

Basic concept of Epidemiology

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What is Epidemiology?

“Epidemiology is the study of how disease is distributed in the populations and the factors what influence or determine this distribution.”

“Epidemiology is the study of the distribution and determinants of the health related states or events in specified populations and the application of this study to control of health problems.” – A Dictionary of Epidemiology, ed 2. New York, Oxford University Press, 1988.

WHO definition of Epidemiology

"The study of the distribution and determinants of health and disease in human populations to enable health services to be planned rationally, disease surveillance to be carried out, and preventive and control programs to be implemented and evaluated."

The objectives of Epidemiology

1. To identify the etiology or the cause of a disease and the risk factors- that is, factors that increase a person's risk for a disease.
2. To determine the extent of disease found in the community.
3. To study the natural history and prognosis of disease.

Objectives contd....

4. To evaluate both existing and new preventive and therapeutic measures and modes of health care delivery.
5. To provide the foundation for developing public policy and making regulatory decisions relating to environmental problems.

History of Epidemiology

- Hippocrates onward: miasma and health
- Population mortality: 1600's onwards
- Quantitative methods: France in the 1800's
- English sanitary physicians: the 1800's
- The bacteriologic revolution: the 1800's on
- Infectious disease epidemiology: TB, malaria, HIV/AIDS, cholera, influenza
- The rise of "chronic disease epidemiology": 1950's onwards
- The speciation of epidemiology: from the 1970's
- New fields: Clinical epidemiology, genetic epidemiology, molecular epidemiology

History of Epidemiology

Pioneers

- John Graunt
- James Lind
- Charles-Alexander Louis
- William Farr
- John Snow
- Wade Hampton Frost
- A. Bradford Hill/Richard Doll

Changing patterns of community health problems

CHOLERA.

THE

DUDLEY BOARD OF HEALTH,

HEREBY GIVE NOTICE, THAT IN CONSEQUENCE OF THE

Church-yards at Dudley

Being so full, no one who has died of the **CHOLERA** will be permitted to be buried after **SUNDAY** next, (To-morrow) in either of the Burial Grounds of *St. Thomas's*, or *St. Edmund's*, in this Town.

All Persons who die from **CHOLERA**, must for the future be buried in the Church-yard at Netherton.

BOARD of HEALTH, DUDLEY.
September 1st, 1839.

A sign in cemetery in Dudley, England, in 1839. (from Dudley Public Library, Dudley)

