Chapter Seven- Maps and its uses in Public Health

7.1. Basic components of maps,

WHAT ALL GOOD MAPS SHOULD HAVE (Bach & Freelan, from WWU's ENVS-321 Computer Cartography)

Regardless of the cartographic style or content, most maps have the following common elements. These are the "Golden Rules of Cartography" – at least for beginner cartographers (though in truth there are no 'rules' in cartography).

1. **TITLE:** the title should be in a large font, easily identifiable as the title of the map and should include *descriptive* text as to the location and purpose of the map. If the map is thematic, the theme should be included in the title. For example: *Corn Production in Washington, 1990*. The title is usually the largest font size of all lettering on the layout, however, it should not dominate the map graphic itself. The title may or may not be in a box and does not need to be at the top of the page (though it often is). For published materials (e.g., books or articles) the title may be included in a figure caption.
2. **SCALE INDICATOR:** the scale of the map is typically indicated by a graphic bar scale, a representative fraction or a verbal scale. The reader must be able to determine the relationship between a unit of measure on the map and a unit of measure in the real world.
3. **ORIENTATION:** a map should indicate which way is north (and/or south, east and west). Commonly this is done by a north arrow or compass rose. Orientation may also be shown by graticule or grid marks (e.g. lines of latitude and longitude). By convention north is towards the top of the page (thus some maps do not have north arrows), but the orientation must still be given for a 'proper' map. North does not need to be at the top of the page and a north arrow is essential in maps where it is not.
4. **BORDER(s)** (or ***Neatline***)**:** a map border identifies exactly where the mapped area stops and should be close to the edges of the mapped area.

   The distance between the map and it's border should be the same on all sides (balanced). There should also be a border around the entire page or map layout (enclosing and grouping the title, legend, text boxes, etc.). Both of these borders are sometimes referred to as a 'neatline.' In addition, there is sometimes a thin additional line just outside of a border (accentuating it and ideally making it more visually appealing) that is *also* referred to as a neatline.

1. **LEGEND:** required if the map uses symbols or colors (including shades of gray and patterns). Maps (and certain map features) do not need legends if the symbology is so common or simple as to be easily understood by the reader. However, it must be clear what each marker or line type, weight and pattern represents. The legend does not need to be labeled "Legend".
2. **MAP CREDITS:** -**SOURCE OF DATA** (especially on thematic maps) -**NAME** of the cartographer -**DATE** of the map creation/publication -**DATE** of the map data -Optional: **PROJECTION** of the map (especially for small-scale maps)

3. **LOCATOR MAP (INSET):** an inset Locator map is needed if the area of the map is not easily recognizable or is of large scale. For example, for a map of Whatcom County, there should be an inset map of Washington, showing the location of Whatcom County. Inset **Detail** map(s) may also be used to show an area of the map in greater detail (larger scale).
4. **EFFECTIVE GRAPHICAL DESIGN:** the layout design is as important as effective sentence structure is to written text. Design refers to the planning and decision making processes involved in the visual display of the spatial data. You can achieve balance by rearranging the map elements (scale, north arrow, legend, title, etc.) and changing size of the text, border. etc. The map and map elements should be: -Neat and clear -Appropriately and consistently generalized -Symmetrically balanced (avoid crowding, no large blank areas) -Without unnecessary clutter (keep it simple, be wary of 'artistic' details)
5. **VISUAL HIERARCHY:** a hierarchy of symbology should be used for the lettering, line weights and shading. More important features are typically larger and/or darker, less important/background information should be smaller and/or lighter. At the same time, do not "over weight" or "under weight" features.
6. **PURPOSE:** All maps have a purpose which influences every element of the map and the map layout. A cartographer should be able to clearly articulate the purpose of their map and should keep the audience (who the map is going to be used by) and the client (who the maps is being produced for) in mind.

7.2. Maps types and Conventional symbols of maps

7.3.Spot map in disease surveillance

7.4.Geographic information systems in disease surveillance and control.

Background

Surveillance is the ongoing systematic collection, analysis, and interpretation of outcomespecific data for use in planning, implementing and evaluating public health policies and practices. A communicable disease surveillance system serves two key functions; early warning of potential threats to public health and programme monitoring functions which may be diseasespecific or multi-disease in nature.

The early warning functions of surveillance are fundamental for national, regional and global health security. Recent outbreaks such as the severe acute respiratory syndrome (SARS) and avian influenza, and potential threats from biological and chemical agents, demonstrate the importance of effective national surveillance and response systems. The International Health Regulations (IHR) 2005 underscore the commitment to the goal of global security and request all Member States to establish and implement effective surveillance and response systems to detect and contain public health threats of national and international importance.

The programme monitoring function of surveillance of communicable diseases encompasses a variety of goals such as eradication or elimination (e.g. of guinea worm, measles) and surveillance for acute flaccid paralysis. Surveillance systems also serve to monitor trends of endemic diseases, progress towards disease control objectives, and to provide information which

may be used to evaluate the impact of disease prevention and control programmes.

Overview of monitoring and evaluation of surveillance & response systems

Monitoring in the context of surveillance and response systems refers to the routine and continuous tracking of the implementation of planned surveillance activities (monitoring the implementation of the plan of action) and of the overall performance of surveillance and response systems.

Evaluation is the periodic assessment of the relevance, effectiveness and impact of activities in the light of the objectives of the surveillance and response systems.

