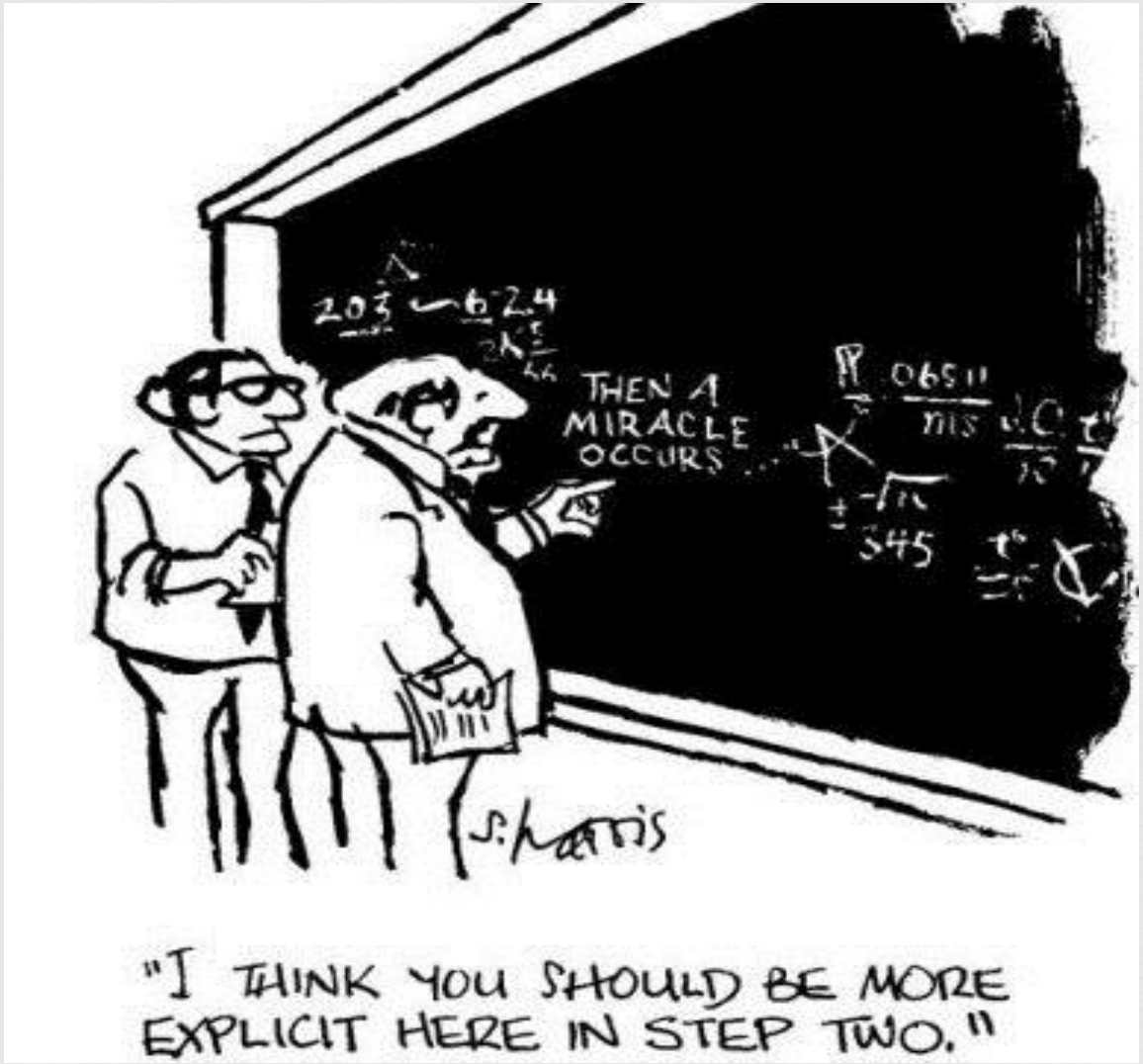
The cornerstone of rigorous research

Will guide your research efforts/choices
(data sources, measures, design, analyses, etc…)

Will keep your research systematic
& will keep you/your research team on track!

Prevents "fishing expeditions"
(which can lead to non-valid research findings)

Research Questions & Hypotheses



Research Questions & Hypotheses

- Q: What is the difference between a hypothesis and a research question?
  - A: The research question has a question mark at the end.
    - Research question: Is smoking associated with lung cancer?
    - Hypothesis: Smoking is associated with lung cancer.
    - Null hypothesis: Smoking is not associated with lung cancer.
  - The hypothesis takes a "stand" one way or another (but the researcher should not necessarily presume to know the answer)

Research Questions & Hypotheses

- **A strong research question is:**
  - Important -- The "so-what" factor....
  - Clear & understandable – the "Grandma" factor....
  - Focused & Specific
  - Plausible, theory-based (isn't just something you dreamed up)
  - Testable in the real world (has **specific, measurable** exposure/outcome)
  - Builds on previous research
    - Hasn't been done (or, done adequately) before
    - But, builds on/extends what HAS been done.
  - Will advance understanding in the field....

How do we make a variable "concrete?" (Operationalizing variables)

- School attendance
- Nurse visits and school attendance
  - What do we mean by "school attendance" and how might we measure a child's attendance? "Nurse visits?"

- Participation in a school-based fitness program
- Participation in a school-based fitness program and weight loss
  - What do we mean by "a school-based fitness program" and how would we decide whether a child had been "exposed" to it? How would we measure "weight loss?"

Research Questions (Judge Their Goodness)

1. Are prenatal vitamins good for fetal development?

2. Does taking folic acid prior to pregnancy help prevent neural tube defects?

3. Does eating bad food make kids unhealthy?

4. Do children who eat a high-sugar breakfast have difficulty concentrating later in the morning?

Try out some questions yourself!