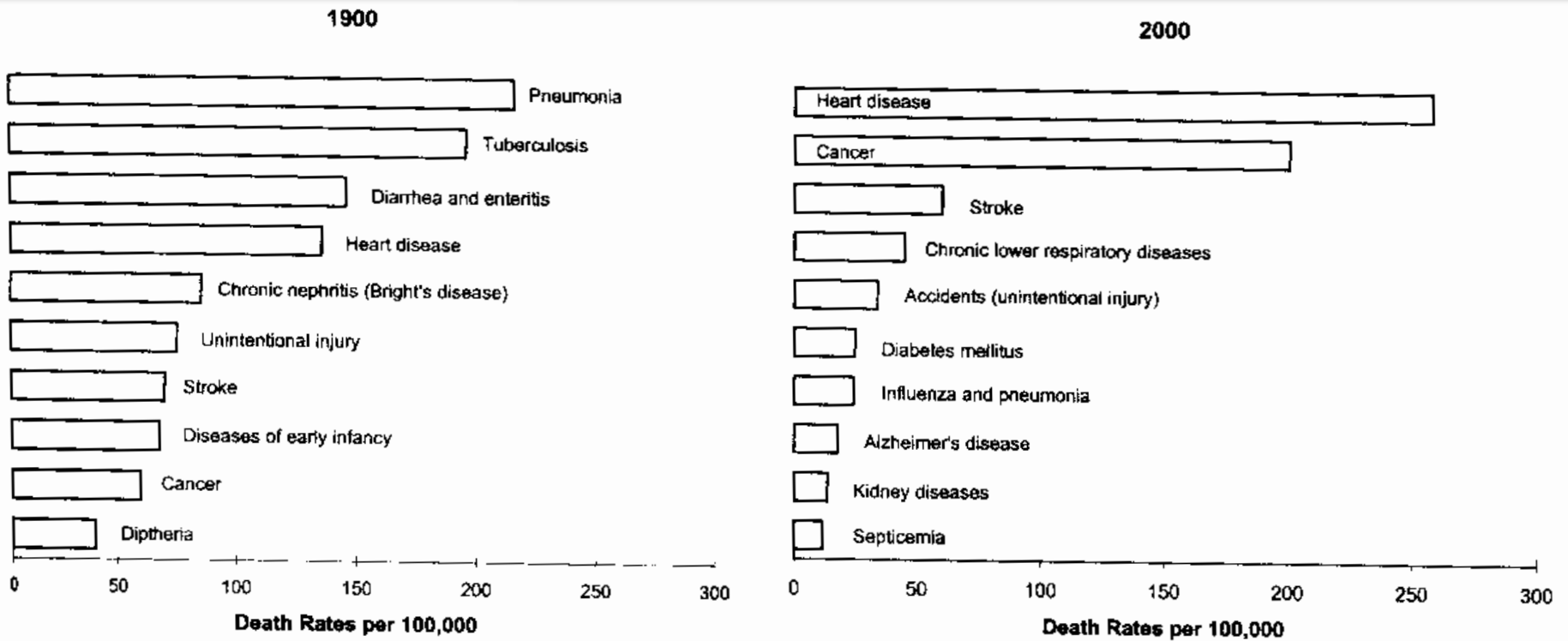


FIGURE 1-2 ▼ Ten leading causes of death in the United States, 1900 and 2000. (Redrawn from Grove RD, Hetzel AM: Vital Statistics Rates of the United States, 1940–1960. Washington, DC, US Government Printing Office, 1968; and National Center for Health Statistics, National Vital Statistics Report, Vol 49, No. 12, October 9, 2001.)

