Death Records

These materials have been developed by the National Center for Health Statistics, International Statistics Program, Hyattsville, Md., as part of the CDC Global Program for Civil Registration and Vital Statistics Improvement.

Outline

- Definition
- Information collected
- Cause of death
  - Format for collection
  - Underlying cause of death
  - Coding cause of death
  - Supplemental information in medical certification
  - Verbal autopsy

Chaloay Wanathong, 69, signs a certificate registering the death of his father at 95, at Ban Pong District Registration office in Rachaburi Province, Thailand. Photo: WHO/Jerome Ming

Photo from WHO Health Metrics Network publication *Framework and Standards for Country Health Information Systems, Second Edition* http://www.who.int/healthmetrics/documents/hmn_framework200803.pdf.

Definition

- **Problems with data**
- **Death is having *no signs of life after live birth has occurred***

Statistical definition of Death

"the permanent disappearance of all evidence of life at any time after live birth has taken place"

From *Principles and Recommendations for a Vital Statistics System, Revision 2,* United Nations, New York, 2001

SOURCES: *Principles and Recommendations for a Vital Statistics System, Revision 2,* United Nations, New York, 2001, Chapter II. C.

Definition

- For legal purposes, deaths may be reported by:
  - Family member or head of household
  - Funeral director or mortician who handled disposition of body
    - Obtains information from next of kin
- If required, cause of death obtained from
  - Physician in attendance
  - Medical examiner or coroner in some cases

SOURCES: *Principles and Recommendations for a Vital Statistics System, Revision 2,* United Nations, New York, 2001, Chapter III.

Death Information that could be Collected for Legal and Administrative Use

- Date of death
- Place of death
- Facility or place where death occurred
- Name of decedent
- Decedent's personal identification number
- Decedent's date of birth
- Decedent's sex
- Decedent's place of birth and/or nationality
- Decedent's marital status
- Name of surviving spouse
- Decedent's place of residence Duration at residence
- Names of decedent's parents
- Cause of death
- Certifier of death
  - Name
  - Address
  - Type of certifier
  - License number
- Name and address of funeral director handling disposition of the body
- Type of disposition
- Date of disposition
- Name & relationship of informant
- Attestation statement with signature of attendant at death, informant or registrar
- Date of registration
- Place of registration
- Death registration number

Death Information that could be Collected for Statistical Purposes

- Additional detail on age if decedent under 1 year of age (usually months, days, hours, or minutes)
- Educational attainment
- Literacy status
- Usual occupation
- Ethnicity, race or religion
- Additional detail related to the cause of death
  - How injury occurred
  - Place of injury
  - Smoking or other risk factors

SOURCES: This slide, previous, and following: *Principles and Recommendations for a Vital Statistics System, Revision 2,* United Nations, New York, 2001, Chapter II.

Death Information Collected – Derived Data

(Items for statistical purposes not collected directly on death record but derived from those items and added to computer files for tabulation)

Derived Data Item	Source on Death Record
• Socio-economic indicator	• Education, literacy status and/or occupation
• Detail on residence such as urban, rural, regional, etc.	• Place of residence
• Other geographic groupings	• Place of residence or occurrence
• Age of decedent	• Date of birth and date of death
• Tabulation category for deaths – Under 1 year of age ▪ Neonatal / Post neonatal ▪ Under 1 week, ▪ Under 1 month – Other age groups	• Date of death, time of death, and date of birth
• Detail on injury deaths	• Cause of death
• Deaths with risk factors	• Cause of death
• Cause of death groupings	• Cause of death

Information Collected

Samples of death records from various countries should be shown to the students particularly those for the countries the students are from.

Examples should include death records for countries that collect cause of death information on their death records as part of the registration process.

Activity

In small groups, examine the sample death certificates for various countries. Compare your country's death record with those from other countries looking at the following:

- Is cause of death information included on the death record?
- What items do death records from other countries have that their country's record does not have (missing items)?
- What kinds of public health analyses can be done with these missing items?
- Are any of the missing items useful for administrative or other purposes?
- Do they think that some items used in other countries should be added to their country's death record, and if so, why?

