Health Monitoring Systems

EpiCenter User Manual

Version 2.6

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1 Introduction

The EpiCenter system analyzes healthcare data for the purpose of detecting anomalies suggestive of public health threats, such as disease outbreaks and bioterrorism. EpiCenter provides automatic notification to appropriate health department personnel when anomalies are detected.

This user manual defines the components and describes functionality for EpiCenter Version 2.6, released in August 2009.

EpiCenter 2.6 is accessible by both public health users and users at individual healthcare facilities. The functionality for healthcare facility users is limited to the Charts/Public Health Reporting Page.

2 Data Analysis Components

This section describes how EpiCenter models healthcare data and available analysis methods. The terminology introduced here is used throughout the user manual and in the EpiCenter product.

2.1 Data Types

2.1.1 Emergency Department Registration Data

Emergency department registration records typically include the following key data elements:

- Sending facility
- Admit date and time
- Encrypted patient ID
- Visit number
- Patient date of birth
- Patient gender
- Free-text chief complaint

In most cases, this data is collected in real-time, meaning that a record is received at Health Monitoring Systems within minutes of a patient being registered at the facility.

2.1.2 Poison Control Center Call Data

Poison control center call data is available in the EpiCenter system in select areas. This data is obtained remotely from the National Poison Data System (NPDS) and provides information pertaining to incoming calls to poison control centers in a specific geographic area. The data provided to Health Monitoring Systems by the NPDS is already classified based on 131 clinical effects. No raw data is received; only counts by each NPDS clinical effect. The poison control center call classifiers available in EpiCenter use these clinical effects to provide classifications that may be suggestive of a public health threat.

2.1.3 Discharge Disposition Data

Discharge disposition data indicates the outcome of a patient's visit to a healthcare facility. In addition to the data elements listed above, these records include a specific disposition for each patient. Example discharge dispositions include discharge to home, admitted to facility, and left against medical advice.

Please note, the analysis tools associated with this data type are only available for regions where this data type is collected.

2.2 Classifiers

All incoming data is automatically classified by the EpiCenter system. The Infectious Disease Symptoms, Syndromes, Animal Related Injury, Influenza Related Illness, and Traumatic Injuries Classifiers are used to classify the free-text chief complaints provided from Emergency Department registrations. The Discharge Disposition classifier is used to classify incoming discharge disposition information. The Bioterrorism/Agents, Body Systems, and Special Clinical Effects classifiers are used to group poison control center call data based on the clinical effects already assigned by the NPDS.

A description of each classifier is provided below.

2.2.1 Syndrome Classifier

The Syndrome Classifier classifies free-text chief complaints based on classifications that group together symptoms associated with the presentation of common diseases. The Syndrome Classifier contains seven syndromic classifications that are composed of one or more classifications from the Infectious Disease Symptom Classifier. A chief complaint can be classified into one or more classifications by this classifier.. See Appendix 1: Syndrome Classifier for more information about the configuration of the Infectious Disease Symptom Classifier.

2.2.2 Infectious Disease Symptom Classifier

The Infectious Disease Symptom Classifier classifies free-text chief complaints based on a specific symptom as opposed to the grouping of symptoms used by the Syndrome Classifier. This method of classification alleviates many of the inconsistencies seen with the Syndrome Classifier. For example, one group of system developers could associate a chief complaint of "fever" to a constitutional category while another group of developers might place this complaint in an influenza-like illness category. The Infectious Disease Symptom Classifiers provides a solution for this issue by approaching the classification process with the symptoms of disease in mind rather than attempting to group symptoms into syndromic classifications. See Appendix 2: Infectious Disease Symptom Classifier for more information about the configuration of the Infectious Disease Symptom Classifier.

2.2.3 Animal Related Injury Classifier (Beta)

The Animal Related Injury Classifier classifies free-text chief complaints into classifications related to animal inflicted injuries. A chief complaint can be classified into one or more classifications by this classifier. The Animal Related Injury Classifier is currently in a beta state as it undergoes additional training to improve its accuracy. See Appendix 3: Animal Related Injury Classifier for a listing of Animal Related Injury Classifier classifications and definitions.

2.2.4 Influenza Related Illness Classifier (Beta)

The Influenza Related Illness Classifier contains several classifications used to identify free-text chief complaints indicative of Influenza. A chief complaint can be classified into one or more classifications by this classifier. The Influenza Related Illness Classifier is currently in a beta state pending additional validation with confirmed Influenza cases. See Appendix 4: Influenza Related Illness Classifier for a listing of Influenza Related Illness Classifier classifications and definitions.

2.2.5 Traumatic Injury Classifier (Beta)

The Traumatic Injury Classifier classifies free-text chief complaints into classifications related to traumatic injuries. A chief complaint can be classified into one or more classifications by this classifier. The Traumatic Injury Classifier is currently in a beta state as it undergoes additional training to improve its accuracy. See Appendix 5: Traumatic Injury Classifier for a listing of Traumatic Injury Classifier classifications and definitions.

2.2.6 Immediate Notification Classifier

The Immediate Notification classifier classifies free-text chief complaints based on a list of keywords considered rare enough and serious enough to warrant immediate attention (e.g. "anthrax"). Because

these keywords are exceedingly rare, time series of these classifications are typically analyzed differently for surveillance using the immediate qualification method. These classifications can also be analyzed using the standard (simple) method if preferred. See Appendix 6: Immediate Notification Classifier for a listing of classifications and definitions.

2.2.7 Patient Concern Classifier

The Patient Concern classifier classifiers free-text chief complaints based on a list of keywords related to a novel outbreak. For EpiCenter Version 2.6, the patient concern classifier focuses on H1N1. See Appendix 7: Patient Concern Classifier for a listing of Patient Concern Classifier classifications and definitions.

2.2.8 Discharge Disposition Classifier

The Discharge Disposition classifier is used to classify discharge dispositions based on the status of a patient when they are discharged from a healthcare facility. A discharge disposition can only be classified into one Discharge Disposition Classifier classification. The Discharge Disposition Classifier is only available in areas where healthcare facilities are submitting this data type. See Appendix 8: Discharge Disposition Classifier for a listing of classifications and definitions.

2.2.9 Bioterrorism/Agents Classifier

The Bioterrorism/Agents Classifier is used to identify poison control center calls that could be suggestive of a bioterrorist threat. This classifier is based on groupings of clinical effects already assigned by the NPDS. See Appendix 9: Bioterrorism/Agents Classifier for a listing of Bioterrorism/Agents Classifier classifications and associated clinical effects.

2.2.10 Body Systems Classifier

The Body Systems Classifier is used to group poison control center calls by the effected body system. This classifier is based on groupings of clinical effects already assigned by the NPDS. See Appendix 10: Body Systems Classifier for a listing of Body Systems Classifier classifications and associated clinical effects.

