

## 18. Overview and Conclusion

*A look backward on what has been covered and forward towards where the field is going.*

### **What is an “epidemiologic perspective”?**

- Population orientation – increasingly, a global orientation
- Problem-oriented / multidisciplinary
- Breadth/challenge – in principle can address any health-related problem – or *any* problem?
- Prevention emphasis
- Sees society as the organism – interconnectedness among all facets

### **Epidemiology “successes” and “not-yet-successes”**

- Cholera - John Snow
- Pellagra - Joseph Goldberger
- Rubella and birth defects - Gregg
- Fluoride and dental caries
- Cigarette smoking and lung cancer
- Blood pressure, cholesterol, smoking, fitness and CHD/CVD
- Legionnaire’s disease
- Breast cancer
- Prostate cancer
- Pancreatic cancer
- Adolescent pregnancy
- Sexually transmitted diseases
- HIV/AIDS
- Drug use
- Violence
- Environmental protection

- Health for all

### **What contributes to success?**

- Specific disease definition
- Biological reasoning and measures, laboratory research
- Individual-level measures of disease
- Heterogeneity of exposure within groups
- The epidemiologic perspective handed down over generations. But the practice of epidemiology as we know it is largely a product of the last 50 years.

### **Epidemiologic methods have developed rapidly**

- Elaboration of epidemiologic theory - case-control studies, epidemiologic measures, randomized trials
- Computing revolution - data management, database linkage, mapping and geographical databases, computer-based data collection
- Statistical analysis methods - many new techniques, e.g., logistic regression, proportional hazards, longitudinal analysis, simulations
- More accurate and precise measures - revolutions in biochemical and molecular biology
- Communications, organizational, and management innovations - for large studies
- But there is also a recurrent concern about the effects on the field of some of these advances, e.g.:

“Perhaps the most dangerous aspect of the state of our discipline today is that there is an unhealthy emphasis on HOW one conducts an epidemiologic study and not WHY and WHAT one does in such a study. Simply put, we are training technocrats. As Lionel Beak so aptly stated (14): ‘In teaching, there is often excessive emphasis on how rather than what or why. Efforts are made to train men [sic!] who are technically competent. The end has been more vocationalism. ... And many administrators, and faculty, who have played a significant role in bringing this about readily assume that this is how it must or should be.’ This trend has been further emphasized by technologic developments in computation which allow one to deal automatically with masses of data in a mechanical and thoughtless manner. More attention and emphasis must be given to reasoning about the various types of data that are collected and analyzed.”

147-148 in Abraham M. and David E. Lilienfeld. Epidemiology and the public health movement: a historical perspective. *Journal of Public Health Policy* 1982; 3:140-149.

## Epidemiology is expanding

- In recent decades, epidemiology has enjoyed enormous growth, expanding opportunities and horizons, and growing recognition from other disciplines:
- Growing awareness of public health-related issues and acceptance (after World War II) of role of government
- Chronic diseases - substantial National Institute of Health funding for epidemiologic research
- Growth of environmental and occupational health regulations - epidemiology is a major source of the evidence
- Litigation - epidemiology in the courtroom (Benedectin, breast implants, tobacco liability, ...)
- Epidemiology is increasingly seen as source of research skills and techniques for clinical research
- Corporate as well as public sponsors
- Surge of managed care is creating new demands
- New schools of public health, new epidemiology departments, new research units
- International expansion

## Is epidemiologic research becoming more difficult?

- Rarer conditions, larger studies
- Very low level exposures
- Subtle relationships/weak effects
- Constructs difficult to define and measure (psychiatric, behavioral, psychosocial, community) as outcomes and exposures
- Understudied populations - researchers unfamiliar, populations disaffected and distrustful, ethical and political concerns
- Greater sensitivity to human subjects issues - truly informed, truly consenting, privacy protection
- Intervention studies [“ . . . I think that we need to face up to the difficulties of doing intervention trials. We talk of experimental epidemiology, but we do very little of it. It is extremely difficult. . . . I think that we just need to face up to the need for doing more experimental epidemiology.” (Sir Richard Doll, interview with *Epidemiology Monitor*)]

## **Challenges in the environment for epidemiology**

- Rising expectations of what epidemiology can do and how quickly – the public (and sponsors) wants not just leads, but answers.
- Media interest and publicity – too much and too soon? (abetted by marketing imperatives and fund-raising).
- Link between academic epidemiology and public health practice has weakened – academic epidemiology has its own perspectives and objectives – Milton Terris argues that the rise of academic epidemiology has led to an overemphasis on statistics, analysis, and hypothesis tests at the expense of biological thinking and hypothesis creation.
- Universities increasingly dependent upon research project funding. → Not “funding for what?”, but “what for funding?”: The ivory tower → The ivy-covered corporate tower?
- Competing priorities for public funds
- All sponsors are looking for marketable results, impact