Review

- Death information for legal purposes obtained from family members or next of kin
- Information on death records
  - Collected for legal, administrative and statistical purposes
  - Items can be added to computer files for tabulation and analysis of data

Cause of Death

- **Collection varies**
  - **Part of death registration**
  - **Separate from registration**
    - **Forwarded to civil registration agency**
    - **Or forwarded to vital statistics agency**
    - **Or other method**
- **If part of registration, cause of death provided by**
  - **Physician in attendance**
  - **Coroner or medical examiner under some circumstances**

SOURCES: *Principles and Recommendations for a Vital Statistics System, Revision 2,* United Nations, New York, 2001, Chapter II.

Cause of Death

In 1967 the World Health Assembly said causes of death to be entered on the death record were

"all those diseases, morbid conditions or injuries which either resulted in or contributed to death and the circumstances of the accident or violence which produced any such injuries."

From *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993

- **Cause of death -** ***All diseases, disease conditions or injuries that caused the death or contributed to the death. For injuries, include conditions of the accident or violence that produced the injuries.***

SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993.

Cause of Death

- **Entering cause of death**
  - **Include all relevant information**
  - **Should not select some conditions and reject others**
- **Analysis of cause of death data**
  - **For public health, need to prevent condition leading to death**
  - **World Health Organization (WHO) Family of International Classifications (FIC) Network**
    - **Works with WHO in the development, dissemination, maintenance, and use of a classification scheme with rules for coding cause of death**
    - **Classification scheme is adopted by WHO**
    - **Use allows for consistent comparisons between countries**

SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993.

Cause of Death

- **Underlying Cause of Death**
  - **Main cause of death chosen from all causes in medical certification**
  - **Of public health interest; used for tabulation purposes**
  - **Defined by WHO as:**

    " (a) the disease or injury which initiated the train of morbid events leading directly to death, or

    (b) the circumstances of the accident or violence which produced the fatal injury."
  - **Not symptoms or modes of dying (respiratory arrest, heart failure)**

SOURCES: This slide and following: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993.

Cause of Death

INTERNATIONAL FORM OF MEDICAL CERTIFICATE OF DEATH

Cause of death		Approximate interval between onset and death
I Disease or condition directly leading to death *)	a).....	.....
	due to (or as a consequence of)	
Antecedent causes Morbid conditions, if any, giving rise to the above cause, stating the underlying condition last	b).....	.....
	due to (or as a consequence of)	
	c).....	.....
	due to (or as a consequence of)	
	d).....	.....
II Other significant conditions contributing to the death, but not related to the disease or conditions causing it	.....	.....
	.....	.....

**This does not mean the mode of dying, e.g. heart failure, respiratory failure. It means the disease, injury, or complication that caused death.*

SOURCES: This slide and following: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993.

Cause of Death

- **Underlying Cause of Death (continued)**
  - **Part I of form**
    - **Diseases related to chain of events leading to death**
    - **Condition leading directly to death on first line**
    - **Each step in chain of events leading to direct cause of death on following lines**
    - **Underlying cause starting chain of events leading to death on lowest line**
  - **Part II of form**
    - **Other significant conditions contributing to death but not directly related to the death**

SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993.

Cause of Death

- **Underlying Cause of Death (continued)**
  - **Example 1**

Part I

a) Rupture of myocardium	Minutes
b) Acute myocardial infarction	6 days
c) Coronary artery thrombosis	5 years
d) Atherosclerotic coronary artery disease	7 years

Part II Diabetes

  - **Underlying cause of death is on line d**

SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993.

Cause of Death

- **Underlying Cause of Death (continued)**
  - **Example 2**

    Part I

    a) Aspiration pneumonia — 2 days

    b) Blunt force injuries — 7 weeks

    c) Motor vehicle accident — 7 weeks
  - **Underlying cause of death is on line c**

SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993.

Cause of Death

- **Coding Cause of Death - ICD**
  - ***International Statistical Classification of Diseases and Related Health Problems, 10th Revision***
  - **Adopted and published by WHO**
  - **Standard coding scheme for converting cause of death literals**
  - **Rules for choosing the underlying cause**
  - **Used since late nineteenth century**
  - **Allows for comparisons of mortality data at international level**

SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993.

