

Health Data Model

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This document provides an overview of the Health Data Model. This model focuses on public health administration complemented with the compilation of data for analysis.

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I. STRUCTURE OVERVIEW.

The class diagram described in this document is founded on elements drawn from previous modeling efforts in the field of health services. This approach also assigns a prominent role to functions of regulation and data consolidation of health-related activities. This is accomplished in the forms of licensing and reporting.

I.1 Sources

The more representative sources of elements for this data structure are the following projects:

- Public Health Conceptual Data Model – Centers for Disease Control and Prevention (CDC, 2000), p27-63.
- Facility Identification Template for States (FITS, EPA, 2000), p67-77.
- California Office of Statewide Health Planning and Development – Enterprise GIS (OSHPD, 2003), p6-17.

I.2 Packages

The model is structured in four packages, namely:

- Health Related Activity
- Licensing and Reporting
- Reporting Zones
- Site Selection

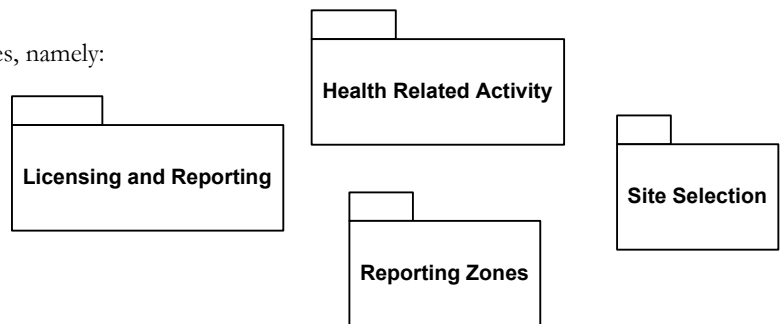


Figure 1 – Health Data Model Packages

The 'Health Related Activity', and 'Licensing and Reporting' packages are considered as core to the public health administration, while the 'Reporting Zones' and 'Site Selection' packages are considered ancillary for analytical purposes.

The following sections describe in detail the object classes that exist in each package and the primary relationships between and among those object classes.

I.3 Relationships

The three types of relationships identified in the core packages are those of:

1. **Supertype / Subtype** – Five core classes and their instances:
 - i. Health related activity
 - ii. Party
 - iii. Material
 - iv. Location
 - v. License
2. **Association** (5): between instances of each of the five core classes
3. **Participation** (6):
 - i. Actor
 - ii. Target
 - iii. Party location
 - iv. Material responsibility
 - v. Material location
 - vi. Licensing

II. DESCRIPTION OF CLASSES

The main model is composed of 46 classes described in alphabetic order of class name in the following pages along with mention of some of the most relevant attributes.

Activity Relationship

Association between instances of **Health-Related Activities**.

General categories:

- Activity comprised of component activities
- Activity cause of another activity
- Any other reason for association of activities

Attributes

- Activity relationship Type – some possible values: "comprises", "causes", "is associated with", etc.
- Activity relationship Time Range – time period the relationship is effective.

Actor Participation

Roles played in the activity.

Participation between **Health-Related Activities** and **Party**.

Attributes

- Actor Type – Function performed by a party in the activity
- Actor Time Range – Time of the participation

Case

Condition or event with specific significance to the health model.

Subtype of Observation.

Supertype of Outbreak.

Attributes

- Case Classification – some possible values: confirmed, probable, suspected, not a case, incomplete information.
- Confirmation Method – mechanism by which a case was confirmed.
- Detection Method - some possible values: report, self-referral, laboratory, investigation, surveillance, routine, testing, screening, record review.
- Disease imported – indication whether the disease was likely acquired outside the jurisdiction of observation, and if so, nature of the inter-jurisdictional relationship.
- Etiologic status – strength of the causal relationship between the disease-causing agent and the disease, some possible values: weak, moderate, confirmed and unknown.
- Transmission mode – mechanism by which disease was acquired, some possible values: sexual, airborne, blood, vector, food, zoonotic, nosocomial, mechanical, dermal, indeterminate.

Emergency Management

Site for the maintenance and dispatching of paramedics and emergency response crews.

Subtype of Point of Service.

Attributes

- Identification – Name or other identification of the service.
- Capacity – number of cases that the service can handle at any given time. Includes transportation and on-site aid.
- Paramedics – number of paramedics on duty.

Facility

Setting within a site for performing specific health-related activities.

Aggregates to Site and Licenses

Attributes

- Identification – Name or other identification of the facility.
- Type – Type of infrastructure or services that can be rendered.

Formal Organization

Administrative and functional structure with common objectives.

Subtype of Organization.

Attributes

- Industry – Type of activity in which the organization is engaged, some possible values: association, council, department, insurance, agency, maintenance, etc.

Health-Related Activity

Action performed for the purpose of documenting, investigating or improving the health condition of a party. Possible perspectives:

- **Fact** about an occurred activity
- **Command**, such as a vaccination order
- **Master table** of possible activities
- **Definition** algorithmically describing an activity
- **Intent** for an outcome of an activity

Supertype of Intervention, Notification, Observation, Referral.