2.2.11 Special Clinical Effects Classifier

The Special Clinical Effects Classifiers contains specific NPDS clinical effects that could be suggestive of public health threats and correlate with other data types available in the EpiCenter system. This classifier is based on the clinical effects already assigned by the NPDS. See Appendix 11: Special Clinical Effects Classifier for a listing of Special Clinical Effects classifications.

2.3 Analysis Methods

EpiCenter provides multiple analysis methods used to identify data anomalies and trends. Analysis methods are available on both the Charts and Maps pages. The analysis methods on the Charts page are used to generate a threshold line viewable on a chart. Additionally, automated surveillance tasks can be created using these analysis methods. On the Maps Page, the analysis methods are used to project a probability of data anomalies geographically. The parameters for each analysis method can be adjusted

by selecting the settings icon on both the Charts and Maps Pages.

A description of each analysis method available on the Charts and Maps Pages is offered below. A guide for adjusting the parameters for each analysis method is provided in Appendix 12: Analysis Method Parameters.

2.3.1 Constant Threshold (Charts Page)

The Constant Threshold, as its name implies, is used to set a fixed threshold. The default threshold used by this analysis method is 0. The Constant Threshold is most commonly used to detect immediately reportable conditions as it can be configured to detect a single instance of a condition.

2.3.2 CuSum EMA (Charts Page)

The Cumulative Sum with Exponential Moving Average (CuSum EMA) algorithm uses the same procedure as EMA to compute predicted counts. However, the threshold is the current predicted count plus a certain number of standard deviations of the prediction errors from the past. The exact number of standard deviations is determined by a set threshold multiplier (default value is 4), a cumulative sum of prediction errors, and a weighting parameter *k* (default value is 0.5). The threshold calculation requires has an additional training period, which is set to 14 days by default.

2.3.3 Exponential Moving Average (EMA) (Charts Page)

The Exponential Moving Average (EMA) algorithm computes the predicted count for the current day as a weighted average of the actual counts for a certain number of days in the past. The weight for the most recent day is set by the weighting exponential parameter (default value is 0.2). The weight for days in the past are calculated from that parameter and decay exponentially as they recede further into the past. The length of the training window is computed from the weighting exponential and a significance level parameter (default value is 0.9). The default values yield a training window of 17 days.

To determine the threshold for the current day, the algorithm calculates the standard deviation of a certain number of past prediction errors (i.e. the difference between the predicted count and the actual count). The standard deviation is weighted to place greater weight on recent errors, in a manner very similar to how the predicted value is computed. The exact number of past prediction errors used depends on two user-specified parameters: the weighting exponential (default value is 0.2) and the level of significance (default value of 0.9). Just as with the predicted value, these defaults lead to a window of 17 days. The threshold is then the predicted count plus *N* standard deviations; *N* defaults to 4 but can be adjusted.

2.3.4 Moving Average (Charts Page)

The Moving Average (MA) algorithm, also called Simple Moving Average (SMA), computes the predicted count for the current day as the average of the actual counts for the past *N* days. The user can specify the number of past days to use; the default value is 14.

To determine the threshold for the current day, the algorithm calculates the standard deviation of a certain number of past prediction errors (i.e. the difference between the predicted count and the actual count). The standard deviation is weighted to place greater weight on recent errors. The exact number of past prediction errors used depends on two user-specified parameters: the weighting exponential (default value is 0.2) and the level of significance (default value of 0.9). These defaults lead to a window

of 17 days. The threshold is then the predicted count plus *N* standard deviations; *N* defaults to 4 but can be adjusted.

2.3.5 Recursive Least Squares (Charts Page)

The Recursive Least Squares (RLS) algorithm computes a predicted count for the current day from a weighted sum of the actual counts of the current day and the past $p - 1$ days, where p is the average period parameter set by the user (default value is 7 days). The weights for the weighted sum are calculated in a way that they will minimize the sum of the absolute value of the errors. This sum of errors is computed to give more weight to more recent errors. The exact weighting is controlled by the lambda parameter, which defaults to 0.99. RLS also has a training period which can be adjusted by the user; the default is 60 days.

The threshold for the current day is simply the predicted count for the current day plus a constant number of standard deviations of the prediction errors; this number defaults to 4 standard deviations.

2.3.6 Exponential Moving Average Probability (Maps Page)

The Exponential Moving Average (EMA) algorithm computes the predicted count for the current day as a weighted average of the actual counts for a certain number of days in the past. The weight for the most recent day is set by the weighting exponential parameter (default value is 0.2). The weight for days in the past are calculated from that parameter and decay exponentially as they recede further into the past. The length of the training window is computed from the weighting exponential and a significance level parameter (default value is 0.9). The default values yield a training window of 17 days.

The percentile calculated by this algorithm is for the difference between the actual count and the predicted count. It is based on the distribution of differences seen over the past *D* days, where *D* defaults to 60 days. These differences are assumed to follow a normal distribution with the observed mean and standard deviation. The percentile for the current difference is then the probability of observing a difference as close or closer to the mean as the current difference is, under that normal distribution. When these differences do not follow a normal distribution, hatching is added to the map shading to indicate that the calculated probability may be slightly skewed.

2.3.7 Poisson Visit Frequency (Maps Page)

The Poisson algorithm computes the predicted count for the current day as the average of the actual counts for the past *N* days. The user can specify the number of past days to use; the default value is 14.

The percentile for the current day is then simply the probability of observing a count smaller than or equal to the current count given a Poisson distribution with a mean equal to the predicted count.

2.3.8 Recursive Least Squares Probability (Maps Page)

The Recursive Least Squares (RLS) algorithm computes a predicted count for the current day from a weighted sum of the actual counts of the current day and the past $p - 1$ days, where p is the average period parameter set by the user (default value is 7 days). The weights for the weighted sum are calculated in a way that they will minimize the sum of the absolute value of the errors. This sum of errors is computed to give more weight to more recent errors. The exact weighting is controlled by the lambda parameter, which defaults to 0.99. RLS also has a training period which can be adjusted by the user; the default is 60 days.

The percentile calculated by this algorithm is for the difference between the actual count and the predicted count. It is based on the distribution of differences seen over the past *D* days, where *D* defaults to 60 days. These differences are assumed to follow a normal distribution with the observed mean and standard deviation. The percentile for the current difference is then the probability of observing a difference as close or closer to the mean as the current difference is, under that normal distribution. When these differences do not follow a normal distribution, hatching is added to the map shading to indicate that the calculated probability may be slightly skewed.

2.3.9 Simple Moving Average Probability (Maps Page)

The Simple Moving Average (SMA) algorithm computes the predicted count for the current day as the average of the actual counts for the past *N* days. The user can specify the number of past days to use; the default value is 14.

The percentile calculated by this algorithm is for the difference between the actual count and the predicted count. It is based on the distribution of differences seen over the past *D* days, where *D* defaults to 60 days. These differences are assumed to follow a normal distribution with the observed mean and standard deviation. The percentile for the current difference is then the probability of observing a difference as close or closer to the mean as the current difference is, under that normal distribution. When these differences do not follow a normal distribution, hatching is added to the map shading to indicate that the calculated probability may be slightly skewed.