- Pick an "exposure" variable
  - School start time
  - Length of recess
  - Vending machines on campus

  - **You choose how to "operationalize" your variables**

- Pick an "outcome" variable
  - MCAS scores
  - Obesity
  - Average monthly nurse visits per capita

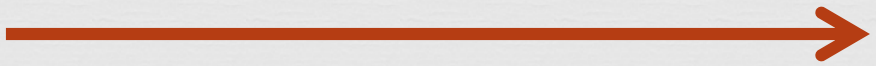
  - **Draw a picture of your question!**

What does a research question look like in picture form?

 = "Leads To"

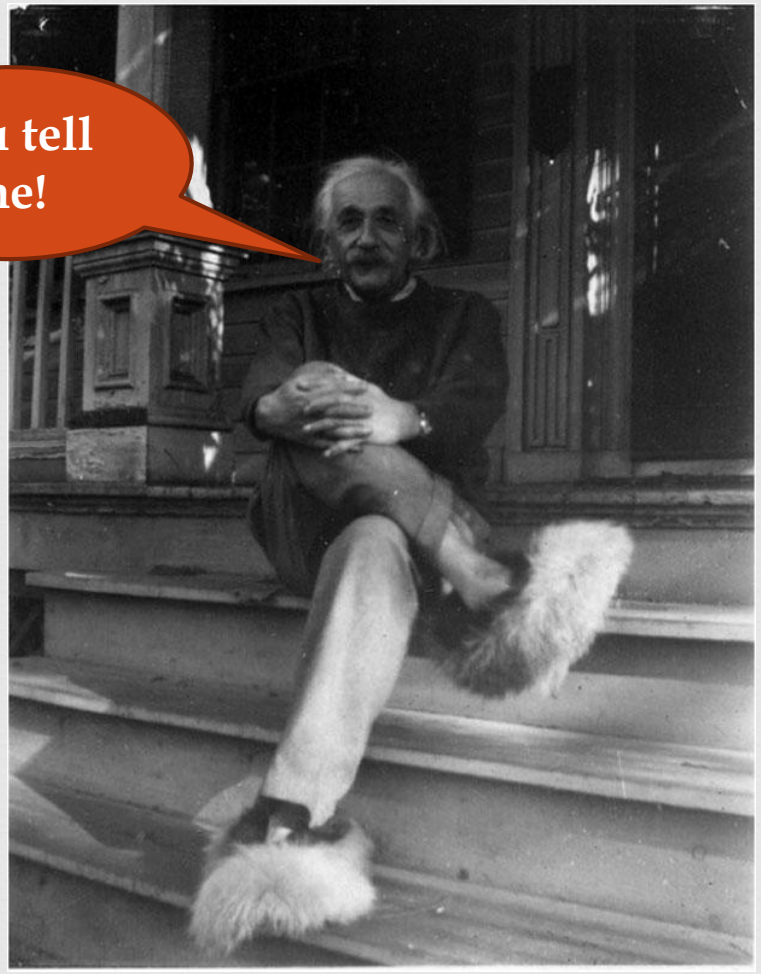
X = Exposure

Y = Outcome

X  Y

Theories/Frameworks

What is a theory?



"A theory is a set of interrelated concepts, definitions, and propositions that present a systematic view of events or situations...."

by specifying relations among variables, in order to explain and predict the events or situations. The notion of **generality**, or broad application, is important. Also, theories are by their nature abstract: that is, **they don't have a specified content or topic area**. Like an empty coffee cup, they have a shape and boundaries but nothing concrete inside. They only come alive when they're filled with practical topics, goals, and problems."

--Glanz, K. Annu. Rev. Public Health 2010. 31:399–418

A theory might explain:

- Why individuals do what they do
- What exposures/actions cause what outcomes
- Why populations differ in their prevalence of a health outcome

Theories of causation/explanation

- What might influence individuals to modify their behaviors
- What might change population patterns of health/disease

Theories of change

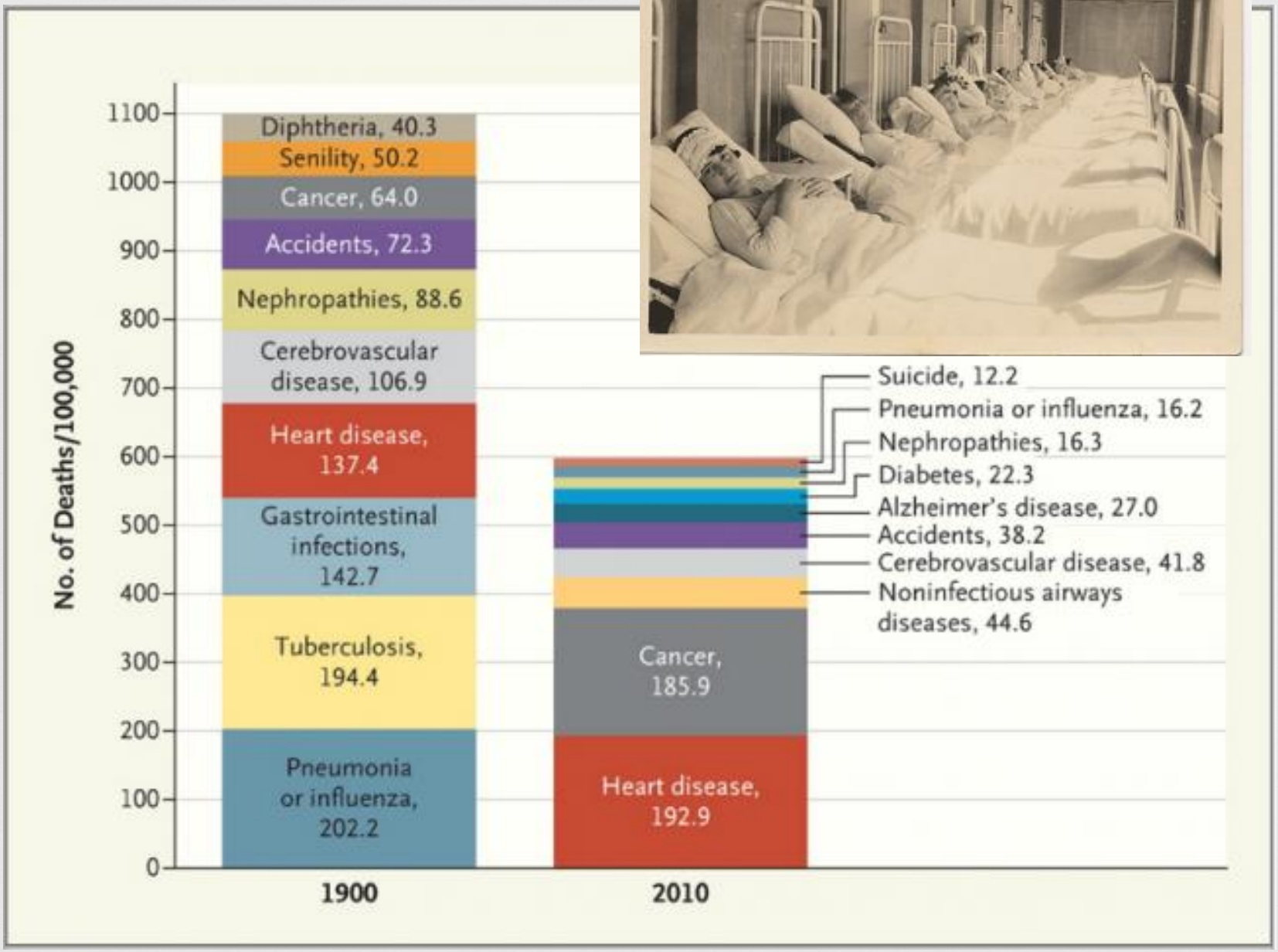
- What is going on in a particular situation/neighborhood/system

