


Technology Name:		Tableau Desktop [ <a href="#">link for more info</a> ]			Version:		8.2	
Reviewer:	Brian Lee @leebrian							
Date:	10/14/2014							
Public Health Processes:								
Diverse alignment across public health processes, but specifically "Process, Store and Analyze Data."								
Description / Purpose:								
<p>Tableau Desktop is a software tool developed by Tableau Software, a company founded out of a Stanford University project in 2003. Tableau Desktop is a visualization and analysis tool that queries data in multiple formats and provides an easy method to generate static and interactive charts, graphs and maps. Specific visualization types include: text tables, heat maps, highlight tables, symbol maps, filled maps, pie charts, horizontal bars, stacked bars, side-by-side bars, treemaps, circle views, side-by-side circles, lines, area charts, scatter plots, histograms, box-and-whisker plots, gantt, bullet graphs and packed bubbles.</p>								
<b>Keywords:</b> Data Analysis, Data Visualization								
<b>Recommended Attributes:</b>								
Acceptability:		Tableau has an extensive feature set that is able to be readily used by novice users through to expert users. Extensive training is available for free through Tableau's website and an active community forum exists to answer user questions and provide examples. Tableau Desktop is able to load data from a variety of common user formats such as comma separated value (CSV) or Excel. A professional version of the tool exists to connect to complex data sources such as MySQL, SQL Server, Google Analytics, Hadoop and other sources.						
Usefulness:		Tableau's primary purpose is to allow users to better interact with data, perform analyses and disseminate results of analyses. Tableau provides a large selection of built-in and user customizable chart times that allow customization and formatting. In addition to charts, Tableau provides US and international mapping features. Tableau creates dashboards of analysis that can be published to TableauPublic for free or to an organizationally hosted Tableau Server Edition. Tableau maintains an active release schedule with major releases every 6-12 months.						
Accuracy:		Tableau provides professional support to validate that their analytic routines calculate figures accurately. Tableau does not provide advanced regression and statistical routines that need to be carried out by statistical software.						
Architecture:		Tableau Desktop is client software that is installed on 32-bit and 64-bit Microsoft Windows workstations and Apple Macintosh workstations. Tableau also provides a Server version that provides a service application programing interface (API) that allows users of Tableau Desktop to publish and share visualizations through the web. While Server is a paid tool, Tableau also provides TableauPublic for free for visualizations and data sets that can be shared publicly.						
Data Quality:		Visualization is a useful component of data quality by allowing epidemiologists to investigate the quality characteristics of a data set. Tableau provides tools to check data for completeness and to calculate representativeness.						

Timeliness:	Tableau does not provide functionality to address timeliness and is out of scope for this evaluation. Data sources that provide data to Tableau need to be assessed for their timeliness independent of Tableau.	
Costs:	Tableau is commercial software provided by Tableau Software at charge. Tableau Desktop is available for a one-time fee of \$999 per user with a \$200 per user per year optional support that provides access to upgrades. A professional edition is available for a one time fee \$1,999 with a \$400 per user per year optional support charge that provides access to upgrades. Tableau also provides a hosted solution for \$500 per user per year that includes all software installs, support and upgrades. Tableau costs are per year, not per seat or per workstation so a single user license allows the user to download, install and use the software on multiple workstations. Tableau also provides a mobile version of the tool for free that runs on Apple iOS and Google Android operating system. The mobile version does not have full functionality, but allows for viewing and interacting with dashboards.	
Organizational:	Tableau is likely to be used by epidemiologists, statisticians and public health advisors who do not have specialized informatics training. Since this is desktop software it is able to be used without ongoing IT support and maintenance of server components.	
Supportability:	Tableau requires no specialized support and can be maintained by its users with minimal interaction with IT support. Installation and upgrades requires temporary administrative access on Windows, but not on Macintosh. This software is currently Level III approved for use on CDC workstations.	
Conclusion:	Tableau provides an easy to use, relatively inexpensive tool for public health practitioners to use to analyze, create visualizations and effectively communicate their analysis with a diverse audience. It provides functionality common on health and non-health web sites and allows for interactivity and a pleasant user interface that other analysis tools do not require. While this tool does not replace completely statistical software packages like SAS, R and SPSS it is valuable for visualization purposes.	
Data Representation:	{"evaluation":{"url":"https://github.com/leebrarian/setph/blob/master/evals/structured-evaluation-technology-public-health-tableau.docx", "technology":"Tableau", "version": "8.2", "keywords":["Data Analysis", "Data Visualization"], "author":"@leebrarian", "acceptability":1, "usefulness":1, "accuracy":1, "architecture":1, "data-quality":1, "timeliness":0, "costs":1, "organizational":1, "supportability":1}}	

## Appendix A: Required Attribute Descriptions

1. Acceptability and User Satisfaction – The willingness of users to participate and effectively use a system. This attribute is sometimes included within Usefulness as it related to how the intended users of a technology are able to integrate it into practice and are satisfied with its performance and functionality.