## **What sets priorities for research funding**

- Public health policy process (Objectives for the Nation)
- New, expanding, and feared diseases (HIV, TB, Alzheimer’s disease)
- Increased recognition for existing problems (injury, teen pregnancy)
- Political process (cancer, HIV, minority health, women’s health, aging)

## **“Academic-Industrial Complex” (cf. Eisenhower’s warning about the Military-Industrial Complex)**

- Peer review, peer influence
- Research institutions
- Drug industry sponsorships of research, conferences, publications
- Insurance industry
- Corporate health care
- American Medical Association – political contributions and lobbying

## **Limits on funding**

- Era of limits
- Costs are rising - inflation, technology, expectations, quality, Big Science
- More investigators, more institutions

- More reliance on “soft money” – research funding as an engine of growth

### **Growing ability to meet challenges**

- Researchers - more and better trained
- Increasing diversity (gradual!) in the profession
- Theoretical and methodologic development (EPID leisure class)
- Record keeping and bureaucratization - megagovernment, megacorporations, megahealthcare - computerized information
- Computers and software - more powerful, more available, more friendly, more customized, more intelligent
- Measurement (automatic readout, continuous monitoring)
- Pattern recognition (e.g., ECG reading, CT scan)
- Record linkage
- Routine surveillance/follow-up
- Larger datasets
- New analytic procedures
- Molecular biology revolution
- New assays
- New understanding [“So I think that epidemiologists have to become much more biochemically and biologically minded than some are nowadays.” (Sir Richard Doll, interview with the *Epidemiology Monitor*)]

### **Epidemiologists’ wish list**

- Biological markers of past exposure (e.g., diet) (need a “C14 for epidemiology”)
- Ways to measure social and behavioral variables
- Ways to understand social factors and disease in the context of social as well as physical environment

### **Some fundamental questions**

#### ***What is epidemiology?***

- Do epidemiologists compromise their scientific credibility if they become advocates?
- Must epidemiology deal with “disease” or can it address any event, condition, or characteristic?

- What kind of population is required to be “population-based” – geographic?, worksite?, health care provider?, patients with a medical condition?, . . .?

***What are the goals of epidemiology / public health?***

- Prolong life? How long? Life expectancy 80 years?, 90 years?, 100 years? 150 years?
- Should we extend life as long as we can consistent with good quality of life? How much life does a generation have a “right” to? What is our generation’s “fair share”?
- Does the effect on the environment matter? Can the earth become too crowded?
- What do we think about a guest who never leaves?

***What determines health?***

- What we don’t know (e.g., Alzheimer’s disease, arthritis, breast cancer, pancreatic cancer, prostate cancer) or don’t know enough (cardiovascular disease, stroke, . . .)
- What we do know but don’t know how to change (e.g., smoking, drugs, violence, risky sexual behavior, . . .)
- What we know how to change but do not (e.g., pure drinking water, good sanitation, immunization, breast feeding, preventive health care, environmental protection, unplanned pregnancy, sexually transmitted diseases, food, housing, transportation, physical security, . . .)
- Collective consciousness?

***Is public health a noble calling?***

Many people pursue self-aggrandizement. Public health professionals pursue a better life for all. But we also want to be paid to do that. Thus we experience diverse and sometimes conflicting attractions, responsibilities, and demands:

|                                       |                  |
|---------------------------------------|------------------|
| Science                               | Management       |
| Curiosity                             | Quality control  |
| Imagination                           | Personnel        |
| Creativity                            | Regulations      |
| Collegiality                          | Money            |
| Dissemination                         | Public relations |
| Idealism                              | Practicality     |
| Pursue knowledge<br>and understanding | Get a job        |
| Improve public health                 | Get grants       |
| Help the disadvantaged                | Get publications |
| Share freely                          | Get more grants  |
| Assist others                         | Get known        |
|                                       | Get ahead        |

This is not a new challenge\*.

Epidemiology seeks knowledge to improve health for all. Knowledge may not be enough to improve health. Powerful forces – geologic, meteorologic, microbiologic, economic, cultural, political -- work to counter changes that would advance public health (e.g., lead, tobacco, global warming, handguns, reproductive health, political extremism, pollution, war and violence). But knowledge is certainly key in alerting us that change would be beneficial and can help to build a consensus to bring about change. Can knowledge reveal how to reconcile conflicting imperatives among economics, politics, religion, culture, ecology, and health? That may be the ultimate challenge for epidemiology.

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\* My teacher, Bert Kaplan, is fond of quoting the renowned rabbi, Hillel: “He used to say, If I am not for myself, who will be for me? And if I am only for myself, what am I? And if not now, when?” *Sayings of the Fathers (or Pirke Aboth)*, translated by Joseph H. Hertz. NY, Behrman House, 1945, I-14. [The commentary adds that “for myself” is “far more than merely a rule of worldly wisdom. ‘If I do not rouse my soul to higher things, who will rouse it?’ (Maimonides).”]

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