Introduction to Surveillance

EPIB 611 - Lecture 17

Oct. 28, 2005

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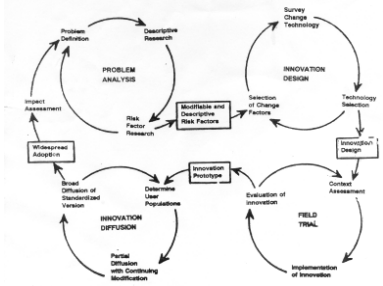

Reference

Price R.H. Education for prevention. In : Kessler M, Goldster SE, eds. A Decade of Progress in Primary Prevention. University Press of New England, 1986.

2

True/False

Canada's chronic disease surveillance system is cutting edge	
Risk behaviors are not usually monitored in systematic surveillance	
Data accuracy in surveillance systems is not as important as timeliness	
Sentinel events signal marked dips or upswings in population disease trends	
Changes in ICD categories over time need to be taken into account when assessing trends	
Passive surveillance is less costly than active surveillance	
The ultimate aim of surveillance is policy change	
Evaluation is usually a built-in component of surveillance systems	

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Introduction to Surveillance

- What is surveillance?
- What are the targets of surveillance?
- Why do we need surveillance?
- Elements of a surveillance system
- Types of surveillance
- Cross-sectional and longitudinal approaches
- Sources of bias

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What is surveillance?

- Ongoing systematic collection, collation, analysis and interpretation of outcome-specific data for use in the planning, implementation and evaluation of public health programs and policy.
- Timely dissemination of information to those who need to know so that action can be taken.
- Methods distinguished by their practicality, uniformity, rapidity rather than accuracy or completeness

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What are the target of surveillance?

- Communicable disease
- Non-communicable disease (chronic disease)
- Health behavior (drug use, risky sexual behavior, risk factors for chronic disease)
- Injury
- Environmental risks (pollen counts, air pollution)
- Occupational exposure
- Health care services (hospital separations, diagnostic tests, prescriptions)

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Sources of information for surveillance

- Death certificate databases
- Hospital separation databases
- Disease registries
- Prescription databases
- Laboratory diagnoses
- Outbreak reports
- Vaccine utilization
- Population surveys
- Sickness absence reports
- Prescription databases
- Pathologist records
- MD office visits
- And many others

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Attributions of surveillance

- Sensitivity
  - system identifies all events in target population
  - for monitoring, low sensitivity acceptable if consistent over time and events detected are representative
- Timeliness – from collection to dissemination
- Representativity
- Predictive value
- Accuracy and completeness of information
- Simplicity
- Flexibility
- Acceptability
- Evaluation????

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Why do we need surveillance?

- Descriptive epidemiology of morbidity and mortality by region, gender, ethnicity, age

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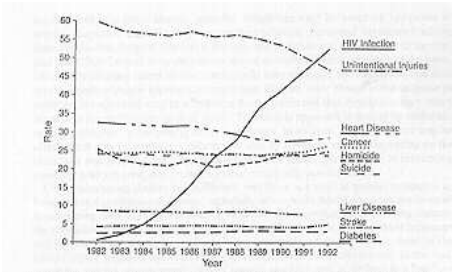

FIG. 22-4. Death rates (per 100,000 population) for leading causes of death in men aged 25–44 years by year: United States, 1982–1992. National vital statistics based on underlying cause of death, using final data for 1982–1991 and provisional data for 1992. Data for liver disease in 1992 were unavailable. (From Centers for Disease Control and Prevention. Update: mortality attributable to HIV infection among persons 25–44 years—United States, 1991 and 1992. *MMWR Morb Mortal Wkly Rep* 1993;42:869–872.)

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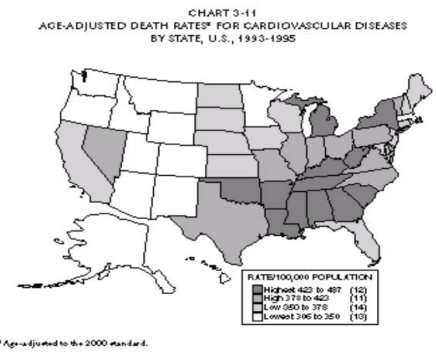

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Why do we need surveillance?