Associated with Activity relationship, Actor participation and Target Participation.

Attributes

- Critical Time – relevant date and time. Examples: a) on a medical record of a past disease the critical time is when the disease was present, not the recording date; b) for a lab test the critical time is when the specimen is obtained, not that of the lab results.
- Activity Time – when the activity actually happens or when it can possibly happen. Can be a point in time or a time range.
- Descriptive text
- Identifier
- Method – specifies which of the possible methods is used to achieve the given end.
- Mood – meaning or context of the activity, some possible values: fact, command, master, definition, intent, etc.
- Status – state of the action (e.g., intended, ordered, in process, completed).
- Type – kind (e.g., physical examination, interview, notification, sterilization, pasteurization).
- Confidentiality – limitations to disclosure and communication of information about the activity.
- Interpretation – rough interpretation of the course or outcome of the activity or antibiotic susceptibility.
- Maximum number of repetitions.
- Priority – routine, emergency, urgent.
- Subject site.

Hospice

Site for prolonged non-intensive care.

Subtype of Inpatient.

Hospital

Site for prolonged or care intensive health-related activities.

Subtype of Inpatient.

Composed of Hospital Sections.

Hospital Section

Hospital department for the performance of specific types of health-related activities or specialties.

Component of Hospital.

Attributes

- Type – target activity or specialty (e.g. intensive therapy, obstetrics, etc.).

Individual

Human person or single organism.

Subtype of Party.

Supertype of Non-person living organism, Person.

Attributes

- Birth Date.
- Death Date
- Sex

Informal Organization

Casual grouping or cluster of individuals with common interests, characteristics or exposures, or relationships.

Subtype of Organization.

Attributes

- Group Type – (e.g. family, social club, retired, veterans, diabetics, alcoholics, patients in a given floor or ward, etc.).

Inpatient

Site in where a patient is interned for prolonged health-related activities.

Subtype of Site.

Supertype of Hospital, Hospice.

Attributes

- Identification – Name or other identification of the site.
- Director – Name of the person in charge of the site.
- #Beds.
- #Staff.

Intervention

Administration of a substance or technique to provide care or to prevent a condition.

Subtype of Health-Related Activity.

Attributes

- Intervention Form – physical form in which the intervention is delivered (e.g. tablet, capsule, suppository, solution, ads, billboards, pamphlets, etc.).
- Quantity – amount or dose.
- Reason – basis for the intervention (e.g., treatment, prophylaxis, high-risk, etc.).
- Route – oral, intravenous, subcutaneous, subdermal, intramuscular, counseling, campaign, advertisement, spray, etc.
- Rate quantity – period of time over which a specified dose is delivered.

- Strength – amount of agent per unit of administration.

Laboratory

Site for the analyses of health-related substances or specimens.

Subtype of Point of Service.

Attributes

- Identification – Name or other identification of the lab.
- Specialty.
- #Technicians.

License

Permit granted by a health authority to a party to perform health-related activities.

Associated with License to license association and Licensing Participation.

Aggregation of one or more Facilities.

Attributes

- License Identification.
- License Effective Date.
- License Expiration Date.
- Service Authorized.
- Jurisdiction.

License to license association

Association between instances of **License**.

Attributes

- License Association Type – one example of this type of relationship is when a facility license is issued conditioned to the responsibility of a licensed professional.

Licensed Person

Human individual licensed to perform health-related activities.

Subtype of **Person**.

Attributes

- License Type.
- Specialty.
- Role.
- Affiliation.

Licensing Participation

[Relationship] **Participation** between **Party** and **License**.

Attributes

- Licensee – party to whom the license is issued.
- Type of service.

Location

Site of interest to public health.

Supertype of Physical location, Postal location and Telecommunications location.

Associated with Location relationship, Material Location participation, Party location participation and Target Participation.

Attributes

- Current status time – time range during which the location is or was active.
- Location Identifier.
- Narrative text.
- Setting code.
- Location status.
- Type – residence, office, restaurant, hospital, daycare, ship, prison, nursing home, district, etc.

Location Relationship

Association between instances of **Location**.

Attributes

- Date Time Range – period of time in which the relationship is effective.
- Type – e.g., same as, adjacent to.

Material

Any material, sample, tool or substance of relevance in the health-related activity.

Supertype of Specimen.

Associated with **Material relationship**, **Material Location participation**, **Material responsibility** and **Target Participation**.

Attributes

- Danger Code – e.g., "examine under hood", "wear gloves", etc.
- Handling – e.g., "do not expose to light", "keep at certain temperature", etc.
- Time range.
- Description.
- Identifier.
- Name.
- Quantity.
- Type.

Material Location Participation

Location where a material instance is or was to be found.

Participation between **Material** and **Location**.

Attributes

- Time Range.
- Type.

