HARVARD T.H. CHAN SCHOOL OF PUBLIC HEALTH

STANLEY CENTER FOR PSYCHIATRIC RESEARCH AT BROAD INSTITUTE

Module 1: Introduction and Measures in Epidemiologic Studies

Part 1: What is Epidemiology?

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1. What is Epidemiology?
2. Epidemiological Concepts
3. Measures of Disease Occurrence
4. Measures of Association
5. Measures of Impact

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1. **What is Epidemiology?**
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Part 1: What is Epidemiology?

Learning objectives:

- An overview of epidemiology;
- Understand the key roles of epidemiology;
- Understand the difference between clinical medicine and epidemiology.

What is Epidemiology?

Epidemiology:

- Root = Epidemic = rapid spreading of disease
- Greek: “EPI” = among
  “DEMOS” = the people

- Study of Diseases, OR
- Study of the Health of a Population

What is Epidemiology?

"The study of the distribution and determinants of disease frequency in human populations and the application of this study to control health problems"

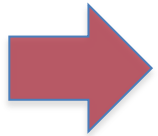
— Aschengrau and Seage

"Epidemiology is a science that aims to document the health status of populations and to assess factors that cause poor health within and across populations so that we may intervene."

— Katherine Keyes and Sandro Galea

What is Epidemiology?

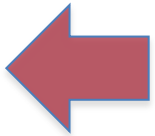
The study of the distribution and determinants of health-related states in specified populations, and the application of this study to control health problems



What is Epidemiology?

“Study”:

- Epidemiology is the basic science of public health.
- It's a highly quantitative discipline based on principles of statistics and research methodologies.



What is Epidemiology?

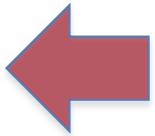
“Distribution”:

- Epidemiologists study the distribution of frequencies and patterns of health events within groups in a population.
- To do this, they use descriptive epidemiology, which characterizes health events in terms of time, place, and person.

What is Epidemiology?

“Determinants”:

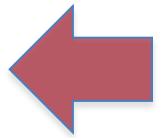
- Epidemiologists also attempt to search for causes or factors that are associated with increased risk or probability of disease.
- This type of epidemiology, where we move from questions of "who," "what," "where," and "when" and start trying to answer "how" and "why," is referred to as analytic epidemiology.



What is Epidemiology?

"Health-related states":

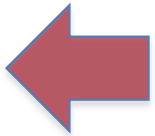
- Although infectious diseases were clearly the focus of much of the early epidemiologic work, this is no longer true.
- Epidemiology as it is practiced today is applied to the whole spectrum of health-related events, which includes chronic disease, environmental problems, behavioral problems, and injuries in addition to infectious disease.
- Beliefs and attitudes towards specific groups of individuals



What is Epidemiology?

“Populations”:

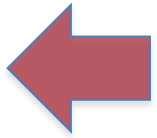
- One of the most important distinguishing characteristics of epidemiology is that it deals with groups of people rather than with individual patients.



What is Epidemiology?

"Control":