2.4 Data Conditioning

By default, EpiCenter displays the actual counts received from data sources. However, EpiCenter also provides the ability to condition data for day-of-week effect, such as the weekly increase in emergency department visits on Mondays. This data conditioning technique uses a Wavelet analysis method to minimize the effect this recurring pattern when calculating the threshold value.

Wavelet analysis can be used to filter out undesirable signals in data. In this instance, the "signal" that needs to be filtered out is the human behavioral tendency to seek healthcare at convenient times during the weekly cycle rather than at the first onset of symptoms. Thus, the wavelet analysis looks for patterns in the data that repeat every seven days. These patterns are then removed from the data. What remains should more closely resemble how the counts would appear if patients sought healthcare uniformly throughout the week.

Data conditioning can be applied on the options dropdown menu on the Charts and Maps pages. When applied to charts, the conditioned counts will appear as a solid blue line while the actual value will be displayed as a dotted blue line (See Figure 1 and Figure 2).

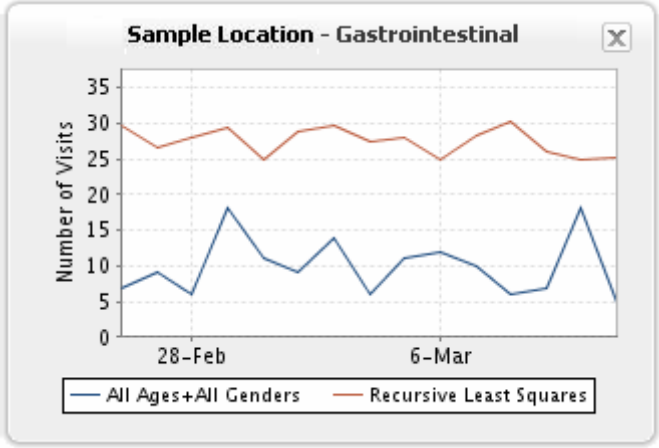


Figure 1: Data not conditioned for day-of-week effect

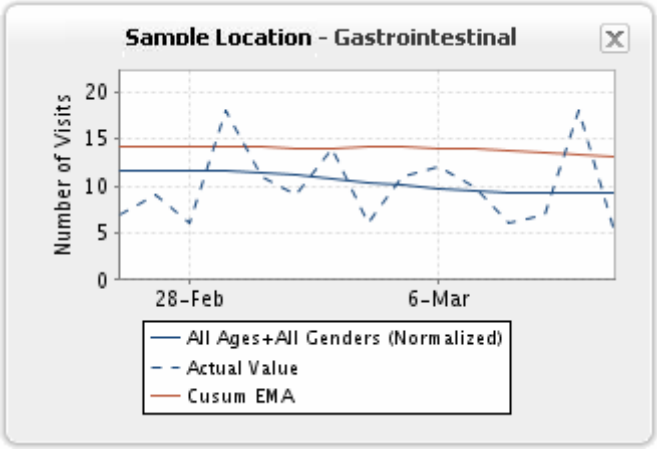


Figure 2: Data conditioned for day-of-week effect

2.5 Data Representation

Three methods of data representation are available in EpiCenter. These include:

- The "number of visits/actual value" data representation displays counts as raw data.
- The "percentage of all visits" data representation displays counts as a percentage of total visits.
- The "rate per 100,000 population" data representation displays counts as a rate based on 2000 census data.

2.6 Totaled By

The totaled by selector is available at the bottom of the left control panel on the Charts, Maps, and Forecasting pages. It is used when generating counts by geography and when configuring surveillance tasks.

When data is “totaled by home,” the patient’s home zip code is used to define a geography. For example, if the location is set to Pennsylvania and the data is totaled by home, results will return for all patients with a home zip code in the state of Pennsylvania.

When “totaled by facility,” the zip code of the facility is used to define a geography. For example, if the location is set to Pennsylvania and the data is totaled by facility, results will return for all visits that took place at a facility with a zip code in the state of Pennsylvania.

Totaled by defaults to “totaled by facility” when viewing data from a specific facility as opposed to a geography.

2.7 Predicted Value

The predicted value is enabled and disabled on the Charts page under Advanced Options. When enabled, the predicted value appears as a green line on the chart. The predicated value automatically appears on all anomaly charts in the bottom right quadrant.

The predicted value is the expected number of cases for a particular time period given what was observed in the recent past. The exact calculation depends on the analysis method that was applied; refer Section 2.3 for more details on how each method calculates predictions.

3 Surveillance

The EpiCenter system conducts automated surveillance on incoming data for the purpose of detecting data anomalies. In the event that a data anomaly is detected, a notification is distributed.

In order for an anomaly to be recognized by the system, a series of qualifications must be met based on the method of qualification selected when the surveillance task is scheduled.

3.1 Simple

The simple qualification method uses a rolling 24 hour historic window and requires that the following conditions be met before an anomaly is generated by EpiCenter:

1. The observed count is greater than or equal to 10
2. The observed count is greater than the threshold
3. If other threshold(s) are applied (ie. normalized or day-of-week), these threshold(s) are exceeded
4. No anomaly using identical parameters has been created in the past 24 hours

If any latent cases are received that fall within the parameters and 24 hour historic window used to detect a specific anomaly, these additional cases will be noted on the anomaly detail page; however, additional notification will not be generated. Any cases falling within the parameters of a specific anomaly that are received after the anomaly was generated will potentially be included in a future anomaly if requirements 1-3 above are met 24 hours after the initial anomaly was generated.

The simple qualification method can be used to detect anomalies for all classifications.

3.2 Immediate

The immediate qualification method uses a set 24 hour window based on a calendar day (midnight to midnight) and requires that the following conditions be met before a new anomaly is generated by EpiCenter:

1. The observed count is greater than the threshold
2. No anomalies using the same parameters has been created for the same calendar day

In the event that one or more cases matching the parameters of a specific anomaly are received after the anomaly is generated and that occur either on the same calendar date of the anomaly or the occurred on the date prior (latent data), the case(s) will be added to the existing anomaly and an updated email notification will be generated following the hourly running of surveillance. This addition will also be noted on the anomaly detail page. If applicable cases are received on the calendar date following the initial anomaly, an additional new anomaly will be created.

4 User Interface

4.1 Logging In

The EpiCenter user interface is accessible at: https://epicenter.hmsinc.com.

EpiCenter is supported for use with Internet Explorer, versions 7 and 8.

4.1.1 Username and Password

Each EpiCenter user is assigned a unique username. This username is the same as your email address. Users are also given a password, which can be changed following instructions in the section on the Options page. Enter your assigned username and password combination into the corresponding boxes on the login page to gain access to EpiCenter. The login page will signify an incorrect entry by outlining the problematic field in red and displaying an exclamation icon (See Figure 3).

