Let us not go over the old ground, let us rather prepare for what is to come.

Marcus Tullius Cicero
106–43 B.C.
Informatics

- Information + Science
- Information
  - Knowledge (?) of specific events or situations that has been gathered or received by communication; intelligence or news.

*American Heritage Dictionary*

Introduction

- Data, information, & knowledge
- Development of counting machines
- Development of PH information management system
- Three waves of federal-state system development in US

Data, Information, & Knowledge

- Pre-computer era
  - Age of observation
    - Public health intervention
  - Age of analysis
    - Scientific method, systematic approach
- Modern PHI
  - Cholera outbreaks in England (manual GIS)
  - PH data collection in US
    - National Health Interview Survey (NHIS)
    - National Electronic Telecommunications System for Surveillance (NETSS)
Development of counting machines

- Fibula of a baboon – 35,000 B.C.
- Abacus
- Water clock – 14th century
- Slide rule – 1622
- Mechanical calculating device – 1623
- ENIAC - 1945

Three waves of federal-state system development in US

- Independent system
  - Vital statistics (NCHS), AIDS/HIV(CDC), PKU, etc.
  - Few standard (just under development)
  - Stand alone system
- Federal funding of state-level system
  - Input the same data into multiple systems
  - A few standards (under development)
  - Still not on-line, but trying the telephone, fax, modem, EDI
  - Health Level 7 (by CDC)
  - Unable to share data
- Integration of the benefits of state-level system
  - Tools of software Reuse
  - Object-oriented SW
  - Web-enabled environment
  - HISSB (Health Information & Surveillance Board)
  - Common Information for PH Electronic Reporting (CIPHER)
  - Standard development for NETSS

Informatics in Bio- & Medical Fields

- Medical informatics
- Bioinformatics
- Hospital Information System
- Nursing informatics
- Public Health informatics

Definition of PHI

- The systematic application of information and computer science and technology to public health practice, research, and learning
The way of PHI

- Promote the health of population
- Disease prevention
- Intervention in the chains leading to diseases, injuries, & disabilities
- Operated in public sections

Disciplines underlying PHI

- Information science
- Computer science
- Management
- Organizational theory
- Psychology
- Communication
- Political science
- Law
- Public health fields

보건정보학 발전의 배경

- 정보학의 방법과 기술을 보건의 실무와 연구에 적용하는 학문
  - 저렴하고, 고성능의 컴퓨터의 사용
  - 온라인 데이터베이스의 활용
  - 컴퓨터 이용 및 접속 인구의 증가
  - 질병예방과 건강증진에 멀티미디어자료이용

Drivers of PHI in US

- Public health reform
  - New partnership among various fields
  - Communication
  - Data gathering & analysis
- Growth in managed care
  - Emphasis on prevention
- Information technology revolution
  - Less expensive
  - Developed internet
Components of PHI

- Producing structures to represent data & knowledge
  - To visualize complex relationships
- Method for acquisition & presentation of data
  - To avoid overload
- Managing change among people, process, & IT
  - Optimize the use of information
- Integrating information

Contributions of PHI

- Disease management
  - Priority...
- Telehealth
  - Veterans administration
  - Remote care of ICU patients...
- Patient safety
  - Prevention of mistake
  - Gathering of side effect data...
- Decision support

데이터시스템과 정보시스템

- 데이터시스템
  - collection, classifying, editing, distribution
  - accuracy, timeliness, confidentiality
- 정보시스템
  - 데이터를 정보로 전환하는 시스템
  - 질병발생의 분포, 위험요인의 차이, 변화, 예측지수 등의 정보 제공
  - 정책결정(우선순위, 평가,...)
시스템의 효율적 활용

**Human to Human**
- www, e-mail, voice-mail

**Human to Machine**
- user interface

**Machine to Machine**
- communication protocols
- hardware

우리나라의 보건정보 프로그램(1)

<table>
<thead>
<tr>
<th>연구 기관</th>
<th>운영지역</th>
<th>개 발 내 용</th>
<th>개발시기</th>
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우리나라의 보건정보 프로그램(2)