7.5. Spot map and Locality map

7.6. Scaled map

- 7.6.1. Definitions,
- 7.6.2. Scaling
- 7.6.3. Triangulation

7.7. **Use of mapping in Public Health**

- 7.7.1. Importance of surveying in Public Health
- 7.7.2. Application of mapping and surveying in public health

Introduction



A **map** is a visual representation of an area – a symbolic depiction highlighting relationships between elements of that space such as objects, region, themes.

The details represented in the map depends mostly on the scale at which the map is designed.

Therefore Scale constitutes an integral element of the map.

SCALE" which indicates the relationship between a certain distance on the map and the distance on the ground.

Selecting the appropriate scale depends on the size of the sheet of paper and the accurate placement of features.

Scaling is the process of measuring or ordering entities with respect to quantitative attributes or traits.

Maps have been used for thousands of years as a tool for sharing knowledge. Knowledge on a map is
presented in a graphical format on paper or more recently as a three-dimensional display on computer
screens and electronic means. Maps carry spatial data which is information about the location and
shape of, and relationships among, geographic features, usually stored as coordinates and topology [1].
The function of the map as a medium for communication is well-recognized. Maps can provide concise, clear, logical, flexible and expandable messages using minimum natural language representation building on the power of graphic presentation. Maps gain their value in three ways [2]:

- As a way of recording and storing information. Governments, business and society at large must
store large quantities of information about the environment and the location of natural resources, capital assets, and people;
- As a means of analysing locational distributions and spatial patterns. Maps allow the user to

recognize spatial distributions and relationships and make it possible to visualize and hence conceptualize patterns and processes that operate through space;

• As a method of presenting information and communicating findings. Maps can convey information and findings that are difficult to express verbally. Maps can also be used to convince and persuade, or even propagandize.

Health mapping refers to the activities, techniques and tools that are used to link geography or location as the common factor that pulls health and community data together. The health map generally aims to create a cartographic representation of the environmental setting, the distribution of diseases and the health services. Health mapping aims to support public health's core functions of surveillance, targeting and intervention. These functions are supported by public health practices including assessment, policy development and assurance. The real value of health mapping emerges when maps are linked to disease control and prevention efforts.

The aim of this paper is to increase awareness of the value and potential role of health mapping, present a situation analysis on the use of health mapping in countries of the Region, identify constraints to the further development of health mapping in the Region and provide recommendations to countries to strengthen the development, maintenance and utilization of health maps for planning and decision-making.

2. Geographic information systems technology

A geographic information system is an organized collection of computer hardware and software, geographic and tabular data, and personnel and knowledge designed to capture, store, manipulate, update, analyse and display spatial data [3]. The use of geographic information systems (GIS) as a major technology for map storage, production and dissemination has been fully recognized. GIS

technology gives data a spatial dimension. It is a tool to represent knowledge in a visual format by
linking statistical and thematic data to geographic locations on maps. GIS and mapping are closely
linked. Maps are digitized to become an integral part of a geographic information system, and GIS
technology produces maps with layers of spatial and thematic data.
Statistical and surveillance data can be presented or visualized in a number of ways, including in tables, graphs and maps. Maps incorporate two major types of data: thematic and spatial. They allow
the full incorporation, online manipulation, classification and visualization of data. Maps connect facts
and figures with places.
There is a strong link between health and geography. Disease distribution and health outcomes are
very much affected by the places where people live. The characteristics of a place, for example whether it is urban, rural, arid or tropical, influence disease patterns, life expectancy, mortality, morbidity, education, income and lifestyle, among other things. In short, “places form people as much
as places are formed from peoples” [4].

Areas of public health mapping

Disease surveillance

A functional disease surveillance system depends on timely dissemination of surveillance data to health officials and the public. Temporal and spatial trends in disease outbreaks can be visualized by
preparing maps showing for each location the date of peak disease incidence, i.e. the week or month
when the largest number of cases occurred. An integrated approach and enabling technology for disease surveillance can be supported by an effective public health mapping programme [7]. Health

mapping can be used as a unifying factor for different disease surveillance activities, since location is
the common element among them all.

Epidemiology

Epidemiologists are able to trace the spread of a disease as they study outbreaks of the disease through
time, location and population. By mapping the location of a population or subgroup and looking at the
presence of ill health among the population over time, it is possible to identify the source of a disease
and how it spreads. Identifying these elements can help the national authorities as part of the health
system to create a plan to combat the spread of the disease.

Water supply and delivery

The quantity and quality of water supply have a direct impact on the health of people. The first known
application of health mapping was related to water sources, when Johan Snow mapped cholera cases
during an outbreak in London in 1854 and linked them to a specific water source [8].

Mapping the location of water sources and the flood seasons connected to these locations facilitates
control and prevention of diseases such as malaria, onchocerciasis, cholera and other water-borne
diseases. Maps can also be generated to identify the relationship between water supply sources and
areas of high dental caries prevalence [9].

Poverty

Reaching the Millennium Development Goals will require identification of target populations and their
geographic locations in a detailed manner. Poverty mapping involves a household survey and a
population census as data sources. Poverty maps allow easy comparison of indicators of poverty or

well-being with data from other assessments. As well, by showing the spatial distribution of poverty,
maps provide evidence for the targeting of intervention or development projects. Mapped information
on the levels and distribution of poverty facilitates the communication of findings, which greatly
assists in the implementation of development projects and in advocacy [10]. These poverty maps also
offer the promise of generating useful data about poverty and inequality at the local level, information
which has potential applications in both the policy and research spheres [11].

Emergency and disasters

The challenge facing emergency preparedness and response planning is mainly concerned with the
interaction between humans and their environment under conditions thought to be hazardous either to life or to habitat [12].