Figure 3: EpiCenter login page – password error

Selecting the "Remember Me" checkbox will keep you logged into the user interface until you logout via the logout button located in the top right corner of the interface. Do not use the 'Remember Me' checkbox if you are accessing EpiCenter on a shared computer.

4.1.2 Forgotten Password

You can request a new password by selecting the "Forgot Password" button located on the bottom right portion of the login box. After selecting this button, you will be asked to enter your email address (See Figure 4). Please use the email address that corresponds to your username.

Figure 4: Forgot password e-mail input

You will then receive an email that contains a direct link to the password reset page (See Figure 5). After entering and confirming a new password, you will be routed back to the login page. You can now enter your username and new password.

Figure 5: Reset password

Please note, if you contact Health Monitoring Systems directly to request that your password be reset, a temporary password will be given and you will be prompted to reset your password upon login.

4.2 Navigating the User Interface

4.2.1 Tabs

The EpiCenter user interface contains multiple pages accessible by selecting the corresponding tab located on the top portion of the interface. These tabs include Summary, Anomalies, Investigations, Charts/Public Health Reporting, Maps, Forecasting, Reports, and Options. The availability of tabs may vary based on a user's permission level.

4.2.2 Control Panel

A standard control panel is available on each page in EpiCenter, with the exception of the Options page. The control panel is located on the left portion of the user interface. The pieces of functionality included on the control panel are enabled on certain pages throughout the application and disabled on others. The image below identifies each piece of functionality (See Figure 6). A description of all functionality then follows.

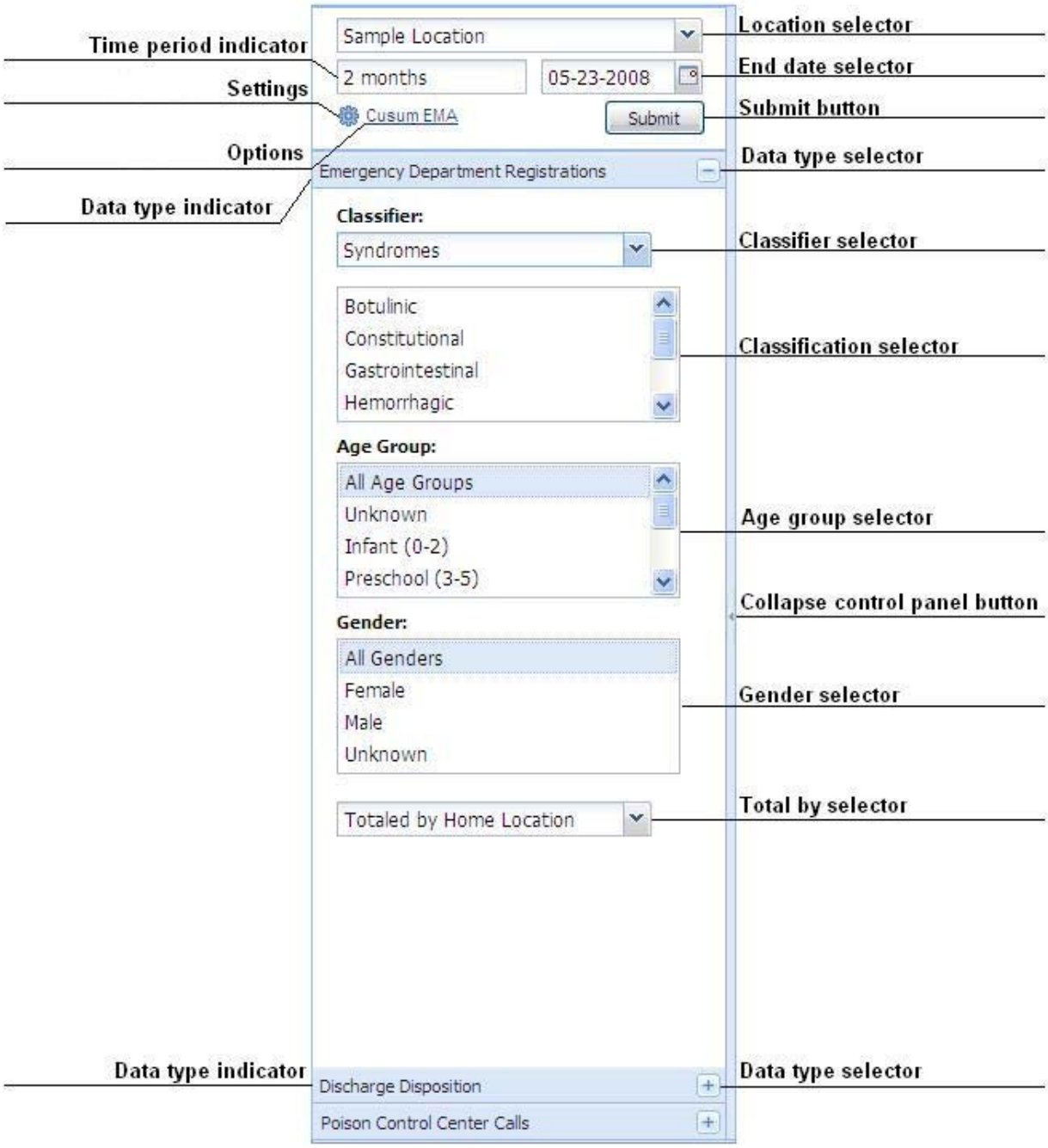


Figure 6: Control panel

4.2.3 Location Selector

The location selector is a free-text box used to indicate the location for which data is viewed. To use this feature, select the text box and begin typing a location. A location can be a geography (i.e. state, county, or zip code) or the name of a healthcare facility (available on the Charts/Public Health Reporting

page only). The system will auto-complete your entry and provide a listing of all matches in a dropdown box. You can then make a selection by highlighting your desired location.

When searching for a geography, if only one match is available, the dropdown box will also contain geographies within that larger geography. This includes a county listing if a state name is entered in the location text box or a zip code listing if a county name is provided (See Figure 7).

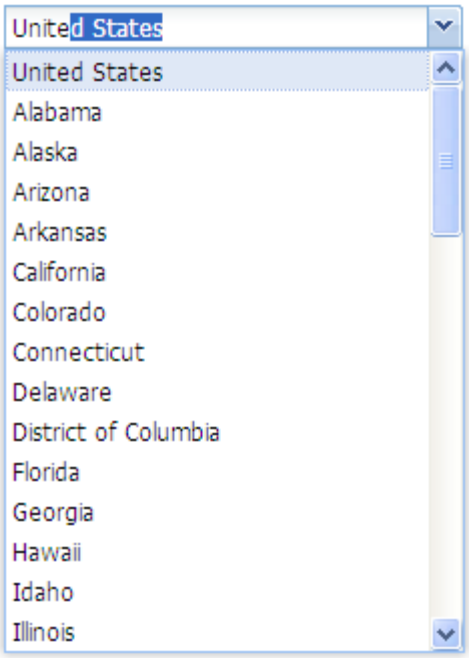


Figure 7: Location selector

If no matches are available, the location text box will become outlined in red. Further, if a valid location is entered but it is outside of a user's authorized region, a red asterisk will appear next to the location name.