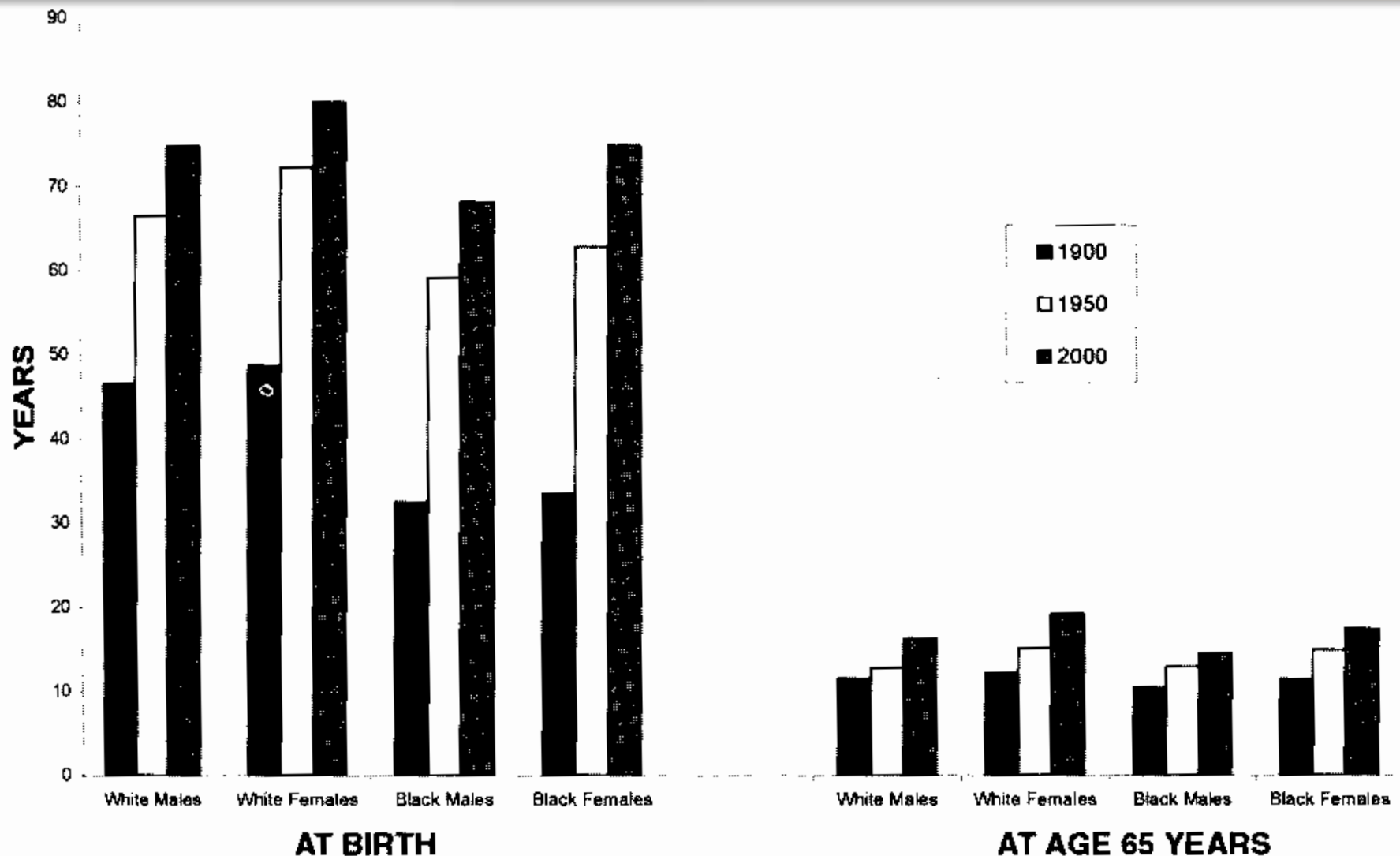


FIGURE 1-3 ▼ Life expectancy at birth and at 65 years of age, by race and sex, United States, 1900, 1950, and 2000. (Redrawn from National Center for Health Statistics: Health, United States, 1987 DHHS publication no. 88-1232. Washington, DC, Public Health Service, March 1988. National Center for Health Statistics: National Vital Stat Rep 49, no. 12, October 9, 2001.)

Epidemiology and prevention

- Identifying subgroups in the population who are at high risk.
 - Proper direction of preventive efforts
 - Identify modifiable and non-modifiable factors or characteristics
- Prevention
 - Primary
 - Secondary
- Approach
 - Population based
 - High-risk

Epidemiological approach

- Association between exposure to a factor and development of a disease
 - **Is the association statistically significant?**
 - **Can it be explained by bias?**
- Is the relationship causal?
 - **Is the association consistent with other data?**
 - **Are the criteria for causality met?**

Example

- Flouride and dental caries

DMF Teeth per 100 Children with Permanent Teeth

ent Teeth)
1000
900

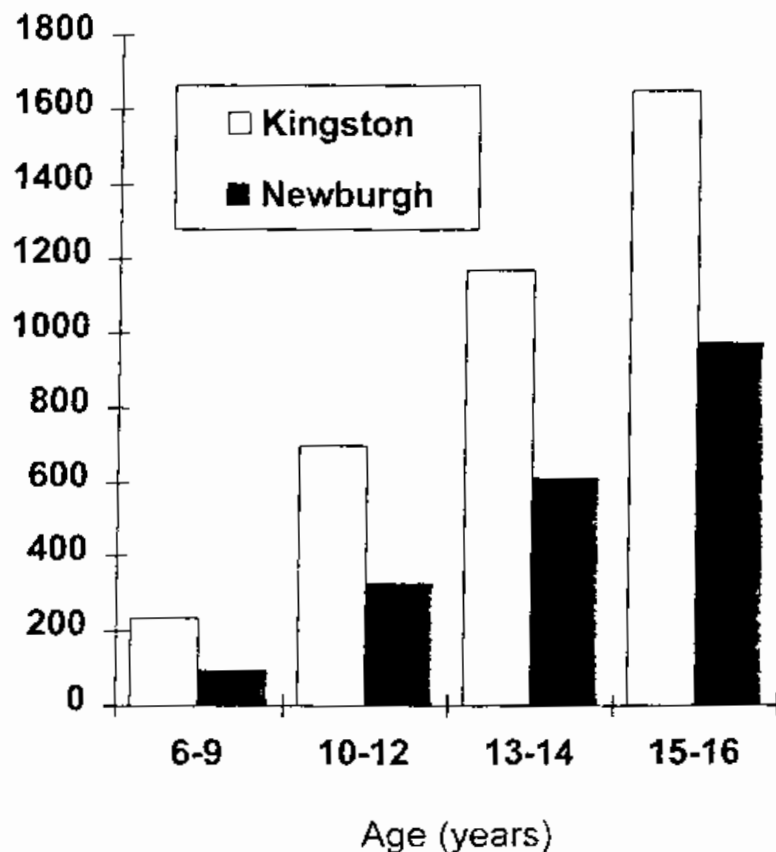


FIGURE 1-8 ▼ DMF indices after 10 years of fluoridation, 1954-1955. DMF—Decayed, missing, and filled teeth. (Adapted from Ast DB, Schlesinger ER: The conclusion of a 10-year study of water fluoridation. *Am J Public Health* 46:265-271, 1956. Copyright 1956 by the American Public Health Association. Adapted with permission.)