Cause of Death

- **Coding Cause of Death – ICD (continued)**
  - **Volume 1**
    - **Tabular list of diseases, injuries, external causes of injury, and factors related to heath status**
    - **3 character ICD codes for categories (1 letter, 2 numbers)**
    - **4 character subcategories (the 3 characters followed by decimal point and 1 number)**
    - **3 character level required by WHO for their mortality data base for international comparisons**
    - **Possible codes are A00.0 to Z99.9**

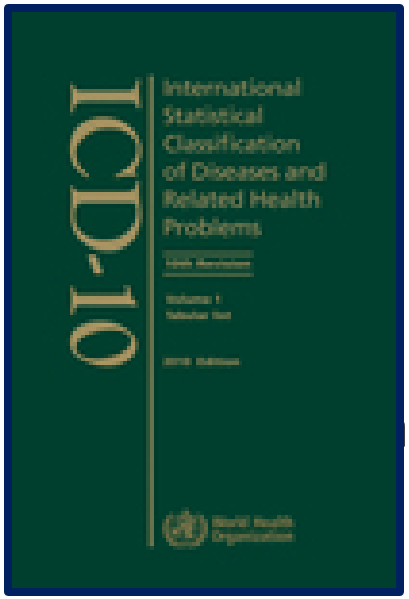
SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993.

International Classification of Diseases-10th Rev

Chapter	Blocks	Title
I	A00-B99	Certain infectious and parasitic diseases
II	C00-D48	Neoplasms
III	D50-D89	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism
IV	E00-E90	Endocrine, nutritional and metabolic diseases
V	F00-F99	Mental and behavioural disorders
VI	G00-G99	Diseases of the nervous system
VII	H00-H59	Diseases of the eye and adnexa
VIII	H60-H95	Diseases of the ear and mastoid process
IX	I00-I99	Diseases of the circulatory system
X	J00-J99	Diseases of the respiratory system
XI	K00-K93	Diseases of the digestive system
XII	L00-L99	Diseases of the skin and subcutaneous tissue
XIII	M00-M99	Diseases of the musculoskeletal system and connective tissue
XIV	N00-N99	Diseases of the genitourinary system
XV	O00-O99	Pregnancy, childbirth and the puerperium
XVI	P00-P96	Certain conditions originating in the perinatal period
XVII	Q00-Q99	Congenital malformations, deformations and chromosomal abnormalities
XVIII	R00-R99	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified
XIX	S00-T98	Injury, poisoning and certain other consequences of external causes
XX	V01-Y98	External causes of morbidity and mortality
XXI	Z00-Z99	Factors influencing health status and contact with health services
XXII	U00-U99	Codes for special purposes

Cause of Death

- **Coding Cause of Death – ICD (continued)**
  - **Volume 2**
    - **Instructions for coding causes of death**
    - **Rules for selecting underlying cause of death**
    - **Information on presentation of coded statistical data and calculation of statistical indicators**
  - **Volume 3**
    - **Alphabetical index to classifications their codes**



SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 1,* World Health Organization, Geneva, 1993.

Cause of Death

- **Coding Cause of Death – ICD (continued)**
  - **Applying ICD codes to cause of death**
    - **In theory, cause on lowest line in part I is underlying cause of death for statistical tabulations**
    - **Medical certifier may not enter cause correctly**
    - **Rules in volume 2 for selecting underlying cause of death**
    - **Applying rules requires extensive training**
    - **Only trained coder should choose underlying cause**

SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993.

Cause of Death

- **Coding Cause of Death – ICD (continued)**
  - **Applying ICD codes to cause of death (continued)**
    - **Some countries use computer programs to apply rules**
      - **Computer assigns ICD codes to each cause of death entry and applies rules to select underlying cause**
      - **Computer program cannot always make selection**
      - **Some cases rejected for coding by trained ICD coder**
    - **All causes can be used for analysis**

SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volume 2, Instruction Manual,* World Health Organization, Geneva, 1993.