- Identify trends over time

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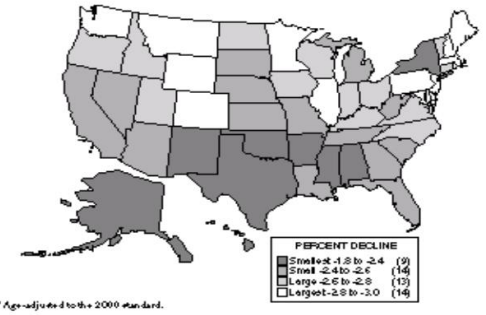
CHART 3-12
AVERAGE ANNUAL PERCENT DECLINE IN AGE-ADJUSTED DEATH RATES* FOR CARDIOVASCULAR DISEASES BY STATE, U.S., 1969-1995



* Age-adjusted to the 2000 standard.

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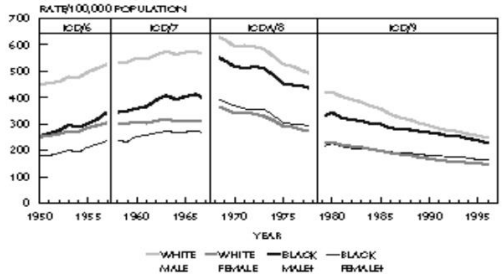
CHART 3-24
AGE-ADJUSTED DEATH RATES* FOR CORONARY HEART DISEASE BY RACE AND SEX, U.S., 1950-1996



* Age-adjusted to the 2000 standard.
†Nonwhite from 1950 to 1967

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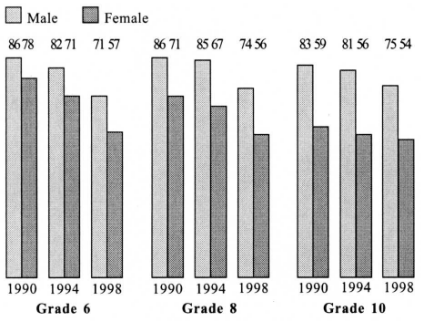

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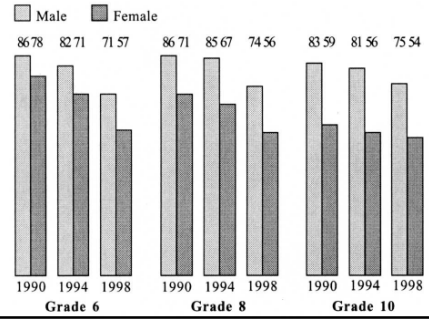
Students who exercised 2+ times/wk (%)



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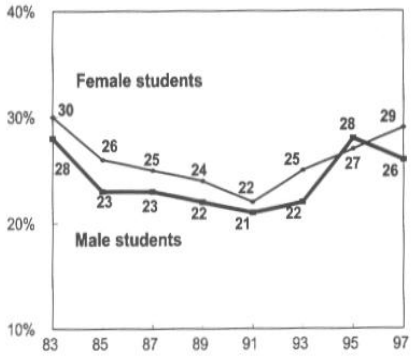

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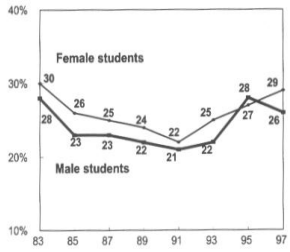
Tobacco Use Among Youth is on the Rise Ontario, Grade 7, 9, 11, 13, 1983-97