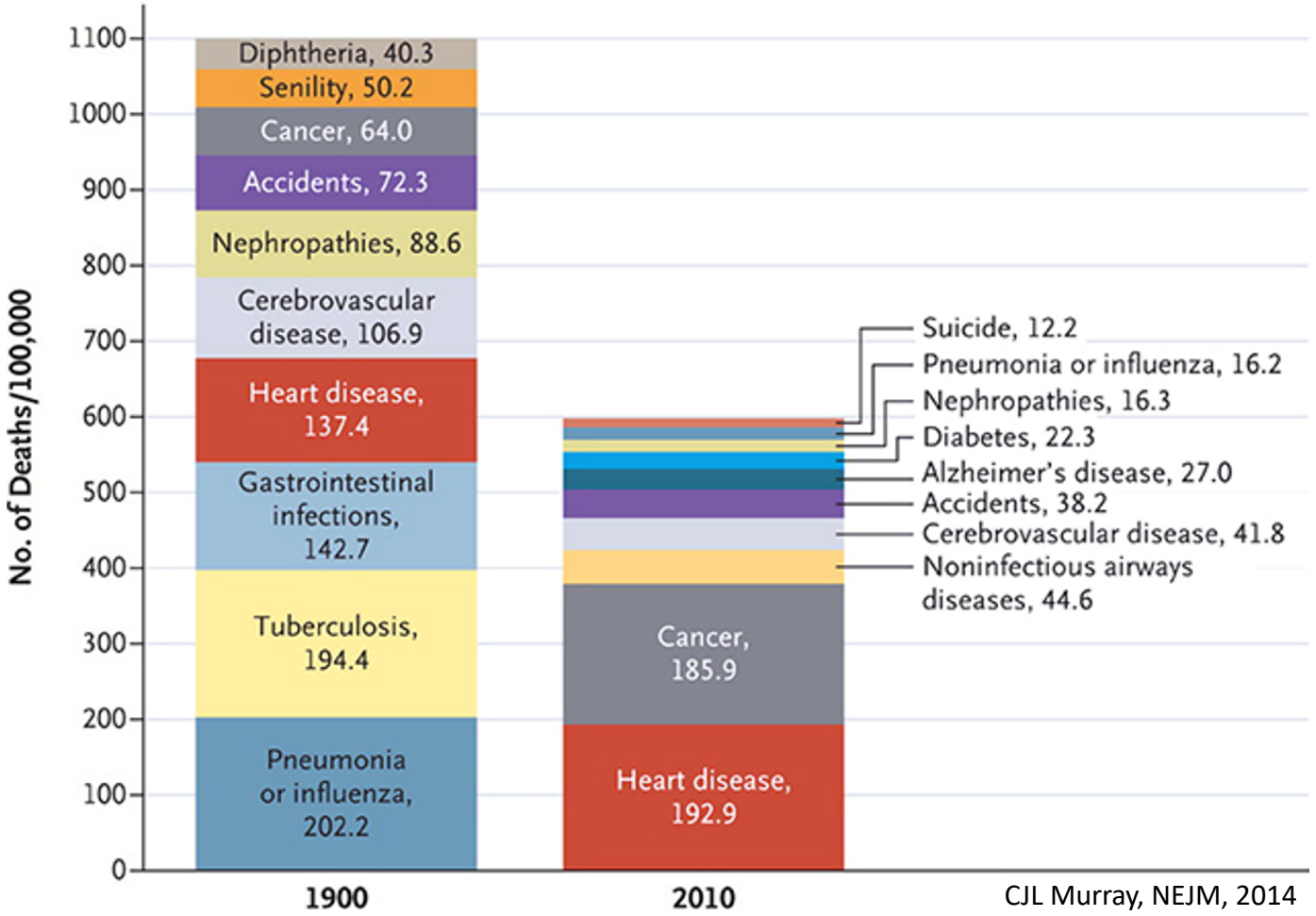
- Finally, although epidemiology can be used simply as an analytical tool for studying diseases and their determinants, it serves a more active role.
- Epidemiologic data steers public health decision making and aids in developing and evaluating interventions to control and prevent health problems. This is the primary function of applied, or field, epidemiology.