Mean DMF per Child Examined

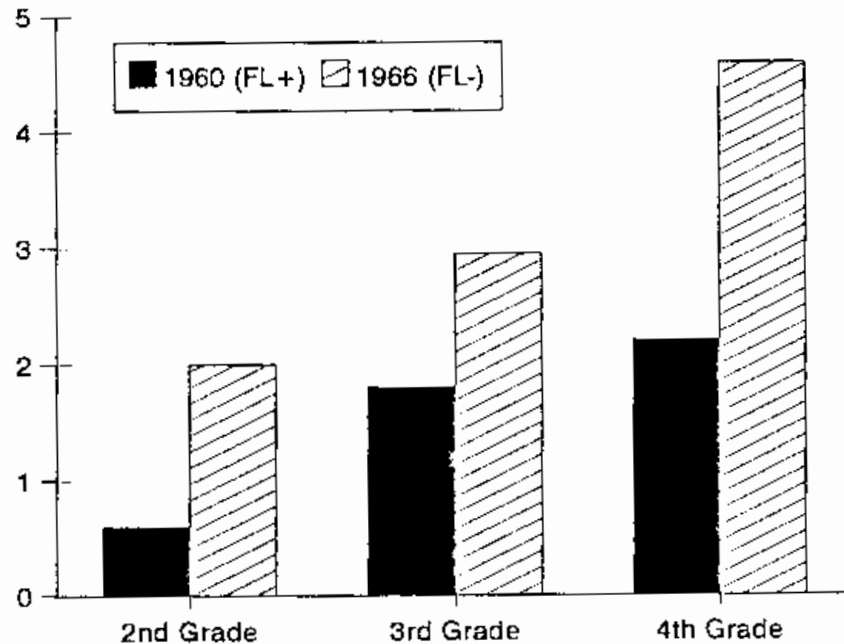


FIGURE 1-9 ▼ Effect of discontinuing fluoridation in Antigo, Wisconsin, November 1960. DMF—decayed, missing, and filled teeth; FL+, during fluoridation; FL-, after fluoridation was discontinued. (Adapted from Lemke CW, Doherty JM, Arra MC: Controlled fluoridation: The dental effects of discontinuation in Antigo, Wisconsin. *J Am Dental Assoc* 80:782-786, 1970. Reprinted by permission of ADA Publishing Co., Inc.)

From observational Data to Preventive Action

- Edward Jenner 1768 heard
 - *"I cannot take the smallpox for I have already had cowpox."* – A dairy maid
- John Snow
 - "Cholera was transmitted through contaminated water"
 - The intake of water companies in London was in a very polluted part of Thames river



FIGURE 1-12 ▼ Photograph of John Snow. (From the Wellcome Historical Medical Museum and Library, London.)

Snow's findings

TABLE 1-2  Deaths from Cholera per 10,000 Houses, by Source of Water Supply, London, 1854

Water Supply	No. of Houses	Deaths from Cholera	Deaths per 10,000 Houses
Southwark and Vauxhall Co.	40,046	1,263	315
Lambeth Co.	26,107	98	38
Other districts in London	256,423	1,422	56

Data adapted from Snow J: On the mode of communication of cholera. In Snow on Cholera: A Reprint of Two Papers by John Snow, M.D. New York, The Commonwealth Fund, 1936.

Conclusion

ZIGGY

TOM WILSON

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THE DOCTOR SPECIALIZES
IN PREVENTIVE MEDICINE...
SO IF YOU'RE ALREADY SICK,
HE'S NOT INTERESTED.



5-6

Tom Wilson

FIGURE 1-15 ▼ Prevention and therapy viewed as mutually exclusive activities. (From Wilson T: Ziggy cartoon. Universal Press Syndicate, 1986.)

Epidemiology is an invaluable tool for providing the rational basis on which effective prevention programmes can be planned and implemented and for conducting clinical investigations that contribute to the control of disease and to the amelioration of the human suffering associated with it.

THANK YOU