Activity

To get an idea of how a coder might assign ICD codes, try to find the codes for some causes of death using ICD-10 (Volumes 1 & 3 or online: http://apps.who.int/classifications/icd10/browse/2010/en). Determine the codes for the following causes of death:

a) Myocardial infarction

b) Type II diabetes

c) Sliding hiatal hernia

d) Alzheimers

e) Drowning (Suicide)

f) Drowning (Accidental)

g) Drowning (Homicide)

Activity

Using Volumes 1 & 3:

1) Look up the cause in V3 (alphabetical index). Look for the entry that best matches the cause. Note the code associated with the cause.

2) Then, look up the code in V1 (tabular list). Read any associated instructions to see if the code needs to be changed.

Using ICD-10 Online:

http://apps.who.int/classifications/icd10/browse/2010/en

1) Either browse the hierarchy on the left for your term or use the search functionality to find your term.

2) Your search will take you to the V1 (tabular list) entry for the cause. Note the code listed for the cause.

Activity

To get an idea of how a coder might assign ICD codes, try to find the codes for some causes of death using ICD-10, Volumes 1 and 3. In groups, determine the codes for the following causes of death:

a) Myocardial infarction - I21.9

b) Type II diabetes – E11.9

c) Sliding hiatal hernia – K44.9

d) Alzheimers – G30.9

e) Drowning (Suicide) – X71.-

f) Drowning (Accidental) – W74

g) Drowning (Homicide) – X92.-

Cause of Death

- **Coding Cause of Death – ICD (continued)**
  - **Tabulation Lists**
    - **Standard groups of 3-digit ICD codes for underlying causes of death**
      - **General Mortality**
      - **Infant and Child Mortality**
    - **Developed by WHO**
    - **For tabulations and distribution of data**
    - **Used to determine leading causes of death**

SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volumes 1 and 2,* World Health Organization, Geneva, 1993.

Cause of Death

- **Supplemental information in medical certification**
  - **Extra items added to standard format**
    - **Manner of death (natural, accident, suicide, homicide, unknown)**
    - **Autopsy questions**
    - **Injury information**
    - **Pregnancy question for females**
    - **Smoking and other risk factors**
  - **More detailed coding of cause of death**
  - **Additional statistical tabulations on cause of death**