Roles of Epidemiology

- Description
- Prediction
- Causal Inference

Roles of Epidemiology – Description

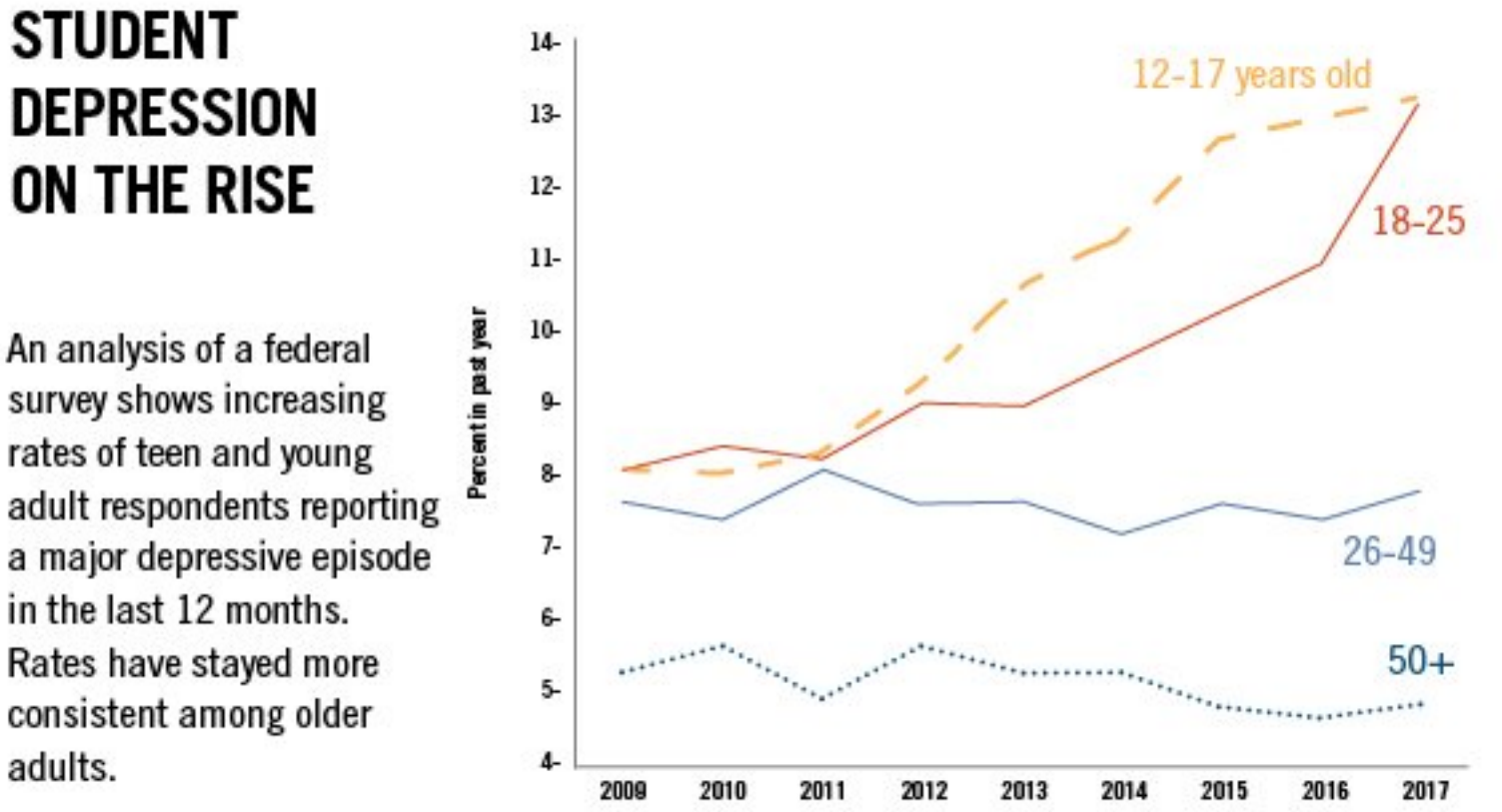


CJL Murray, NEJM, 2014

Example:

- Top causes of mortality in the US in 1900 and 2010

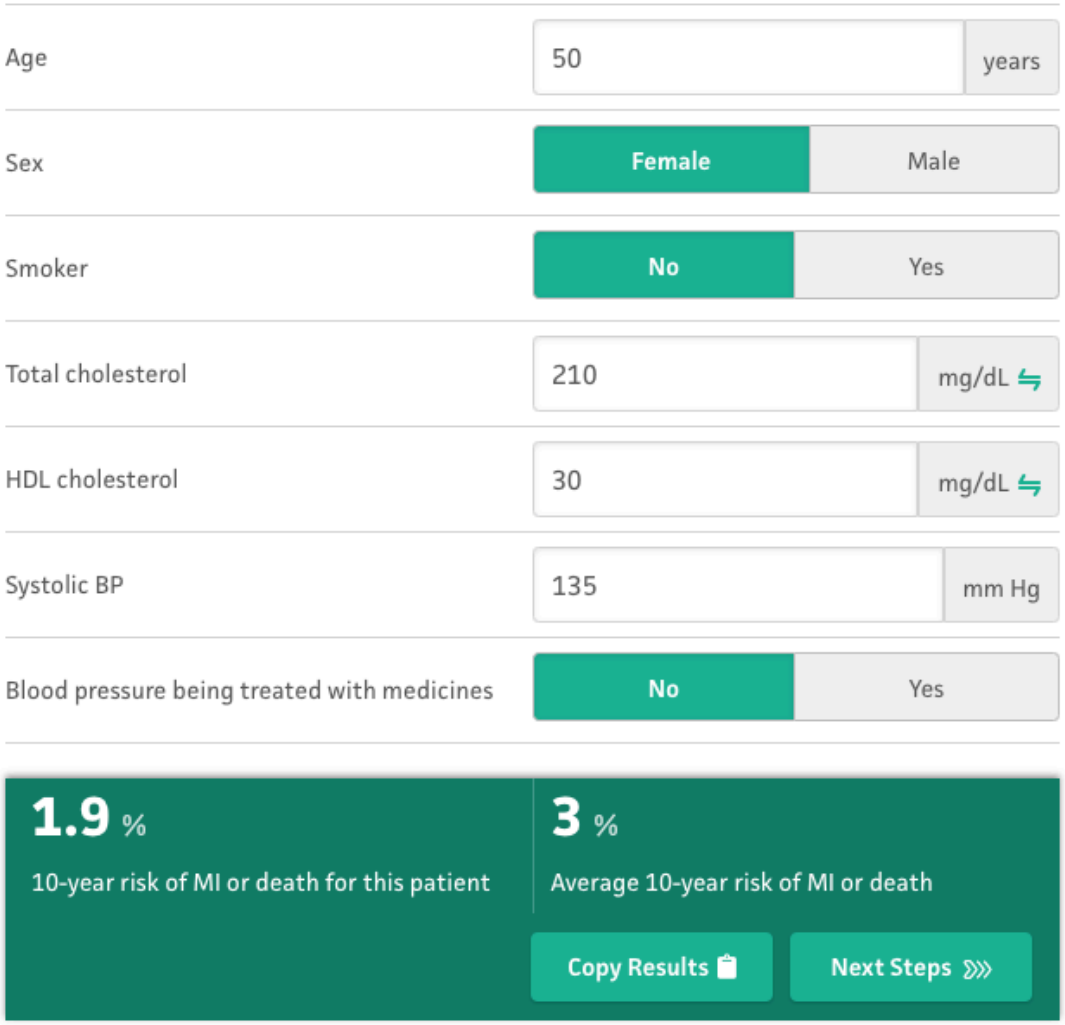
Roles of Epidemiology – Description



Example:

- Depression rate in the US over time by age group

Roles of Epidemiology – Prediction



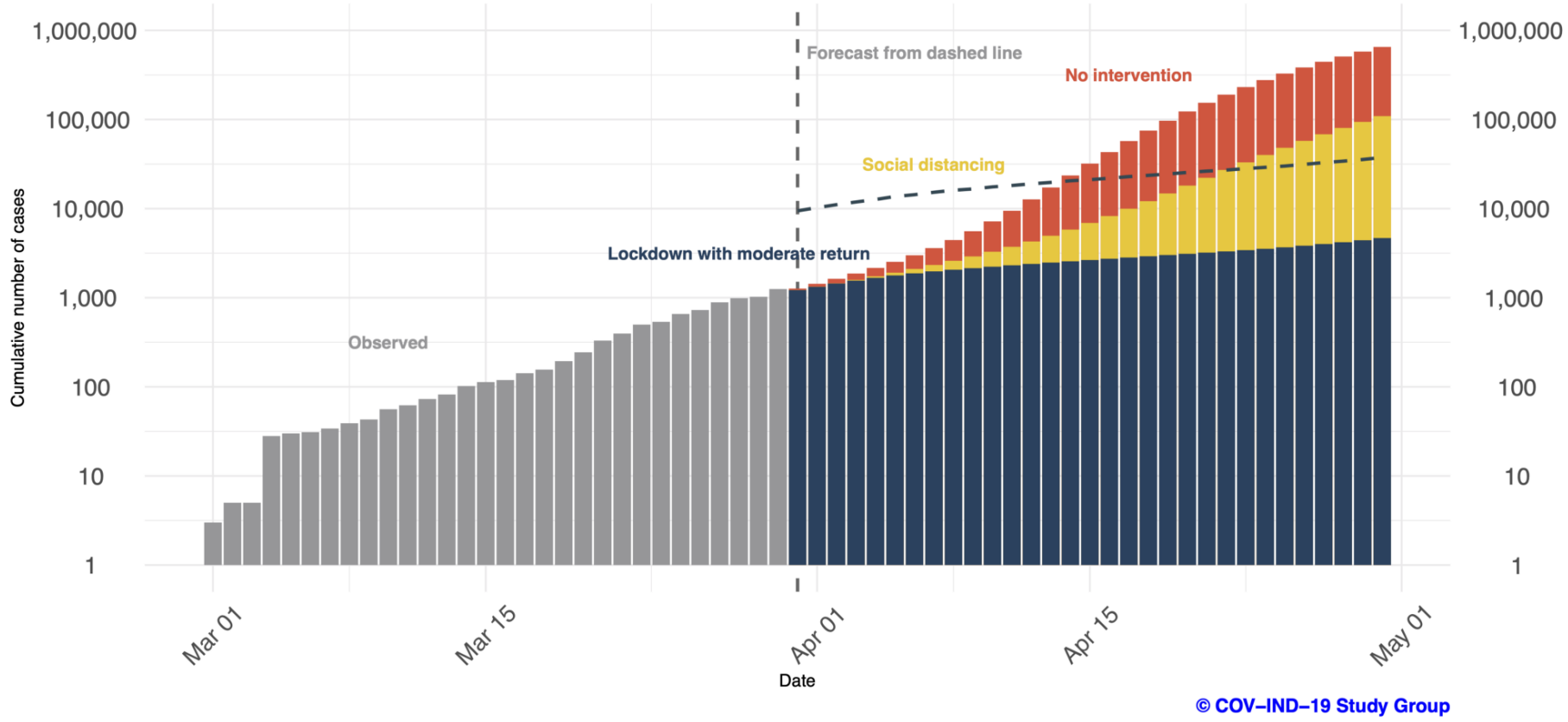
Example:

- Framingham Risk Score for Hard Coronary Heart Disease

Roles of Epidemiology – Prediction

Example:

- Prediction of COVID-19 cumulative cases in India



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Roles of Epidemiology – Causal Inference

Causal claims and associations are commonly seen in the literature and often picked up by the media

NEWSLETTER MEDICALNEWSTODAY

Will climate change increase suicide rates?

Written by Tim Newman on July 28, 2018 — Fact checked by Jasmin Collier

Global warming seems set to impact almost every facet of our lives. A new study predicts that it might also increase suicide rates in the United States and Mexico.

WebMD SIGN IN SUBSCRIBE SEARCH

Binge-Watching TV: Sign of Depression, Loneliness?

Researchers say hours and hours of viewing often isn't just harmless fun

FROM THE WEBMD ARCHIVES

By Robert Preidt

HealthDay Reporter

THURSDAY, Jan. 29, 2015 (HealthDay News) -- Binge-watching television is linked with feeling lonely and depressed, a new study suggests.

"Even though some people argue that binge-watching is a harmless addiction, findings from our study suggest that binge-watching should no longer be viewed this way," study author Yoon Hi Sung said in a news release from the International Communication Association.

The study included more than 300 people. They were between the ages of 18 and 29. The researchers asked about their TV viewing habits and their moods.

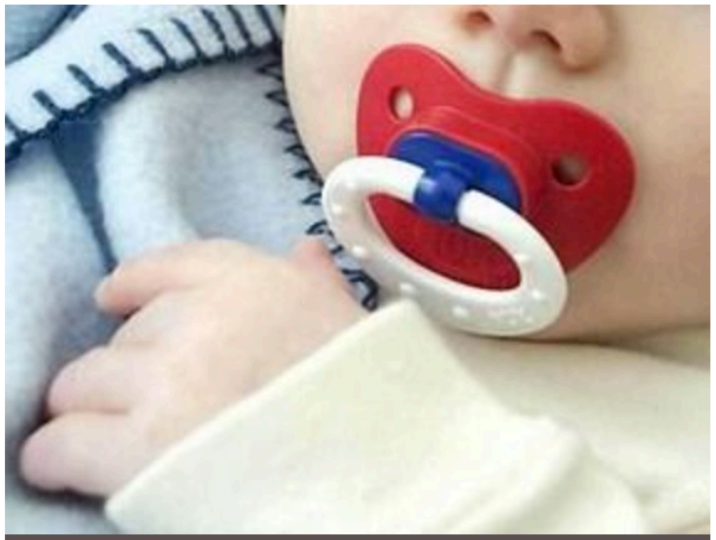
Roles of Epidemiology – Causal Inference

Dummies 'cause speech defects'

ALLOWING children over three to use a dummy can triple their chance of suffering speech problems, a study suggests.