Theory of the problem

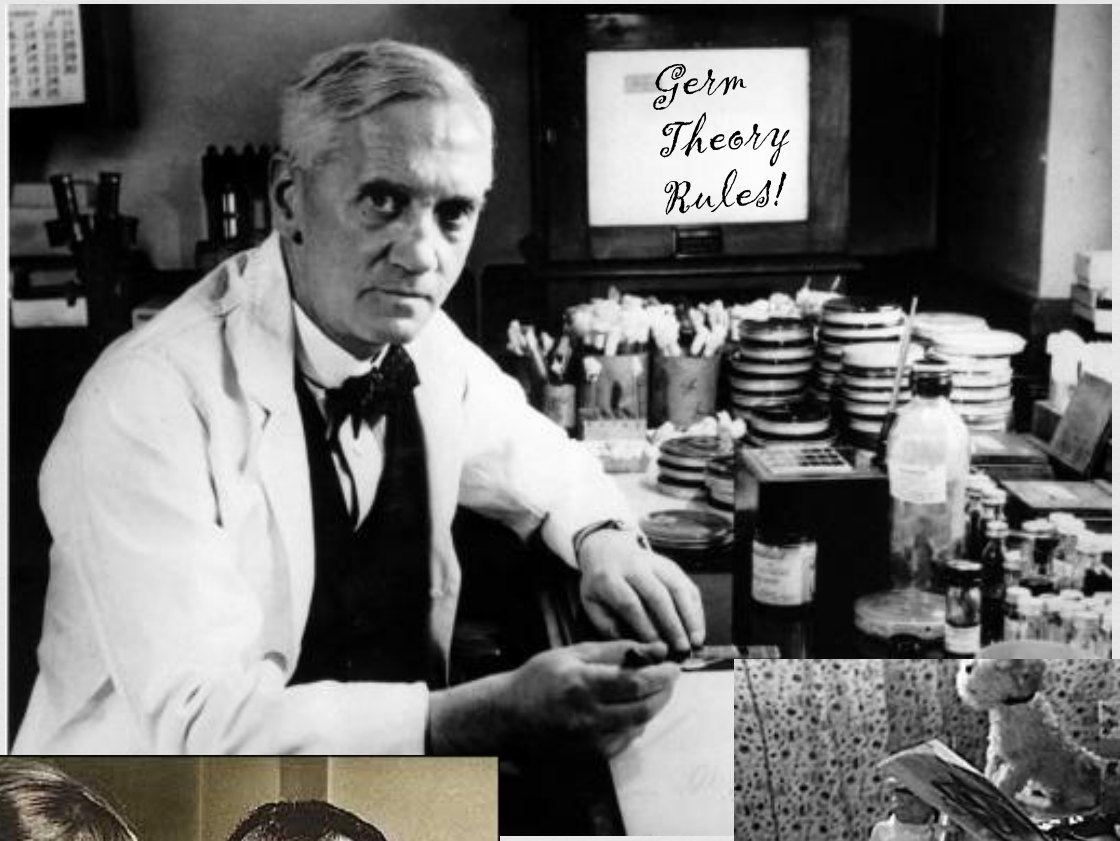
How will theory inform your research process?

- The question(s) that your research asks
- Data & measures of exposures & outcomes
- Populations you choose to study/compare
- The answers you find
- How you interpret & present them
- What "solutions" you recommend.....