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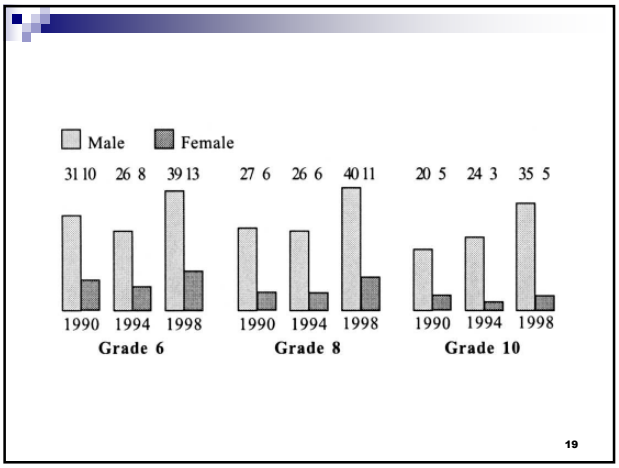
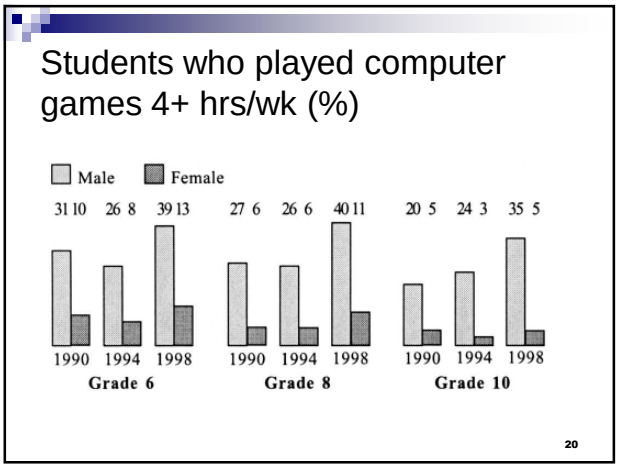
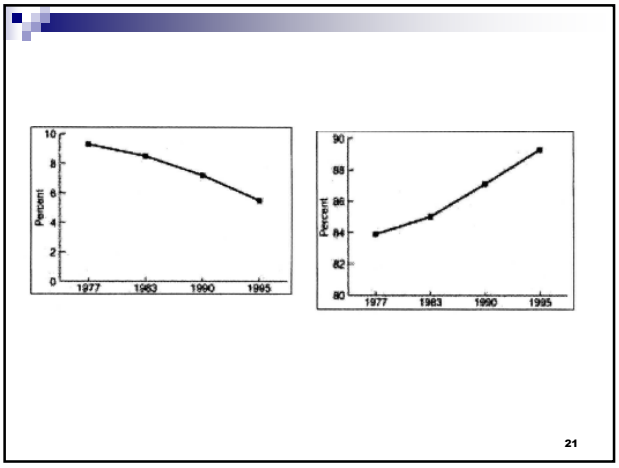
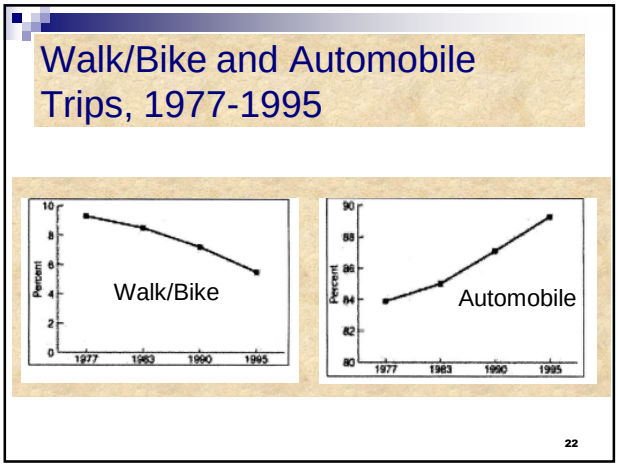
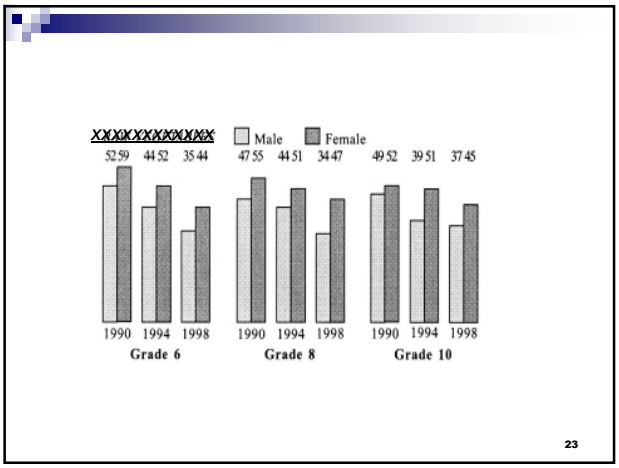
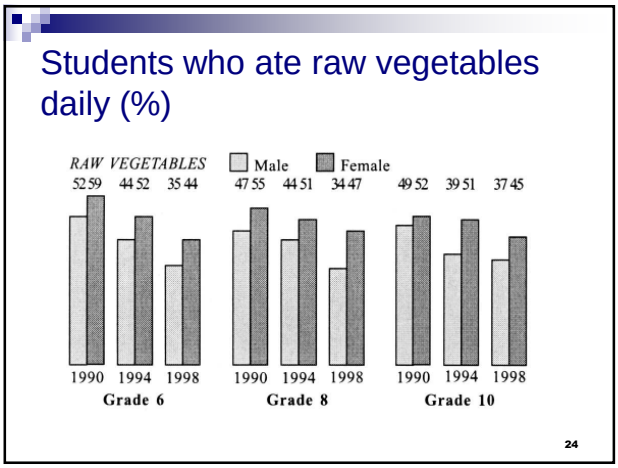