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외국의 보건정보 프로그램

Sweden
- Health & Medical Region
- Health Service Pyramid

U.S.A
- RMP (Regional Medical Program)
- CDC
  - NNDSS with NETSS, CDC Wonder, MMWR
  - 121 Cities Mortality Reporting System

일본
- 자동화종합검진시스템, 지역임상검사시스템
- 응급의료정보시스템

보건정보시스템의 과제

기간망의 확충
국가망과의 연계
의심대역, 정책결정자와 의료인
자료수집체계의 표준화
전문인력 양성
보안성 확보
Public Health Surveillance

The ongoing, systematic collection, analysis, and interpretation of data (e.g., regarding agent / hazard, risk factor exposure, health event) essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those responsible for prevention and control.

CDC

Purposes of Public Health Surveillance

- Assess public health status
- Define public health priorities
- Evaluate programs
- Stimulate research

Surveillance

Information for Action
Uses of Public Health Surveillance

- Estimate magnitude of the program
- Determine geographic distribution of illness
- Portray natural history of a disease
- Detect epidemics / define a problem
- Generate hypothesis and stimulate research
- Evaluate control measures
- Monitor changes in infectious agents
- Detect changes in health practice
- Facilitate planning

Shigellosis

![Graph showing Shigellosis cases from 1968 to 1998.](image)


Rate of Hepatitis A

![Map showing the rate of Hepatitis A in the United States, 1998.](image)

Determine geographic distribution of illness

<table>
<thead>
<tr>
<th>Category</th>
<th>Color</th>
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<tr>
<td>&lt; 5.0</td>
<td>green</td>
</tr>
<tr>
<td>5.0-9.9</td>
<td>yellow</td>
</tr>
<tr>
<td>10.0-19.9</td>
<td>orange</td>
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<tr>
<td>&gt;20.0</td>
<td>red</td>
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</table>


Varicella (Chickenpox)—by Month, United States, 1988-1995

![Graph showing varicella cases by month, 1988-1995.](image)

Portray the natural history of a disease
Rate of Salmonellosis (excluding Typhoid Fever)—United States, 1966-1996

Detect epidemics/define a problem

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<thead>
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<tbody>
<tr>
<td>Rate/100,000 Population</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
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</table>

MEASLES (Rubeola)
United States, 1963-1998

Generate hypotheses, stimulate research

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<tbody>
<tr>
<td>Reported Cases (Thousands)</td>
<td>500</td>
<td>450</td>
<td>400</td>
<td>350</td>
<td>300</td>
<td>250</td>
<td>200</td>
<td>150</td>
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</table>

Botulism (Foodborne)
United States, 1978-1998

Laboratory-confirmed cases

Outbreak caused by potato salad, NM
Outbreak caused by sauteed onions, IL
Outbreak caused by fermented fish/sea products, AK
Outbreak caused by baked potatoes, TX

Detect epidemics/define a problem

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</thead>
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<tr>
<td>Reported Cases</td>
<td>110</td>
<td>90</td>
<td>70</td>
<td>50</td>
<td>30</td>
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</table>

Poliomyelitis (Paralytic)
United States, 1968-1998

Evaluate control measures

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</thead>
<tbody>
<tr>
<td>Reported Cases</td>
<td>60</td>
<td>55</td>
<td>50</td>
<td>45</td>
<td>40</td>
<td>35</td>
<td>30</td>
</tr>
</tbody>
</table>

NOTE: Inactivated vaccine was licensed in 1955. Oral vaccine was licensed in 1963.

Physical Activity
Georgia 1998

Participated in Physical Activities
Georgia - 1998

Selected Sources of Data

- Environmental monitoring systems
- Animals/vectors
- Individuals
- Laboratories
- Medical records
- Administrative records
- Police records
- Birth/death certificates

Data Sources and Methods for Surveillance

- Notifiable diseases
- Laboratory specimens
- Vital records
- Sentinel surveillance
- Registries
- Surveys
- Administrative data systems
- Other data sources

미국의 보건정보시스템
‘Centers for Disease Control and Prevention’
What is the NETSS

A computerized public health surveillance system

To provide weekly data on cases of nationally notifiable diseases.