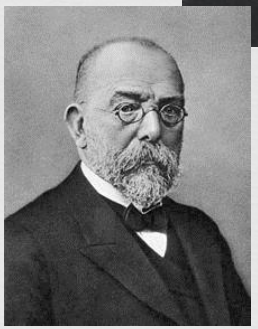
Top 10 causes of death: Then and now…



Alexander Fleming, 1928 (Penicillin)

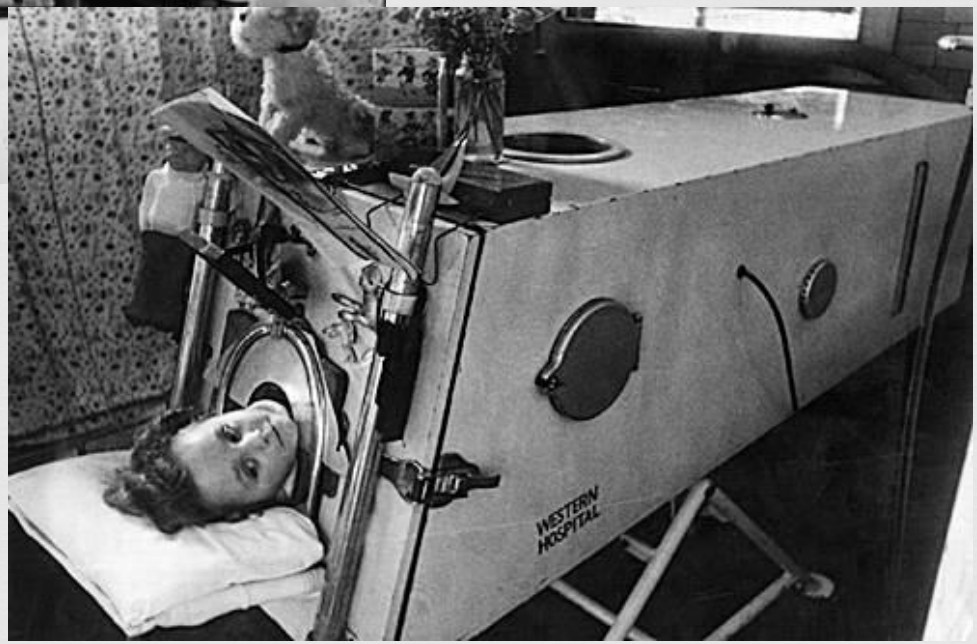


Pasteur



Koch

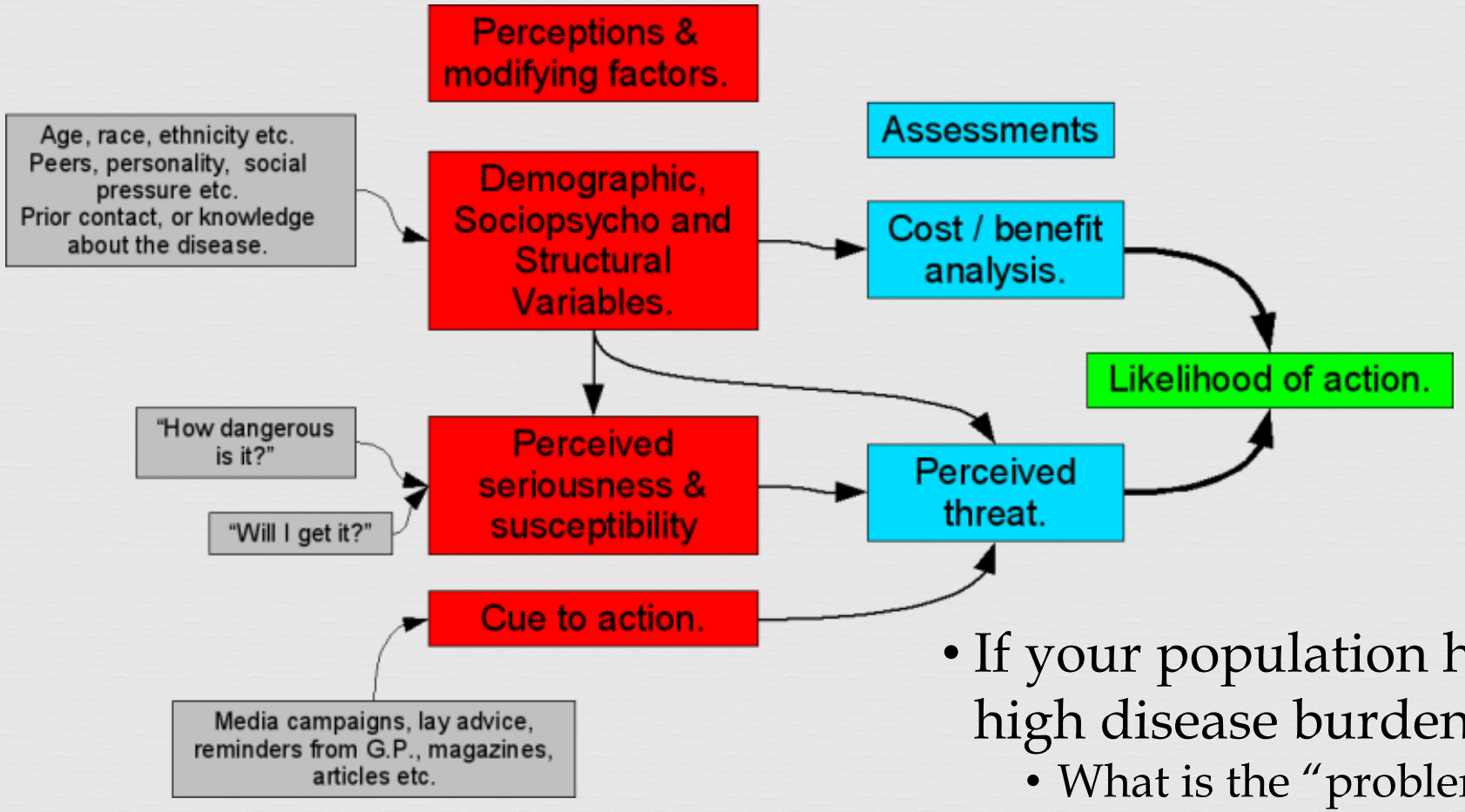
Salk



Polio Vaccine: 1955; Polio eradicated in U.S. 1962

Theories of health behavior

- Health Belief Model
  (USPHS, 1950's – to explain TB screening behaviors, costs/benefits)



- If your population has a high disease burden....
  - What is the "problem?"
  - What is the "solution?"