Male
Female
31 10 26 8 39 13 27 6 26 6 40 11 20 5 24 3 35 5
1990 1994 1998 1990 1994 1998 1990 1994 1998
Grade 6
Grade 8
Grade 10
19


Students who played computer games 4+ hrs/wk (%)
Male
Female
31 10 26 8 39 13 27 6 26 6 40 11 20 5 24 3 35 5
1990 1994 1998 1990 1994 1998 1990 1994 1998
Grade 6
Grade 8
Grade 10
20


Percent
1977 1983 1990 1995
21


Walk/Bike and Automobile Trips, 1977-1995
Walk/Bike
Automobile
Percent
1977 1983 1990 1995
22


Male
Female
52 59 44 52 35 44 47 55 44 51 34 47 49 52 39 51 37 45
1990 1994 1998 1990 1994 1998 1990 1994 1998
Grade 6
Grade 8
Grade 10
23


Students who ate raw vegetables daily (%)
RAW VEGETABLES
Male
Female
52 59 44 52 35 44 47 55 44 51 34 47 49 52 39 51 37 45
1990 1994 1998 1990 1994 1998 1990 1994 1998
Grade 6
Grade 8
Grade 10
24

Why do we need surveillance?

- Provide data for planning services and policy.
  - allocation of preventive/medical resources
  - projection of future service needs
- Monitor changes in health practices/health care delivery

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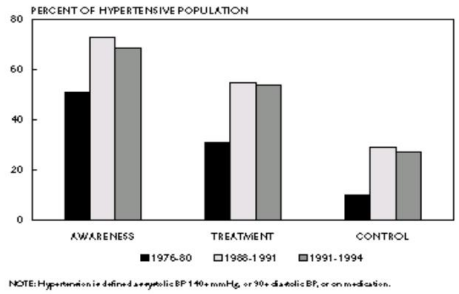
CHART 3-60
HYPERTENSIVE POPULATION AWARE, TREATED, AND CONTROLLED, AGE 18-74, U.S., 1976-1980, 1988-1991, AND 1991-1994



NOTE: Hypertension is defined as systolic BP 140+ mmHg, or 90+ diastolic BP, or on medication.

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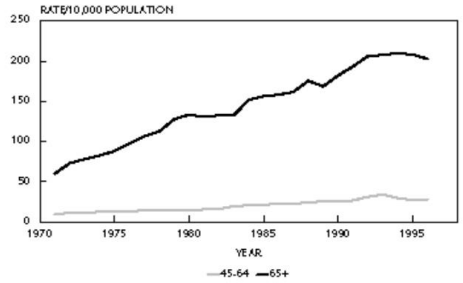
CHART 3-35
HOSPITALIZATION RATES FOR CONGESTIVE HEART FAILURE, AGE 45-64 AND 65+, U.S., 1971-1996



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Why do we need surveillance?

- Evaluation of services/prevention strategies

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Measles surveillance

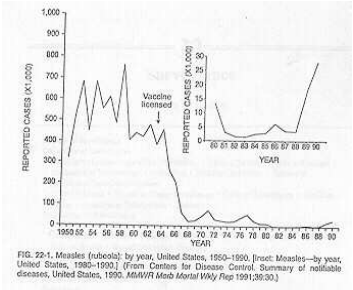

FIG. 22-1. Measles (rubeola): by year, United States, 1950–1990. [Inset: Measles—by year, United States, 1980–1990.] (From Centers for Disease Control. Summary of notifiable diseases, United States, 1990. *MMWR Morb Mortal Wkly Rep* 1991;39:30.)

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Why do we need surveillance?