2. Usefulness – The ability of a system to meet the objectives and priorities as designed. When possible, this attribute is used to describe by the ability of a technology to meet the disease prevention actions enabled by analysis and interpretation of the system or technology data. Usefulness can also be defined as the ability of the system to meet the domain characteristics or functionality specific to this system. Evaluation should assess the ability of the system to meet the necessary functionality or accomplish its purpose. This will vary greatly depending on the type of technology and the evaluator should assess this differently depending on the type of tool. In some cases the purpose is apparent (e.g., outbreak investigation) while in other cases the evaluator may need to contact the author of the technology to gain insight.

3. Accuracy – Is the measure of how the data within a system accurately reflects the reality of data outside of a system. While the sensitivity and predictive value positive attributes are specific to public health, the accuracy attribute is related but generalized to non-public health tools. This attribute represents a technology's ability to present data that accurately represents the real value

4. Architecture or Type of System – Describing the overall architecture of a technology is important for determining fit of a technology for use within a particular public health organization. This attribute is sometimes called system design or technology design and includes important characteristics like whether it uses peer-to-peer or centralized data sharing. The evaluator must assess the technology in relation to their organizational context as to whether the type of system (web site, mobile application, message queue, etc.) is an appropriate fit for the architecture of other technologies that will be used within an organization.

5. Data Quality – Represents the completeness and validity of the data stored within a system or technology. Data quality is a compound attributes that in some evaluations is stand-alone but in other evaluations is broken down into sub-components such as completeness, validity, and representativeness. While this is a public health specific definition for data quality, when evaluating non-public health technologies this definition must be adapted to reflect the ability of the technology to either consume or product data that is complete and error free. In many cases, a technology may provide specific benefits over improving data quality and/or reducing the number of errors or faults within the technology.

6. Timeliness – The measure of the time between initial exposure to disease agent and the ability of the user to take appropriate public health action. The time lapsed

between when an event occurs to when a technology renders the event actionable for a user. The specific methods to measure timeliness will vary depending on the technology under evaluation but is important for comparing different technologies as to how soon a technology is useful within public health. It is important that timeliness be all inclusive to cover all aspects of timeliness that are appropriate to a technology such as onset of exposure, onset of symptoms, onset of behavior, capture of data, completion of data processing, application of analytical processing, generation of alert, initiation of investigation and initiation of public health intervention. For technologies outside of public health, some steps may not be able to be included within the specific evaluation of the timeliness attribute.

7. Costs – Cost is critical in determining the overall relative value of a technology and is important in the selection of whether a technology is appropriate for use within an organization. Evaluation of the cost attribute should include both direct costs such as licensing, support, hardware, software purchases, personnel and travel; as well as indirect costs incurred across the organization for adopting a technology. The rating based on this attribute should address the cost of a system in relation to its value or results from the usefulness attribute. This can include the value of the prevention as a result of the technology but will depend on the particular aspects of a technology. In the case of software technologies, this evaluation attribute also includes the licensing model whether it is open source, commercial or government produced software. The software license model is important for determining initial costs as well as ongoing costs for support and operation.

8. Organizational and Social – The stakeholders that use and interact with a technology on every level are critical for including within an evaluation. Including stakeholders within an evaluation provides the necessary context for understanding a system as well as providing a context for the overall evaluation results. This evaluation attribute describes how a technology is adapted within an organization and addresses the social fit of the technology. This can determine how a technology is compatible with other technologies within an organization or how the technology is used differently across stakeholder groups.

9. Supportability and Compatibility– This attribute describes a system’s operation and the complexity of a system in relation to how users and administrators maintain the system. This attribute is sometimes included in the costs evaluation of a system. This attribute is important in determining the fit of a technology into an existing mix of technologies in an organization.

## Appendix B: Optional Attributes

Select zero or more attributes as deemed necessary to accurately evaluate the technology of interest.

**01. Data Management and Interoperability** – Data management represents a variety of technology functions and features focuses on how a technology works with data within its boundaries and how data is received from and sent to outside partners. This attribute is particularly common in describing how a public health system is able to store, control access, provide access, ingest and extract data to enable to the processing of data into information. Each technology may address data management in a different manner. This attribute can be synergistic in with the attribute of standardization for how it enables interoperability with other technologies.