Material Relationship

Association between instances of **Material**, largely in some kind of whole or part or containment. Special functioning of the relationship depends on the role of the material.

Attributes

- Type.
- Time Range.

Material Responsibility

Participation between **Material** and **Party**.

Attributes

- Identifier.
- Time Range.
- Type.

Non-person living organism

Individual living thing other than a human being that is sufficiently important in its own right to model as a party.

Subtype of **Individual**.

Attributes

- Identification – Name or other identification of the organism.
- Species

Notification

Interaction with a party to report or document a significant condition.

Subtype of **Health-Related Activity**.

Attributes

- Reason – e.g., reportable condition, lab test, screening results, referral, etc.

Observation

Action performed in order to determine an answer or result.

Subtype of Health-Related Activity.

Supertype of Case.

Attributes

- Derivation text – explains how an observation derives from other observations, e.g., “change convalescent to acute”.
- Value – result value of an observation activity.

Organization

Grouping and/or collective action of individuals.

Subtype of Party.

Supertype of Formal Organization, Informal Organization.

Attributes

- Identification – Name or other identification of the organism.

Outbreak

Spatial occurrence of a condition in cases in excess to the normal expectation.

Subtype of Case.

Attributes

- Jurisdiction extent – quality measure of the number of jurisdictions involved, some possible values: single jurisdiction, multi-county, etc.
- Peak Date – date with the highest observed number of cases.
- Time range – period of time during which the outbreak takes place.

Outpatient

Site in where short-term health-related activities are performed.

Subtype of Site.

Supertype of Primary Clinic, Specialist.

Attributes

- #Physicians – Number of physicians on duty.

Party

Individual or organization of specific interest to public health.

Supertype of Individual, Organization.

Associated with Actor participation, Party Location participation, Material responsibility, Party relationship and Target Participation.

Attributes

- Identification – Name or other identification of the party.

Party Location Participation

[Relationship] **Participation** between **Party** and **Location**.

Attributes

- Status.
- Effective date.
- Time range – period of time in which the party is located to the location.
- Type – e.g., owner, occupant, visitor, worker, client, etc.

Party-to-Party Relationship

Association between instances of **Party**.

Attributes

- Time range – period of time in which the relationship is valid.
- Type – e.g., employee of, sexual partner of, parent/child of, etc.

Person

Human individual.

Subtype of **Individual**.

Supertype of **Licensed person**.

Attributes

- Identification – Name or other identification of the person.
- Ethnicity – e.g., Hispanic, non-Hispanic.
- Occupation
- Race – e.g., American Indian/Alaskan native, white, African American, Asian, Hawaiian/Pacific Islander, etc.
The attribute repeats to record multiple racial categories to which a person can belong.

Pharmacy

Site for the preparation and sale of prescribed substances or utensils.

Subtype of Point of Service.

Attributes

- Identification – Name or other identification of the pharmacy.

Physical location

Spatial location or reference to land or property registry.

Subtype of Location.

Attributes

- Identification – Name or other identification of the location.
- Address.
- City/Township.
- State Code
- State name
- ZIP
- ZIP extension
- FIPS county
- County name
- Country
- Tribal land
- Latitude.
- Longitude

- Datum.
- Property text – description sufficiently precise to enable recognition.

Point of service

Site for health-related activities performed by technicians and not requiring certified health professionals for its operation.

Subtype of Site.

Supertype of Pharmacy, Laboratory and Emergency management.

Attributes

- Type.

Postal location

Used to direct mail or to find in a street map.

Subtype of Location.

Attributes

- Directions – descriptive information to assist a party in finding the location.
- Postal address – text used for an address label

Primary Clinic

Site for short-term health-related activities requiring the participation of a non-specialist, certified health professional.

Subtype of Outpatient.

Attributes

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- Type.

Referral

Introduction of an individual from one party to another. A prescription is a referral of the patient to the pharmacist.

Subtype of Health-Related Activity.

Attributes

- Description text.
- Reason text.

Site

Physical location at which one or more healthcare service is provided.

Subtype of Physical Location.

Supertype of Inpatient, Outpatient, Point of Service.

Aggregation of one or more Facilities.

Specialist Consultory

Site for short-term health-related activities requiring the participation of a specialist, certified health professional.

Subtype of Outpatient.

Attributes

- Type – usually related to the medical specialty treated.

Specimen

Part, fraction, aliquot, component, tissue sample, or any substance collected in a health-related activity.

Subtype of Material.

Attributes

- Source site – where, in relationship to the specimen source, the specimen is taken; e.g. body sites, geographic location, material artifact.

Target Participation

Any party or material target of a health-related activity.

Participation between Health-Related Activity, Location, Material and Party.

Attributes

- Awareness code.
- Time range.
- Type.

Telecommunication location

Electronic address providing a mechanism to contact the party.

Subtype of Location.

Attributes

- Electronic address text – number, character string or frequency used to establish communication.
- Personal Identification – code assigned to a person and used to access a device such as a beeper. Often referred to as PIN.
- Time Zone.