The location selector is enabled on the Summary, Anomalies, Investigations, Charts, and Forecasting pages.

4.2.4 End Date Selector

The end date selector is used to specify the ***end date*** of a date range for viewing data. If the hour selector is enabled, the end date selector is also used to define the 24-hour sliding window applied to the data. The end date can be entered as free-text or by using the calendar popup tool. To activate the calendar popup tool, click on the calendar image to the right of the date (See Figure 8).

Figure 8: Calendar popup tool

Use the arrows located to the left and right of the month and year label to move to the previous and next months, respectively. A date is selected by clicking directly on the calendar. The down arrow immediately to the right of the month and year label provides an additional popup allowing for the selection of a specific month and year. After selecting the month and year, click "OK" to return to the calendar. The "Today" button located on the bottom of the calendar popup will automatically set the end date to today's date.

The end date selector is enabled on the Anomalies, Investigations, Charts/Public Health Reporting, Maps, and Forecasting pages. The selector is disabled on the Summary page as an automatic default of seven days from the current date is used.

4.2.5 Time Period Indicator

The time period indicator is a free text box used to indicate the time period from the end date for which data is viewed. The time period can be entered as days, weeks, months, or years. The numerical portion of the time period must be entered as a number as opposed to text (e.g. "2" instead of "two"). For example, to view data from one month prior to May 1, 2008, set the end date to 5/1/2008 and enter "1 month" in the time period indicator text box.

The time period indicator is enabled on the Anomalies, Investigations, Charts, Maps, and Forecasting pages. The time period indicator is disabled on the Summary page as an automatic default of seven days from the current date is used. The time period indicator is also disabled on the Maps page as data is only displayed for the date indicated in end date selector.

4.2.6 Submit Button

The submit button is used to generate results once all settings have been specified. Clicking the submit button will produce results in the user interface. The submit button is enabled on the Summary, Anomalies, Investigations, Charts, Maps, and Forecasting Pages.

4.2.7 Options

The contents of the options dropdown menu varies per page throughout EpiCenter. It is accessible by clicking on the blue underlined text below the time period indicator. Selecting this text will produce a dropdown menu, the contents of which vary with the page selected.

On the Charts and Maps pages, the first portion of the dropdown menu contains a listing of analysis methods. An analysis method is selected by clicking directly on the text on the dropdown menu. A bullet will appear to the left of the selected method and the blue underlined text below the time period indicator will display the name of the selected method (See Figure 9).

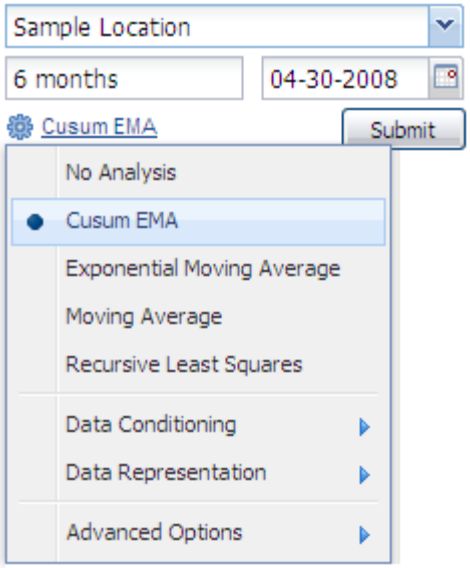


Figure 9: Analysis method selection on the Charts and Maps pages

The next feature on the options dropdown is data conditioning. This is enabled on the Charts and Maps pages. By highlighting data conditioning on the options dropdown menu, you can apply conditioning for day-of-week effect. This is selected by clicking on the corresponding text. A bullet will appear to the left of the selected conditioning method (See Figure 10).

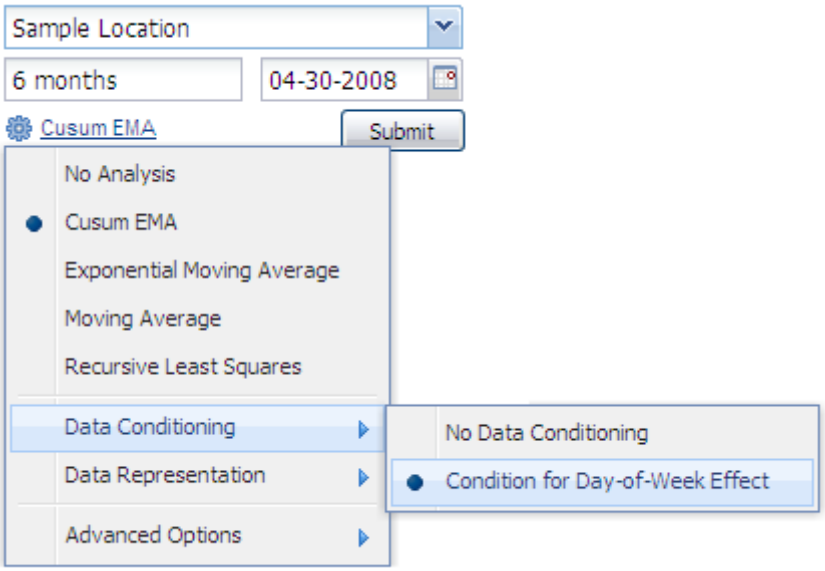


Figure 10: Data conditioning selection

The next feature on the options dropdown is data representation. This is enabled on the Charts, Maps, and Forecasting pages. By highlighting data representation on the options dropdown, you can represent data as number of visits, a percentage of all visits, or as a rate per 100,000 population. A data representation method can be selected by clicking directly on the corresponding text. A bullet will appear to the left of the selected representation method (See Figure 11).

