32.1 The Science of Epidemiology

• **Epidemiology**
  – The study of the occurrence, distribution, and determinants of health and disease in a population

• In developed countries infectious diseases cause fewer deaths than noninfectious diseases
  Worldwide, infectious disease accounts for 30% of all deaths

• Even in developed countries, new diseases are emerging
  – Example: West Nile fever
Figure 32.8

- Male-to-male sexual contact: 4%
- Heterosexual contact: 9.9%
- Injection drug use: 14.5%
- Male-to-male sexual contact and injection drug use: 0.3%
- Other: 71.3%

- Males: 71.3%
- Females: 82.7%

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Figure 32.1

The graph shows the mortality rates per 100,000 population over the years from 1900 to 1990. The mortality rate has decreased dramatically from 800 in 1900 to 0 in 1990. There was a significant increase in mortality around 1920, possibly due to a pandemic or other event. The inset graph on the right shows a more detailed view of the 1970-1990 period with a steady increase in mortality rates.
Figure 32.2

(a) Endemic disease

(b) Epidemic disease

(c) Pandemic disease

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<table>
<thead>
<tr>
<th>Surveillance system (acronym)</th>
<th>Disease surveillance responsibility</th>
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<tr>
<td>121 Cities Mortality Reporting System</td>
<td>Influenza, pneumonia, all deaths</td>
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<tr>
<td>Active Bacterial Core Surveillance</td>
<td>Invasive bacterial diseases</td>
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<td>BaCon Study</td>
<td>Bacterial contamination associated with blood transfusion</td>
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<td>Border Infectious Disease Surveillance Project (BIDS)</td>
<td>Infectious disease along the U.S.–Mexican border</td>
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<td>Dialysis Survey Network (DSN)</td>
<td>Vascular access infections and bacterial resistance in hemodialysis patients</td>
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<tr>
<td>Electronic Foodborne Outbreak Investigation and Reporting System (EFORS)</td>
<td>Foodborne outbreaks</td>
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<tr>
<td>EMERGEncy ID NET</td>
<td>Emerging infectious diseases</td>
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<td>Foodborne Diseases Active Surveillance Network (FoodNet)</td>
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<td>Global Emerging Infections Sentinel Network (GeoSentinel)</td>
<td>Global emerging diseases</td>
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<tr>
<td>Gonococcal Isolate Surveillance Project (GISP)</td>
<td>Antimicrobial resistance in <em>Neisseria gonorrhoeae</em></td>
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<td>Health Alert Network (HAN)</td>
<td>Health threat notification network, especially for bioterrorism</td>
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Figure 32.4

Common-source epidemic (for example, cholera)

Host-to-host epidemic (for example, influenza)

Onset of epidemic
TRANSMISSION OF DISEASE

HOST

Contaminated hand

Contaminated handkerchief

Contaminated eating utensil

Eating utensil washed

Sneeze or cough covered

Hands washed

Handkerchief disposed
Virus acquired by inhalation

Inhalation

Virus proliferates and infects adjacent tissue

Body defenses halt virus; or virus exhausts target tissue

Day 0  Day 1  Day 2  Day 3  Day 10
Virus acquired by inhalation

Virus migrates to lymph nodes and proliferates

Virus is disseminated to skin/mucous membranes by bloodstream

Body defense system attacks virus; rash fades

Inhalation

Day 0

Day 5

Day 10

Day 18
Entrance of measles virus to child

Period of incubation
Day 0
(a)

Period of prodromal symptoms
Day 10
(b)

Rash appears at hairline and on face
Day 13
(c)

Period of acme
Day 16
(d)

Period of decline
Day 18
(e)

Period of convalescence
Day 21
(f)

Rash fades from body
Figure 32.6

(a) Susceptible

(b) Immune

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