Theories of health behavior

- Stages of Change Theory

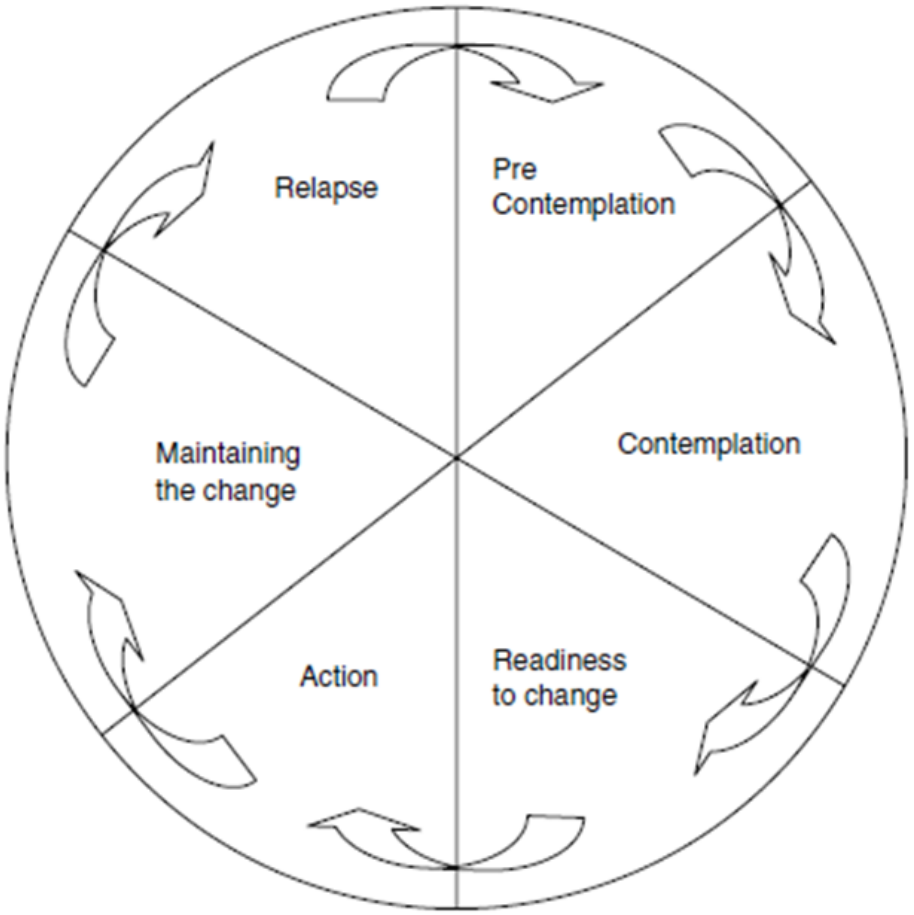


Figure 1.7 The transtheoretical model, adapted from Prochaska & Diclemente (1983)

- What is the "problem?"
- What is the "solution?"

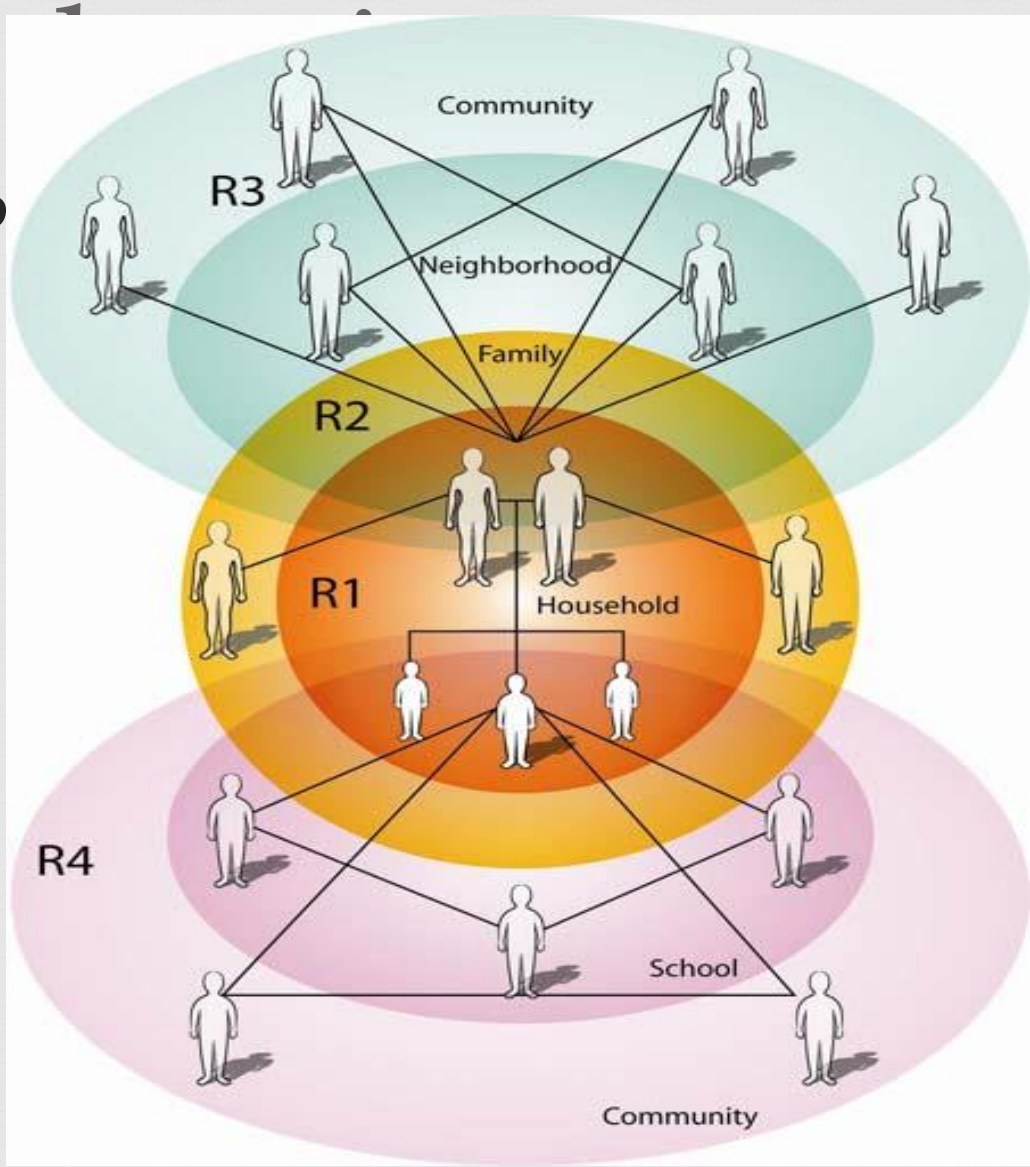
Theories of health behavior

- "Lifestyle"