By VICTORIA FLETCHER
PUBLISHED: 00:00, Wed, Oct 21, 2009

SHARE TWEET 1



Dummies restrict speech sounds []

Experts say it is further evidence that children should not be given dummies unless they are going to sleep. Researchers looked at 128 children between the ages of three and five.

Their parents were asked to fill in a questionnaire about whether they were breast or bottle fed, if they used dummies, if and how often they sucked their thumbs.

ORIGINAL ARTICLE

Evidence-based medicine: assessment of knowledge of basic epidemiological and research methods among medical doctors

L Novack, A Jotkowitz, B Knyazer, V Novack

Postgrad Med J 2006;**82**:817–822. doi: 10.1136/pgmj.2006.049262

See end of article for authors' affiliations

Correspondence to: V Novack, Division of Internal Medicine,

Background: An understanding of statistical methods and basic epidemiology are crucial for the practice of modern medicine.

Aims: To assess (1) the knowledge of basic methods of conducting research and data analysis among residents and practicing doctors and (2) the effect of country of medical school graduation, professional status, medical article reading and writing experience on the level of this knowledge.

Methods: Data were collected by means of a supervised self-administered questionnaire, which was distributed among doctors at Soroka Medical Center, Beer-Sheva, Israel. The questionnaire included 10 multiple-choice questions on basic epidemiology and statistics, and respondent demographical data.

Results: Of the 260 eligible doctors, 219 (84.2%) returned completed questionnaires. Of the 219 doctors, 50% graduated more than 8.5 years ago, 39.7% were specialists and the remaining were residents. The most frequent specialty was internal medicine (37.4%). Israel was the most frequent country of graduation (45.7%), followed by the former Soviet Union (Eastern medical education; 38.4%). The median total score

Table 3 Habits of reading and publishing of medical artides

	Total, n = 219	Eastern medical education, n = 84	Western medical education, n = 135	p Value
Number of papers read/week, %				
0	3.7	3.6	5.8	0.15
1–2	61.1	68.7	56.4	
3–5	23.6	22.9	24.1	
6–10	7.4	2.4	10.5	
>10	4.2	2.4	5.3	
Number of published papers, %				
0	26.6	38.6	20.7	0.003
1–5	37.0	40.4	35.3	
6–10	12.7	8.8	14.7	
11–15	1.2	3.5	—	
>15	22.5	8.8	29.3	
Parts of a paper usually read, %				
Abstract	86.9	74.4	94.5	<0.001
Background	55.8	46.2	61.7	0.03
Methods	40.5	30.8	46.5	0.03
Results	70.9	59.0	78.1	0.003
Discussion	80.6	76.9	82.8	0.30

*Mann–Whitney U test.

Clinical Medicine vs. Epidemiology

Clinical medicine:

- Results relate to individuals
- Sick people
- Aimed at treatment

Epidemiology/Public Health:

- We study groups of people, not individuals
- We study well people, in addition to sick people
- We try to see the trait that is common to the sick, yet rare in the well—aimed at prevention

Example: Post-traumatic Stress Disorder (PTSD)

Clinical medicine:

- What specific symptoms does the individual have?
  - E.g. re-experiencing, hyperarousal, avoidance
- What is the cause of PTSD for a specific individual?
  - E.g. physical abuse, loss of a loved one
- What is the best treatment for that individual?
  - E.g. cognitive behavioral therapy

Epidemiology/Public Health:

- What are the causes and determinants of PTSD more generally in a population?
  - E.g. trauma exposure, racism, war, genetics, existing mental illness, etc.
- What can be done about it at population level?
  - E.g. school programs for stress coping

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