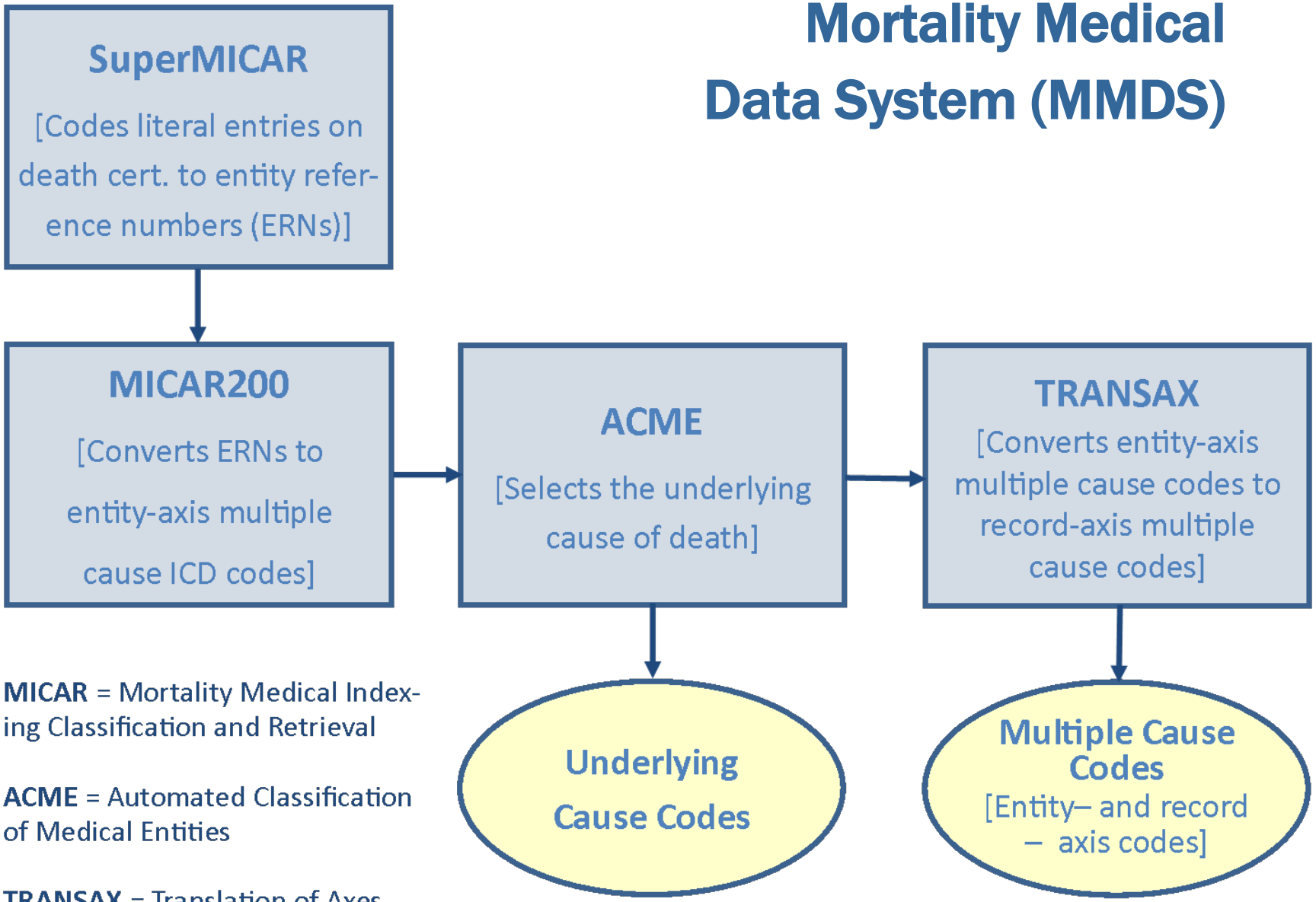
SOURCES: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Volumes 1 and 2,* World Health Organization, Geneva, 1993.

Cause of Death

- **Automated Coding Systems**
  - **To automate entry, classification, and retrieval of COD information**
  - **Provides standardization in mortality coding**
  - **Facilitates international comparability**
  - **Mortality Medical Data System (MMDS) used in the US, Canada, Australia, and the UK**

SOURCES: Anderson, RN. The International Collaborative Effort on Automating Mortality Statistics. Data Users Conference. Washington, DC. 2006. www.cdc.gov/nchs/ppt/duc2006/anderson_39.ppt.

Mortality Medical Data System (MMDS)



MICAR = Mortality Medical Indexing Classification and Retrieval

ACME = Automated Classification of Medical Entities

TRANSAX = Translation of Axes

SOURCES: Anderson, RN. The International Collaborative Effort on Automating Mortality Statistics. Data Users Conference. Washington, DC. 2006. www.cdc.gov/nchs/ppt/duc2006/anderson_39.ppt.

Cause of Death

- **Automated Coding Systems (cont'd)**
  - **Problem: MICAR is only suitable for coding death certificate data certified in English**
  - **What about non-English speaking countries?**
    - **IRIS: an electronic system for automated coding of causes of death**

SOURCES: Anderson, RN. The International Collaborative Effort on Automating Mortality Statistics. Data Users Conference. Washington, DC. 2006. www.cdc.gov/nchs/ppt/duc2006/anderson_39.ppt.

Cause of Death

- **IRIS**
  - **Developed jointly by France, Hungary, Italy, Sweden, and Germany**
  - **Multiple languages: language-dependent parts are stored in database tables that can be easily modified**
  - **Improves comparability**
    - **Uses components of the MMDS**
    - **Updates to ICD-10 base are included according to WHO timelines**

SOURCES: German Institute of Medical Documentation and Information (DIMDI). Iris Institute. Web: http://www.dimdi.de/static/en/klassi/koop/irisinstitute/index.htm. Accessed 17 January 2013.