Why Is NETSS Important?

- Rapid identification of epidemics of disease
- Timely and complete understanding of patterns of occurrence
  - case-specific characteristics.
  - changes in age, sex, race-ethnicity, and geographic distributions
- To monitor both intrastate and interstate trends in disease more efficiently.

Reports of Surveillance Data
NNDSS

In 1878, the U.S. Marine Hospital Service
To collect morbidity reports regarding cholera, smallpox, plague, and yellow fever from U.S. consuls overseas;
To be used for instituting quarantine measures to prevent the introduction and spread of these diseases into the United States.
Now 52 notifiable diseases

National Notifiable Disease Surveillance

- Reporting mandated by state law/regulation
- Health care providers, laboratories report to local HD (county)
- County HD submits reports to State
- Reports transmitted to CDC primarily through National Electronic Telecommunications System for Surveillance (NETSS)

Current Status:
National Notifiable Diseases Surveillance System (NNDSS)

- CSTE/CDC collaboration
- List revised at annual CSTE meeting
- Voluntary reporting by states to CDC
- Reporting mandated at state level
- Reportable diseases vary by state

MUMPS
United States 1973-1998

Reported Cases per 100,000 Population

NOTE: Mumps vaccine was licensed in December 1967.
Use of NCHS Data Systems for Surveillance

**Vital Statistics**
- National Infant Mortality Surveillance (NIMS)
  - Linked:
    - birth records
    - death records

**Sentinel Surveillance**

- Monitoring of key health events through sentinel:
  - Sites
  - Events
  - Providers
  - Vectors/animals
Confused Work-Related Asthma Patients
By Industry Type: 1988-1998
Michigan

- Manufacturing: n=960
- Construction: n=36
- Services: n=215
- Trade: N=47
- Miscellaneous: N=76

Lung and Bronchus Cancer (Invasive)
United States, 1973-1994
SEER Incidence and U.S. Mortality

Lead Poisoning
Michigan, 1990

Overall Rate for Michigan Men:
24 per 100,000

Rate per 100,000

- None
- 1-25
- 26-100
- 100+

*Rate per 100,000 cases age 19+ denominator is the 1990 U.S Census population data.
Use of NCHS Data Systems for Surveillance

- Population-based surveys
  - National Health Interview Survey
  - National Health and Nutrition Examination Survey
- Provider-based surveys
  - National Hospital Discharge Survey
  - National Ambulatory Medical Care Survey

Ectopic Pregnancies
United States 1980-1996

Administrative data systems

Number of Ectopic Pregnancies in women 15-44

Year

Source: National Hospital Discharge Survey, NCHS, CDC

Other Data Useful for Surveillance

- Vaccine Adverse Event Reporting System
- CDC Drug Service
- Miscellaneous
연구 목표

어떻게 보건의료정보 보와 바이오정보를
제공할 것인가?
소프트웨어 개발은
무엇을 가지고 어
렇게 할 것인가?

BMI-OM (Bio-Medical Information Interworking Object Model)
BMI-SDK (Bio-Medical Information Interworking SDK)

연구 목표

어떻게 보건의료정보 보와 바이오정보를
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BMI-OM (Bio-Medical Information Interworking Object Model)
BMI-SDK (Bio-Medical Information Interworking SDK)
표준화 추진 전략
- OMG LSR DTF (Life Science Research Domain Task Force) 참여 및 표준화 추진 (2~3년)

문서 잘 보기

- HL7 (Health Level 7) 가입 및 정보 모델 업데이트

- W3C (WWW Consortium) 표준화 과정 참여

관련기술과 표준안
IT 기술
- UML - 객체지향 모델링 언어
- XML - 데이터 표현
- CORBA - 분산 객체 기술
- Java/Python - 프로그래밍 언어
- SyncML - 데이터 동기화 표준

의학연구
- 표준의료정보 표준안
- HL7 의무기록 정보모델
- DICOM - 의료영상 연계
- Expression - MAGE-MLOM
- Structure - mmCIF

바이오정보 표준안
- Sequence
- BSA

연구 조직도

시스템 아키텍처

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