- What health outcomes do you associate with "lifestyle?"
- What is the "problem?"
- What is the "solution?"

Community-based

- Social Network/Support Theories

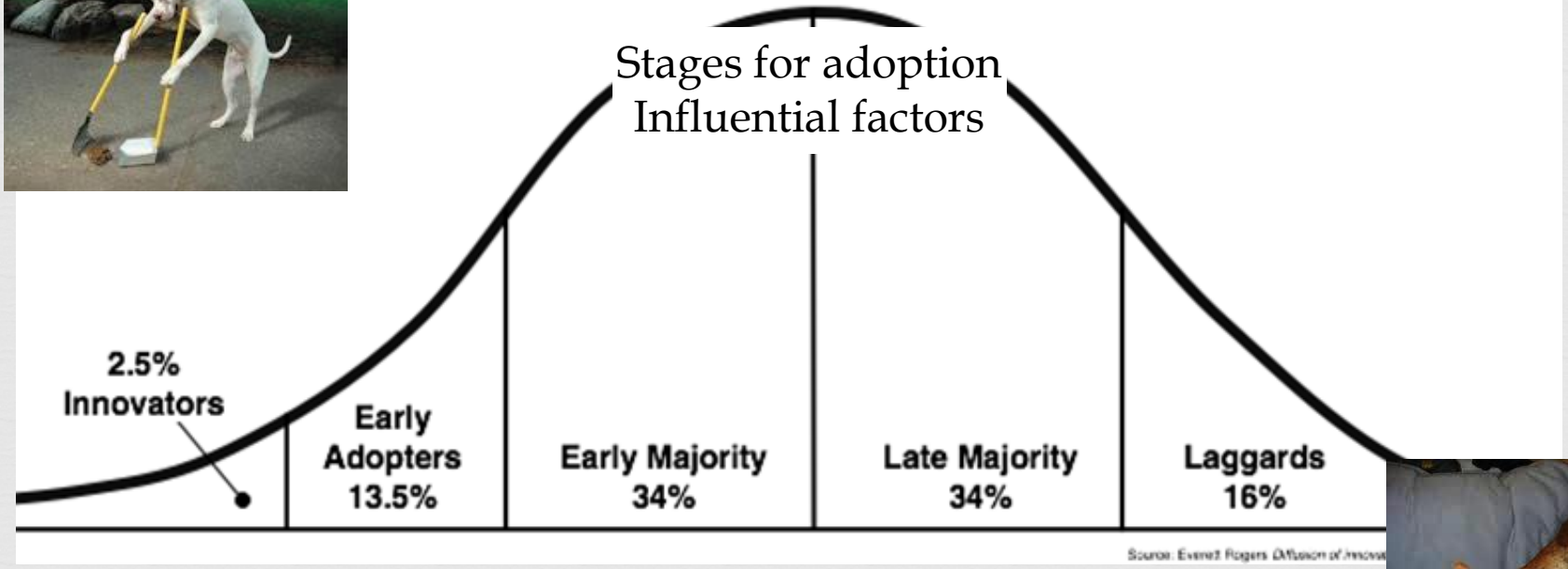


- What is the "problem?"
- What is the "solution?"