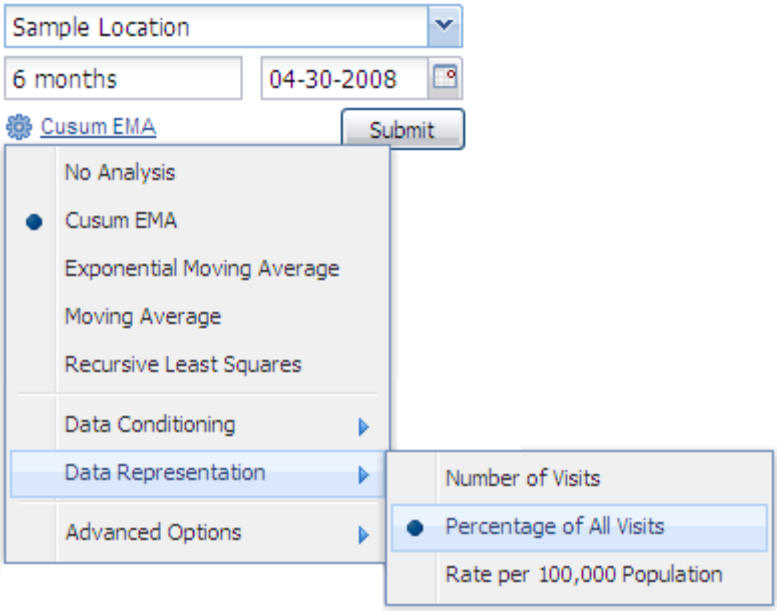


Figure 11: Data representation selection

On the Charts page, advanced options allow you to combine results, enable the hour selector, and plot predicted values. Select the checkbox contained in the dropdown menu to select and deselect combined results, the hour selector, and plot predicted values (See Figure 12).

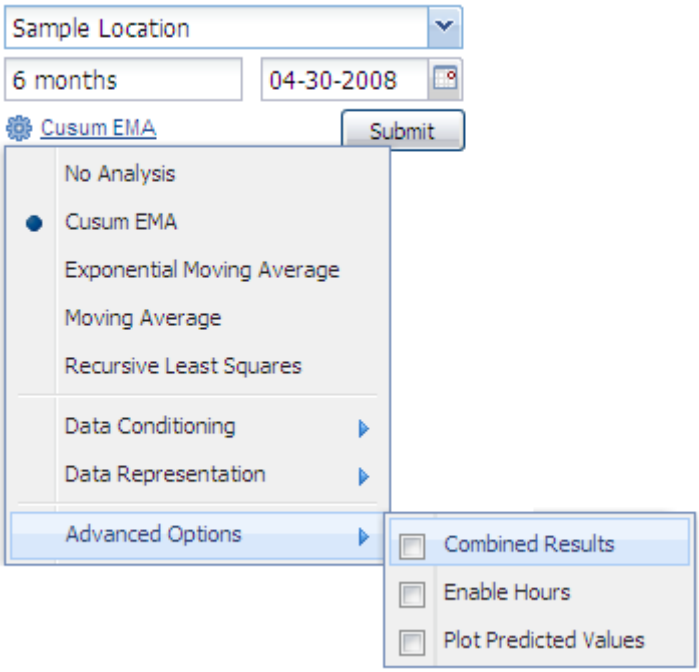


Figure 12: Advanced Options, Charts page

If combined results is active and more than one classification from the classification selector is selected, one chart will display showing the number of records that are classified into one or more of the applicable classifications. Please note, each record is only counted once. If combined results is deselected, a chart returns for each individual classification showing only the counts for that specific classification.

If the hour selector is enabled, an hour will appear to the right of the date in the end date selector. This hour then defines the 24-hour sliding window used to define one “day” when querying data (See Figure 13).

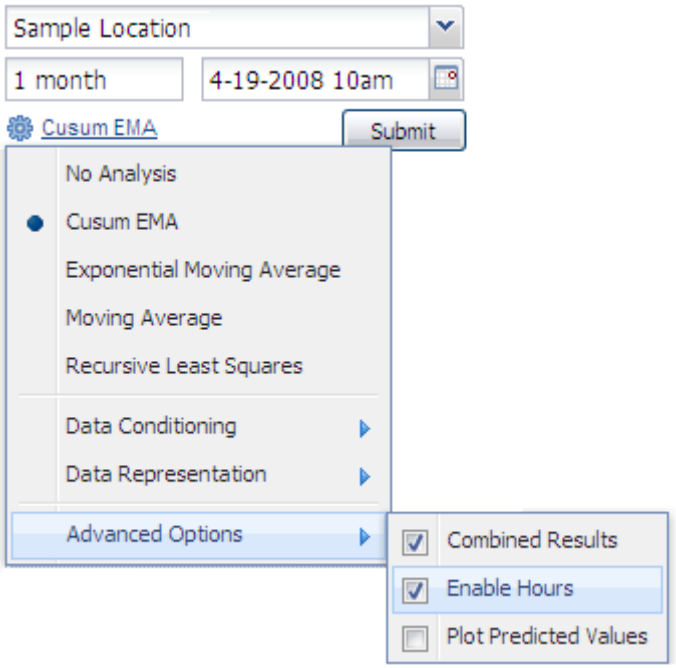


Figure 13: Hour Selector

When the hour selector is first enabled, the hour shown in the end date selector field defaults to the last full hour. If the current date is entered as the end date, the next hour following the current time is the maximum hour available for selection.

If the hour selector is disabled, only a date appears in the end date selector and the 24-hour sliding window automatically defaults to use 12:00am to 11:59pm to define one "day."

Please note, the hour selector represents Eastern Time (GMT – 5:00).

If plot predicted values is enabled, a green predicted value line will display on all charts plotted.

On the Anomalies page, the Options dropdown provides the ability to display inactive anomalies and to download a list of matching anomalies as a CSV file. The option to download the list as an Excel file may also be available (See Figure 14).

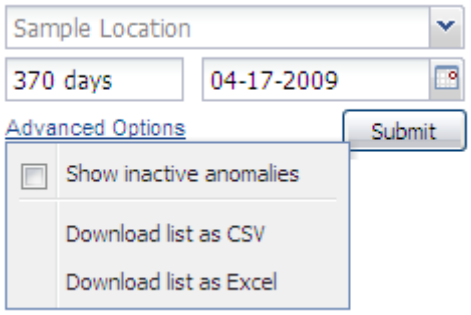


Figure 14: Advanced Options, Anomalies Page

On the Investigations page, the Options dropdown provides the ability to display inactive investigations and to show only investigations assigned to the user logged into the system (See Figure 15).

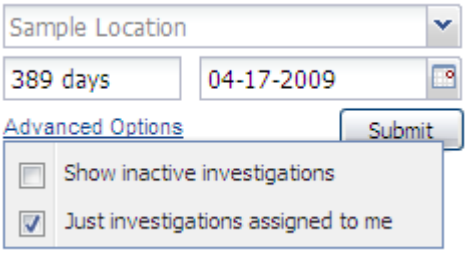


Figure 15: Advanced Options, Investigations Page

4.2.8 Settings

On the Summary page, the magnifying glass icon located to the left of the options dropdown menu text allows for the creation of surveillance tasks based on a selected surveillance view (See Figure 16). This feature is available on the Summary page for organizational administrator level users. Clicking on this icon produces the surveillance task set-up window for the surveillance view currently displayed.