**02. Data Analysis and Data Visualization** – Data analysis approaches are critical to the planning, creation and execution of information systems within public health. While data management focuses on the structure, storage and manipulation of data; analysis and visualization focuses on the use of data to perform the necessary functions of public health. Data analysis is related to and enables other attributes like data quality (ability to analyze the data is critical to determining data quality) and timeliness (ability to visualize the data enables swifter decision making with data).

**03. Description and Documentation** – It is important that a system be clearly described in overall function as well as the intended purpose that the system is trying to fulfill. Each evaluation needs to include a description of the technology to give cover the purpose and intent of the system. This includes the level of documentation available for the technology and will affect the usability (i.e., clarity of documentation makes technology easier to adapt) as well as the usefulness of the system.

**04. Performance and Efficiency** – This attribute describes a technology's ability to consistently and efficiently meet the demands of the users of the technology. This attribute measures the responsiveness of a technology and its ability to maintain a useful level of responsiveness under expected user activity loads.

**05. Flexibility** – Flexibility refers to a system or technology's ability to adapt and change as the needs of the technology's users change. The evaluation of this attribute is important to determine the ability for a technology to expand and adapt to shifting organizational changes. Depending on the type of technology, this attribute will be reflected in different manners. Since technology will be used in different manners depending on its function within public health (i.e., environmental health, health policy, infectious disease, non-communicable disease, etc.) the value of a technology is greater if it can be reused in different

configurations by a wide variety of users. This is particularly valuable in data intensive tools that need to adapt as data standards change over time.

06. Stability and Reliability – Stability and reliability represent the ability of a system or technology to remain functional in variable conditions and for long periods of time within failure or unexpected periods of being offline. While this definition is specific to surveillance systems, it is useful in the evaluation of technologies to describe how a technology is able to withstand unexpected performance conditions and whether it can consistently respond to the user without an interruption in service. This is important in evaluating how technologies will fit into an organization as gaps in stability and reliability can negatively impact other systems used within an organization.

07. Data Dissemination – Systems must be able to present and share data clearly so that it can be used by decision makers and system users. This attribute represents a technology's ability to accurately share information and collaborate with users of other technologies.

08. Standardization – This attribute reflects the ability of a technology to generally recognized formats for system data that increases the ability for other systems to understand and use data produced by a system. This attribute is important in determining the interoperability of a technology with other technologies but varies as to how it is important within a technology. Technologies that rely more on data interchange will require this attribute to be used with a higher priority.

09. Security and Privacy – This attribute is largely driven by the US Health Insurance Portability and Accountability Act (HIPAA) of 1996 that describes privacy controls that are required to protect patient health information. However, this attribute is commonly included into the Usefulness or Architecture attributes of a system rather than broken out as a separate dimension of an evaluation. An evaluator may choose to prioritize this attribute if a technology is particularly sensitive to privacy or security concerns such as when a technology operates within multiple health care institutions.

010. Simplicity vs. Complexity – Simplicity describes the complexity of a systems' structure as well as how easy it is for a user to operate a technology. Systems should be as simple as possible while still fulfilling their objectives. The simplicity of a technology is closely related to its usability or acceptability attributes. The more complex a system is, the more difficult it is to deploy within an organization and the greater the risk that it conflicts with other technologies used. The evaluation of a system based on its complexity or simplicity will be an important factor for organizations with limited informatics expertise to support the tool and educate users on its functionality.

O11. Ethical and Legal – This attribute is important for determining whether a technology is an appropriate fit based on legal and ethical concerns of an organization using the technology or the user operating the technology.

O12. Portability – Portability describes how well a system can be duplicated and made useful in another setting outside of its primary setting. This attribute describes the technology's ability to be reused in diverse situations. It is related to the simplicity attribute in that technologies that are simple are more likely to be portable to additional situations and organizations. This attribute is also sometimes linked to the generalizability of a technology from one specialized situation to other situations. This attribute is important for evaluators who are concerned with the ability of a single tool to be used within multiple diverse portions of their organization.

### **Appendix C: Common Ground Business Processes**

1. Conduct Exercise To Evaluate Organizational Response Capacity
2. Conduct Syndromic Surveillance
3. Conduct Notifiable Disease Surveillance
4. Conduct Active Surveillance
5. Conduct Public Health Investigation
6. Initiate Alerts
7. Develop And Report Situational Information
8. Manage Resources
9. Develop And Initiate Risk Communication
10. Administer Medical Countermeasures (MCMS)
11. Data Collection
12. Data Management
13. Process, Store, And Analyze Data
14. Conduct Epidemiological Research
15. Community Health Assessment
16. Develop Strategic Plan
17. Identify And Deploy Health Guidelines
18. Deliver Programs And Services
19. Develop Public Health Intervention
20. Link Individuals/Populations To Programs/Services
21. Develop And Implement Program Evaluation