Community-based theories

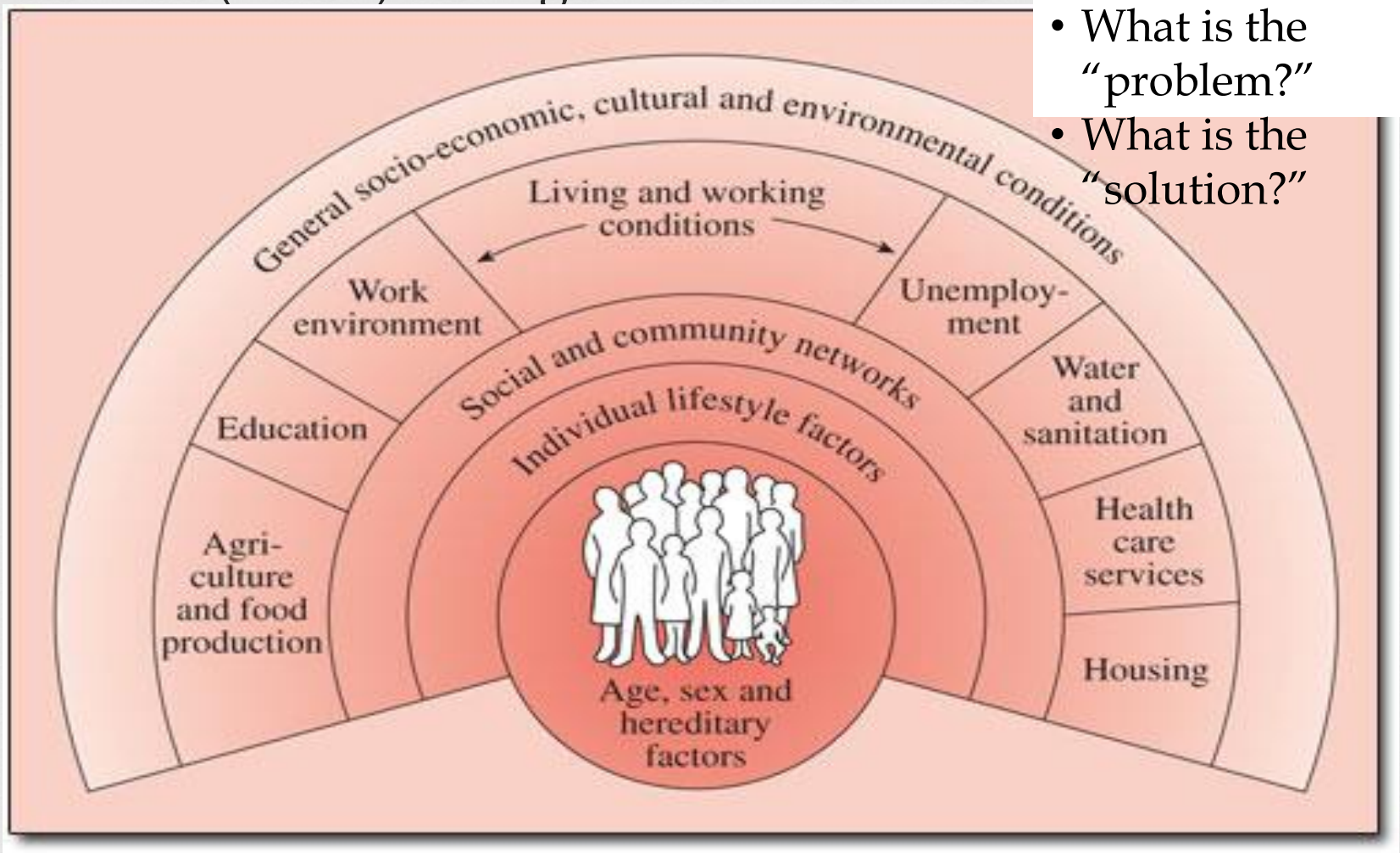
- Diffusion of Innovations theory
  - Marketing theory

- What is the "problem?"
- What is the "solution?"



Theories that (might) explain population patterns of health

- The (Social) Ecological model

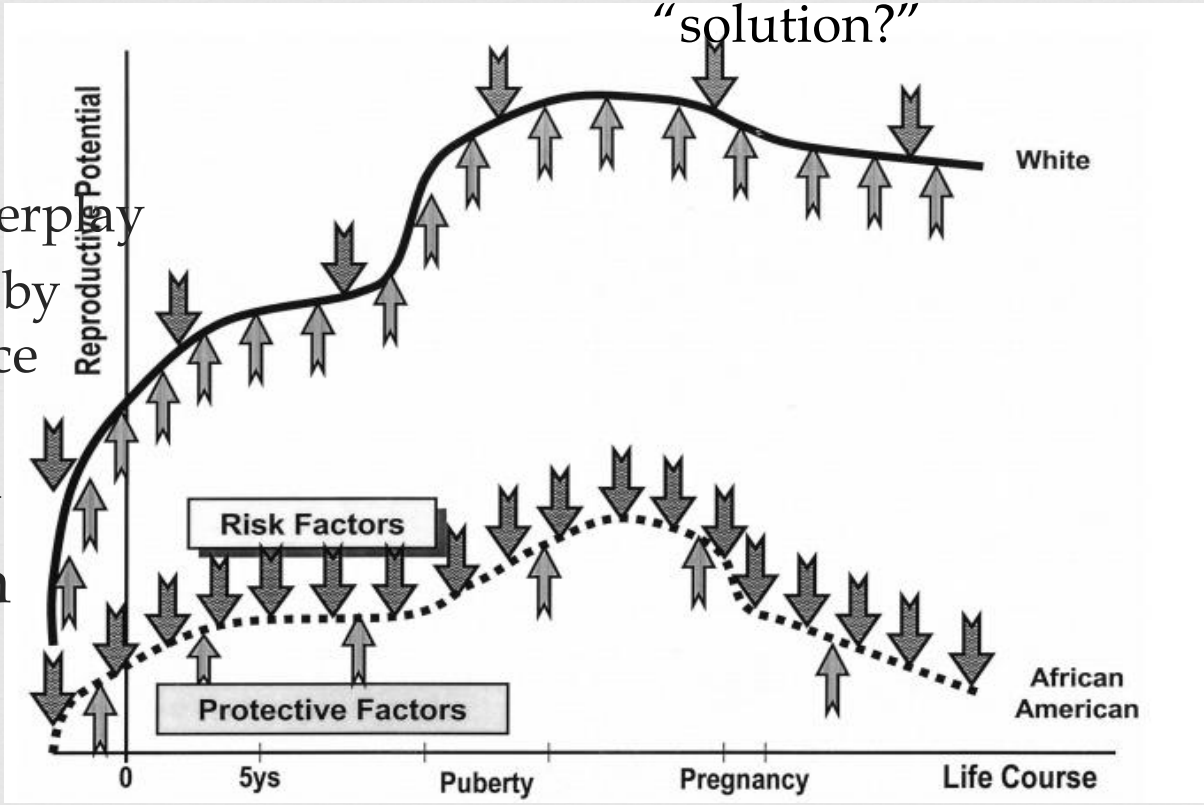


- What is the "problem?"
- What is the "solution?"