Review

- **Cause of death**
  - **May be collected separately from death information for civil registration**
  - **Best provided by physician in attendance at death or coroner or medical examiner responsible for determining circumstances of death**

Review

- **Medical Certification of Death form**
  - Developed by WHO for standard collection of cause of death information
  - All relevant conditions should be entered
- **Underlying Cause of Death**
  - Developed by WHO for tabulation purposes
  - Disease or injury that started train of events leading directly to death or event causing fatal injury

Review

- **International Classification of Diseases, 10th Revision (ICD-10)**
  - **Classification scheme developed by WHO**
  - **Rules for coding cause of death data**
  - **3 digit alphanumeric codes for main categories of diseases, injuries and external causes**
  - **4 digit subcategories for more detail**
  - **Tabulation Lists**
    - **Standard groupings of 3 digit ICD codes**
    - **Used for leading causes of death**

Cause of Death

- **Verbal autopsy**
  - **Used in areas lacking civil registration system or medical certification of cause of death**
  - **Obtain probable cause of death**
  - **Method**
    - **Interview with family members or caregivers of deceased**
    - **Use questionnaire to obtain details on signs, symptoms, complaints, and medical history or events of deceased in period before death**

SOURCES: *Verbal Autopsy Standards, Ascertaining and Attributing Cause of Death*, World Health Organization, Geneva, 2007.

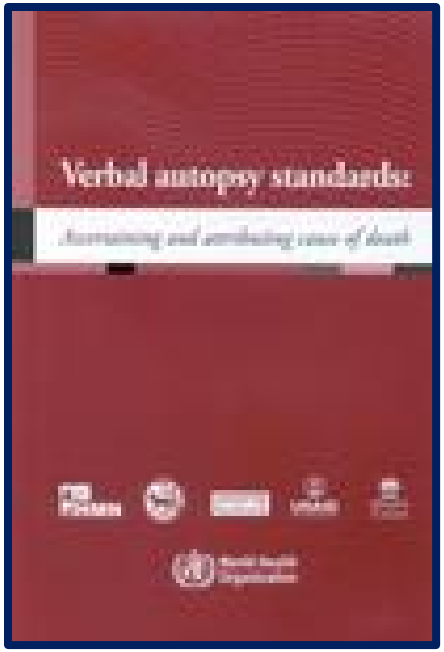
Cause of Death

- **Verbal autopsy (continued)**
  - **Cause of death assigned based on data collected**
    - **Usually assigned by panel of physicians**
    - **Information at community or population level**
    - **Research tool for epidemiological studies**

SOURCES: *Verbal Autopsy Standards, Ascertaining and Attributing Cause of Death*, World Health Organization, Geneva, 2007.

Cause of Death

- Verbal autopsy (continued)
  - Development of WHO standards
    - Increased use of verbal autopsy
    - Need comparable data from country to country
    - *Verbal Autopsy Standards* published in 2007
      - Standard questionnaires for three age groups
      - Coding guidelines for applying ICD-10 to verbal autopsy
      - Cause of death list for verbal autopsy with corresponding ICD-10 codes



SOURCES: *Verbal Autopsy Standards, Ascertaining and Attributing Cause of Death*, World Health Organization, Geneva, 2007.

Cause of Death

- **Verbal autopsy (continued)**
  - **2012 WHO Verbal Autopsy Instrument**
    - **Shortened by approximately 40%**
    - **Compatible for use with mobile data collection and automated analysis (InterVA-4)**
    - **Causes of death mapped to ICD codes**
    - **Intented to facilitate routine use as part of a national death registration system**

SOURCES: *Verbal Autopsy Standards, Ascertaining and Attributing Cause of Death*, World Health Organization, Geneva, 2012.