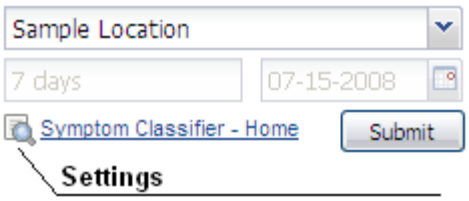


Figure 16: Settings icon on Summary page

On the Charts and Maps pages, the tool icon located to the left of the options dropdown menu text allows for the configuration of parameters for an analysis method. This is enabled on the Charts and Maps pages. Clicking on this icon produces a popup window containing all applicable parameters. If adjustments are made to an analysis method, “custom” will appear next to the analysis method name. To restore default parameters, open the parameter popup window and click “reset.”

4.2.9 Data Type Indicator

The data type indicator is a header that specifies the type of data used for analysis. Available data types will vary by area and may include

- Emergency department registration data
- Discharge disposition data
- Poison control center call data

The data type indicator is enabled on the Charts, Maps, and Forecasting pages.

4.2.10 Data Type Selector

The data type selector is used to open or close the attributes for a specific data type. The data type selector appears as a plus sign (+) for an open data type and a minus sign (-) for a closed data type. To open a data type, click directly on the minus sign. The data type opened previously will automatically close. The data type selector is enabled on the Charts, Maps, and Forecasting pages.

4.2.11 Classifier Selector

The classifier selector allows for the view of all data associated with the defined attributes or to apply filtering by a specific classifier. Click the down arrow on the right side of the classifier dropdown box to produce a list (See Figure 17). To view all data, select "Total Counts." To use a classifier, click directly on the name of the desired classifier. If a classifier is selected, the classification selector below will populate accordingly.

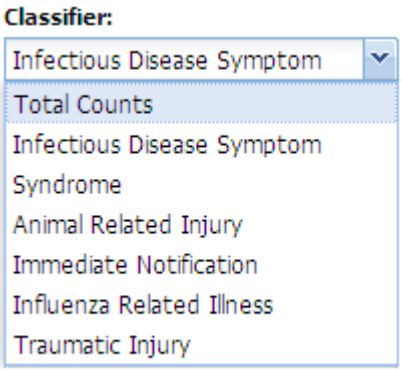


Figure 17: Classifier selector dropdown menu

The classifier selector is enabled on the Charts, Maps, and Forecasting pages.

4.2.11.1 Classification Selector

The classification selector allows for the selection of one or more classifications contained within a particular classifier. Selecting a classifier name in the classifier selector dropdown menu populates the classification selector with all available classifications. A classification is selected by clicking directly on the name contained in the scrolling list. Pressing and holding the CTRL key on your keyboard allows for the selection of more than one classification. To select a consecutive list of classifications, click on the first and last classification while holding the SHIFT key on your keyboard. This highlights the first and last classifications as well as those in between. Please note, when multiple classifications are selected, the resulting counts are for visits that meet the criteria for any of those classifications; each visit will be counted only once.

The classification selector is enabled on the Charts, Maps, and Forecasting pages.

4.2.11.2 Age Group Selector

The age group selector is used to define the age groups for which data is viewed. EpiCenter contains the following age groups:

Age Group	Age Range
Infant	0-2
Preschool	3-5
Child	6-12
Adolescent	13-17
Adult	18-64
Geriatric	65+

Selecting "all age groups" includes all records, regardless of the patient's age. The "unknown" age group contains cases where the patient's age is not provided. These cases are included when "all age groups" is selected.

Pressing and holding the CTRL key on your keyboard allows for the selection of more than one age group. To select a consecutive list of age groups, click on the first and last age group while holding the SHIFT key on your keyboard. This highlights the first and last age group as well as those in between.

The age group selector is enabled on the Charts, Maps, and Forecasting pages.

4.2.11.3 Gender Selector

The gender group selector allows for the viewing of data for all genders or for a specific gender or set of genders. The "unknown" gender contains cases where the patient's gender is unknown or not provided. These cases are included when "all genders" is selected.

Pressing and holding the CTRL key on your keyboard allows for the selection of more than one gender. To select a consecutive list of genders, click on the first and last gender while holding the SHIFT key on your keyboard. This highlights the first and last gender as well as those in between.

The gender selector is enabled on the Charts, Maps, and Forecasting pages.

4.2.11.4 Totaled by selector

The totaled by selector allows for the totaling of cases by either the patient's home zip code or by the zip code of the facility visited. Use the down arrow on the right side of the totaled by dropdown box to switch between these two methods.

5 Summary

The Summary page is displayed upon logging into EpiCenter. It provides a snapshot of incoming data for the past seven days. The Summary page can be set to display the default "Classifier Summary View" or a predefined custom surveillance view. The options dropdown menu on the Summary page allows for the selection of a custom surveillance view or the default Classifier Summary View for display. A view is selected by clicking directly on the text contained in the dropdown menu. A bullet appears to the left of

the selected view when it is selected. The blue underlined text below the time period indicator displays the name of the selected view (See Figure 18).

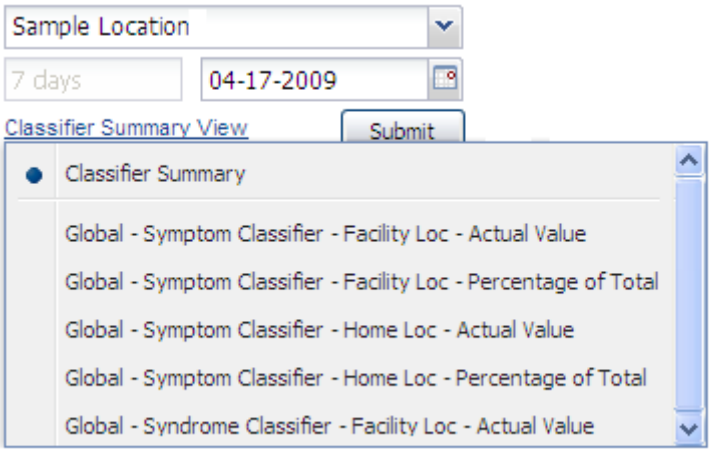


Figure 18: Option Dropdown Menu for the Summary Page

The Classifier Summary View contains a chart displaying all emergency department registrations, located in the upper left portion of the screen, as well as a breakdown by classification for each classifier and by data type. Each classifier-based chart shows the seven classifications with the highest counts for the past seven days. All classifications are shown when a classifier contains less than seven classifications. Each chart contains a legend below the x-axis. The data displayed on the charts is automatically totaled by home location for geographies and by facility if a specific facility name is entered into the location selector.