Theories that (might) explain population patterns of health

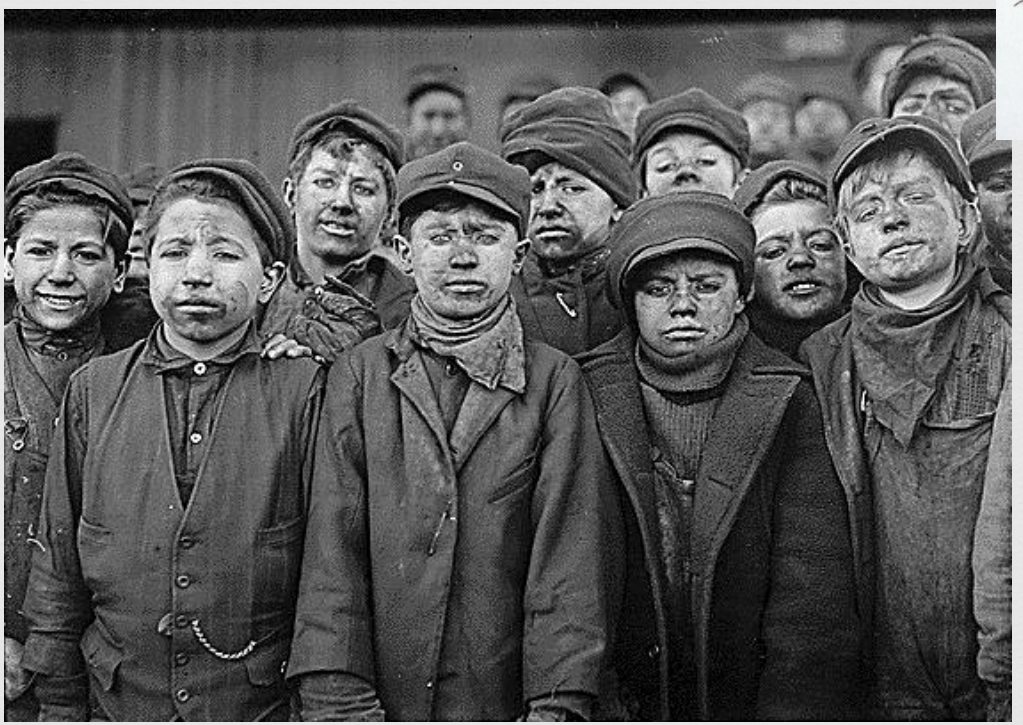
- Lifecourse theory/perspective
  - Key constructs:
    - Time & timing
    - Risk/resilience interplay
    - Exposures shaped by equity/social justice issues
  - Interventions now affect health down the road

- What is the "problem?"
- What is the "solution?"

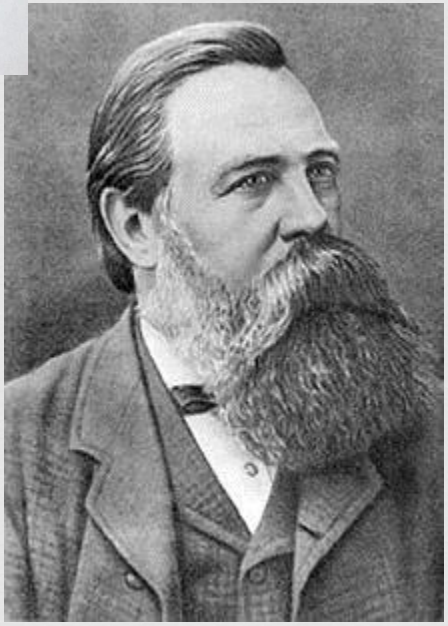


Theories that explicitly try to explain population patterns of health

- Political economy of health/Social production of disease
- Ecosocial Theory (Krieger, 199



- What is the "problem?"
- What is the "solution?"



Engels

You may be wondering.....

Why is this important?

Theory influences your work at every stage (whether you know it or not)

- **In any PH research, theory will shape:**
  - How you frame your questions
    - What knowledge/attitudes are related to substance abuse?
    - What early life experiences might lead to later maternal substance abuse?
    - Do experiences of racism put pregnant women at greater risk for substance abuse?
    - Does a sexist, capitalist economic system, structure job opportunities such that women are necessarily disadvantaged and stressed?

Why do moms do drugs???

Theory influences your work at every stage (whether you know it or not)

- **Theory will shape:** The data you collect (measures & "risk/resilience factors")
  - Moms' knowledge of drug abuse and fetal outcomes in this community
  - Maternal support groups? Child care services?
  - Social cohesion/capital/trust?
  - Availability of treatment/recovery services?
  - Prevalence of early childhood trauma in this community
  - Percent of families who experienced a low-skill job loss in the past year?
  - Gender-related experiences of stress among women of reproductive age in this neighborhood?

What do I need to find out about?

Theory influences your work at every stage (whether you know it or not)

- **Theory will shape:** Who is included in your study & how you categorize them
  - Will you bother to look at differences by race/ethnicity?
  - Will you categorize people by education level? And why?
    - Because you think the problem has something to do with "ignorance?"
    - Because better education leads to higher income, more opportunities & a less stressful life?

For whom is this a problem & why?

Theory influences your work at every stage (whether you know it or not)

- **And also, theory will shape:**
  - The answers you find!
    - Rates of substance abuse by:
      - Race/ethnicity? Age?
      - Nativity? Education?
      - Experiences of trauma?
    - Prevalence of drug knowledge/acceptability in your community?
    - Proximity of treatment centers?
    - Volume of social support & networks in the community?
    - Maternal stress levels?
    - Economic opportunities?

Theory influences your work at every stage (whether you know it or not)

- **Theory will shape:** How you interpret your findings...
- What do you make of your findings that:
  - **You find:** Lower educated moms had higher rates of illegal substance use?
    - Ignorance? Life opportunities? Early trauma?
  - **You find:** Recent African immigrant moms had lower rates of substance abuse compared to US-born African American moms?
    - More social support?
    - Religion/culture/knowledge?
    - Marital status?
    - Less poverty?
    - Less lifetime exposure to racism?

Theory influences your work at every stage (whether you know it or not)

- **And lastly, Theory will shape:**
  - What you conclude that you should do about "the problem"
    - Which populations to focus on?
    - Does this community need more:
      - Education?
      - Treatment services?
      - Jobs?
      - Opportunities to build social cohesion?
      - Funding for home-visiting?
      - Act at *multiple* levels (from individual to policy level)?
        - A la Social Ecological model...