Cause of Death

- **Verbal autopsy (continued)**
  - **Cause of death information from verbal autopsy is not same as cause of death from medical certification**
    - **Certainty of cause of death is lower in verbal autopsy**
    - **Verbal autopsy works best for causes with distinctive features**
      - **Generally acceptable childhood causes: neonatal tetanus, measles, malnutrition, and accidents**
      - **Generally unacceptable childhood causes: diarrhea, malaria, acute lower respiratory infections (ALRI)**
    - **Data from verbal autopsy should not be merged with data from medical certification in civil registration**

SOURCES: *Verbal Autopsy Standards, Ascertaining and Attributing Cause of Death*, World Health Organization, Geneva, 2007.

Cause of Death

- **Verbal autopsy (continued)**
  - **WHO cautions**

"The purpose of verbal autopsy is to describe the causes of death at the community level or population level where no better alternative sources exist. Therefore, it is a limited substitute for proper medical certification. The quality of information and of the diagnoses varies depending on the skills of the interviewer and the memory of the respondents."

From *Verbal Autopsy Standards, Ascertaining and Attributing Cause of Death,* World Health Organization, Geneva, 2007

SOURCES: *Verbal Autopsy Standards, Ascertaining and Attributing Cause of Death*, World Health Organization, Geneva, 2007.

Cause of Death

- **Verbal autopsy (continued)**
  - **Quality of information depends on expertise of reviewers assigning underlying cause of death**
  - **Computer algorithms**
    - **Developed to identify underlying cause of death**
    - **May be used in place of the panel of physicians**

SOURCES: *Verbal Autopsy Standards, Ascertaining and Attributing Cause of Death*, World Health Organization, Geneva, 2007.
Photo from WHO web site; Health Metrics Network, http://www.who.int/healthmetrics/documents/Components_of_a_strong_HIS.pdf

Cause of Death

Slide should be shown describing method for obtaining cause of death (with example of medical certification form if it is used) in country where course is being taught or comparison if students are from different countries.

Slides should also indicate if data are tabulated using tabulation lists recommended by WHO.

Review

- **Verbal autopsy**
  - **Used when collection of cause of death not part of civil registration**
  - **Interview family members or caregivers about symptoms, complaints, circumstances, and/or medical history of deceased**
  - **WHO developed standards for verbal autopsy questionnaires and for determining cause of death**
  - **Cause of death is not same as cause of death collected from civil registration**
  - **Data should not be combined with data from cause of death collected through civil registration**

Problems with Death Data

Problem	Examples
Source and Accuracy of Information	Informant does not know correct information Medical certifier did not recently attend deceased Sensitive information not given correctly
Missing Records	Death records not registered in some geographic areas or for some population groups Late records not included in statistical files Records for infants or children are poorly registered Deaths occurring at home are not registered
Missing Information	Medical certification not complete Data skewed due to missing items for some population groups
Errors in Preparation and Processing	Transcription errors when data entered in record Coding errors and keying errors Errors in computer software programs Medical certification not correctly linked to legal data when separate collection systems used ICD rules not correctly applied for underlying cause of death

SOURCES: *Principles and Recommendations for a Vital Statistics System, Revision 2,* United Nations, New York, 2001, Chapter II.

Discuss

What are some problems with death records?

What effect do these problems have on statistical data?

What are some possible ways to eliminate or prevent these problems?

Word Choice Questions

1. Cause of death information is *(always/not always)* collected when the death is registered in the civil registration system.
2. The best person to provide cause of death information is the *(next of kin/medical attendant)*.
3. Collection of cause of death information should be done using the Medical Certification of Death form developed by the *(United Nations/World Health Organization)*.
4. The disease or injury that started the train of events leading to death or causing the fatal injury is called the *(immediate/underlying)* cause of death.

Word Choice Questions

5. The cause of death recommended by WHO for statistical tabulation purposes is the *(immediate/underlying)* cause of death.

6. WHO developed the International Classification of Diseases for *(querying/coding)* cause of death information using standard rules.

7. In countries without collection of cause of death as part of the civil registration process, information on cause of death may be collected by interviewing family members or caregivers about the medical history of the deceased using a method called *(death sampling/verbal autopsy)*.

Word Choice Questions

8. Cause of death data obtained through verbal autopsy (is/is not) the same as medical certification in the civil registration process.
9. Cause of death data obtained through verbal autopsy (may/should not) be combined with cause of death from the civil registration system.