- Results lead to action
  - case or outbreak investigation
  - contact tracing (TB)
  - interventions (quarantine, influenza vaccination; preventive treatment)
- Results generate hypotheses about etiology
  - allocation of research dollars

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Elements of surveillance system

- Case definition, indicators
- Population under surveillance
- Cycle of surveillance
- Confidentiality
- Incentives to participation

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Case definition, Indicators

- Requirements depend on location, timing
  - simple, brief (can be used by staff with little training)
  - feasible
  - reliable
  - inexpensive
  - possible versus probable
  - more difficult in chronic disease
- Examples
  - Measles: fever with red rash, red eyes, disappearing within a week
  - Malaria: Fever, headache, body aches, inability to carry out normal daily activities

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Population under surveillance

- Population-based
- Institution-based
  - hospitals, practices, nursing homes, prisons, schools
- Combination
  - Drug Abuse Warning Network (DAWN) in US: morbidity and mortality data on illicit drug use from hospital ERs and medical examiners/coroners

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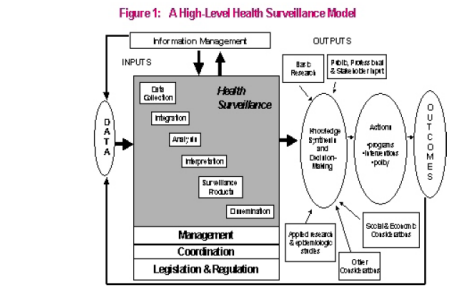
Cycle of surveillance



The model, as seen in Figure 1 above, describes a cyclical process where information, derived from data and supplemented by other information, leads to greater knowledge and decision-

Confidentiality

- Legally mandated reporting requires confidentiality precautions
  - limited access to data (locks, passwords etc)
  - encryption algorithms for coding names
- Perceived lack of confidentiality a major deterrent to reporting completeness
  - STDs
  - drug use

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Approaches to surveillance

- Active versus passive methods
- Legally notifiable diseases
- Sentinel events
- Sentinel surveillance
- Cross-sectional versus longitudinal

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Active versus passive surveillance

- Passive surveillance
  - issue case definition
  - wait for cases to be reported
  - volunteer-reporting
- Active surveillance
  - actively search for cases in MD offices, hospitals, pathology departments
  - TB

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Notifiable/reportable diseases

- By law, be reported to governmental authorities by medical practitioners
- Universally reportable
  - internationally quarantinable diseases (plague, cholera, yellow fever, smallpox)
  - under WHO surveillance (influenza, malaria)
- Recommended
  - chickenpox, dengue fever, genital warts, etc
- Others vary by country, location
  - anthrax, botulism, lyme's disease, etc

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Sentinel events

- Occurrence of rare event associated with a specific exposure that can alert health officials to hazards
- Used to assess stability or change in health levels in a population
  - death from acute head injury is a sentinel event for traffic hazard
  - death resulting from wrong medication is a sentinel event for medication errors

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Sentinel surveillance

- Surveillance based on sub-populations (sentinel populations) selected to represent the relevant experience of entire population
  - networks of family physicians
  - schools
  - worksites
  - volunteer sites

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Longitudinal versus cross-sectional

- Longitudinal (notifiable diseases, vital statistics, disease registries)
  - Ongoing data collection
  - Incident cases
- Cross-sectional
  - Serial surveys (NHANES, BRFSS, CCHS, Sante Quebec)

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Bias in surveillance systems

- Information bias
  - Incomplete reporting (passive vs active surveillance)
  - Differences/changes in case definition
- Selection bias
  - Non-representative sentinel populations
  - Non-representative survey samples

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Chronic Disease Surveillance in Canada Today

- Numerous initiatives exist including established systems to less developed initiatives
- Loose confederation of locations, data collection procedures, representativeness
- Many sources used to provide data on determinants, risk factors, diagnoses, interventions, outcomes
- No blueprint for chronic disease surveillance to achieve integration of efforts, reduce duplication, assure quality of surveillance information

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Vision for chronic disease surveillance in Canada

- Bring existing systems together into a national, coordinated network that integration local, provincial and national effort
- Standardize data collection methods
- Facilitate access to data
- Formal training in chronic disease surveillance to improve capacity
- Better dissemination to professionals, public stakeholders
- Assure long-term adequate resourcing for long term continuity

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Future?

- Electronic medical records (discharge diagnoses, prescriptions, lab data, test results, etc)
- Record linkage systems
- Confidentiality of data?

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	True/False
Canada's chronic disease surveillance system is cutting edge	F
Risk behaviors are not usually monitored in systematic surveillance	F
Data accuracy in surveillance systems is not as important as timeliness	T
Sentinel events signal marked dips or upswings in population disease trends	F
Changes in ICD categories over time need to be taken into account when assessing trends	T
Passive surveillance is less costly than active surveillance	T
The ultimate aim of surveillance is policy change	F
Evaluation is usually a built-in component of surveillance systems	F

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