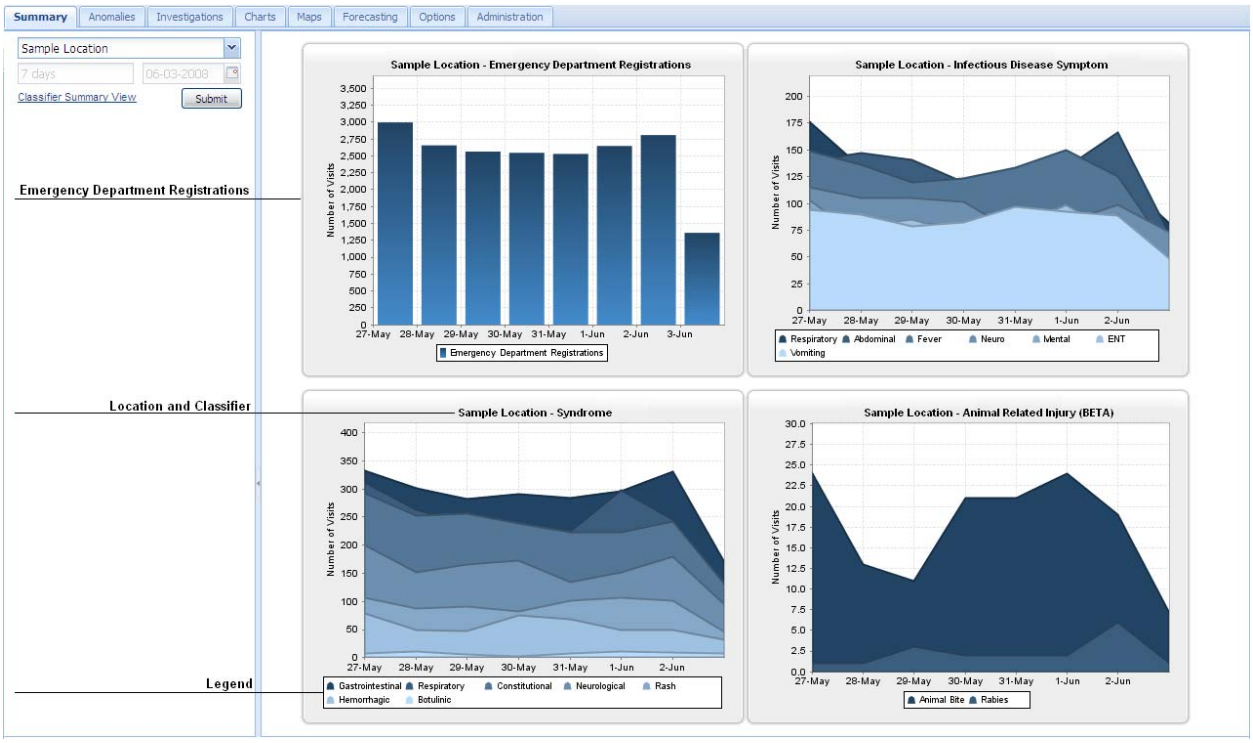


Figure 19: Summary page – Classifier Summary View

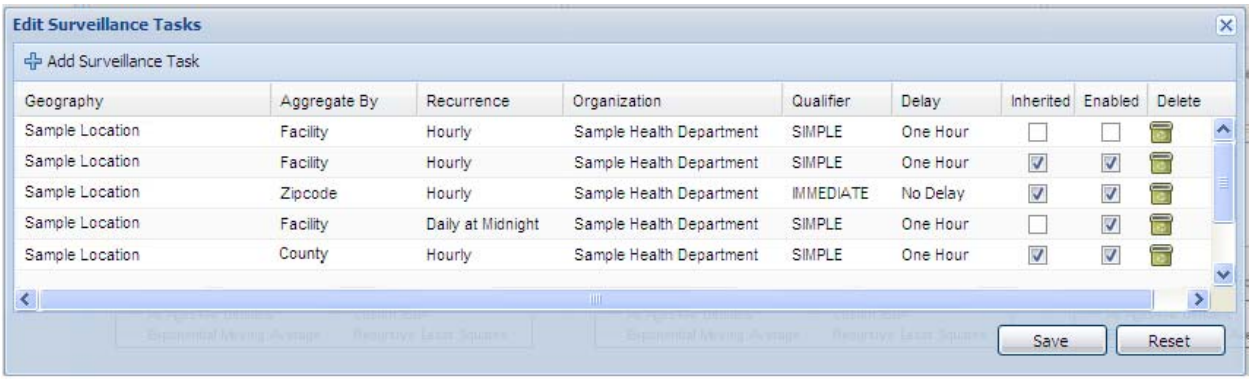
A custom surveillance view is displayed on the Summary page using the options dropdown menu. Once selected, the charts contained within the surveillance view display on the left portion of the screen. An individual chart is removed from a surveillance view by selecting the X located in the upper right corner. If all charts are removed from a surveillance view, the surveillance view will be deleted. Charts are added to the surveillance view through the tools available on the Charts page.

Figure 20: Summary page – Custom Surveillance View

The location selector on the Summary page defaults to a user's accessible region. The location can be changed to any area within that accessible region. Use the submit button to update the charts after a new location is entered.

5.1 Creating and Editing Surveillance Tasks

Some organizational administrator level users are able to create a surveillance task for a particular surveillance view on the Summary page by selecting the settings icon next to the options dropdown text. Selecting this icon produces a popup window containing the surveillance task parameters.



Geography	Aggregate By	Recurrence	Organization	Qualifier	Delay	Inherited	Enabled	Delete
Sample Location	Facility	Hourly	Sample Health Department	SIMPLE	One Hour	☐	☐	
Sample Location	Facility	Hourly	Sample Health Department	SIMPLE	One Hour	☑	☑	
Sample Location	Zipcode	Hourly	Sample Health Department	IMMEDIATE	No Delay	☑	☑	
Sample Location	Facility	Daily at Midnight	Sample Health Department	SIMPLE	One Hour	☐	☑	
Sample Location	County	Hourly	Sample Health Department	SIMPLE	One Hour	☑	☑	

Figure 21: Create and Edit Surveillance Tasks

To add a new surveillance task, click on the "Add Surveillance Task" button located on the top left portion of the popup box. A new entry will be added to the surveillance task listings in the bottom

portion of the popup box. Please note, a maximum of 30 surveillance tasks can be created per organization. Please contact Health Monitoring Systems if you require tasks beyond this limit.

To edit an existing surveillance task, change the parameters as desired and select the "save" button.

The following parameters must be set through the surveillance task popup up box:

Parameter	Available Options	Description
Geography	A user's accessible region or a subset of that region	A surveillance task can be set for a user's entire accessible region or for a smaller area within that region. Ex: A user permitted to access data for Florida could create a task for the entire state, a specific county, zip code, or custom region within Florida.
Aggregate by	State County Zip code Region Facility	"Aggregate by" determines the aggregation level applied to the geography. Ex: If the geography for a surveillance task is Florida, and aggregate by county is selected, surveillance will be run separately for each county in Florida. Aggregating by facility runs surveillance on a per facility basis for all facilities submitting data in the indicated geography.
Recurrence	Hourly Daily at noon Daily at midnight	Recurrence indicates how frequently the surveillance task is run.
Organization	The user's organization	The organization field will default to the user's organization. If a user's organization is a sponsoring organization, sponsored organizations are available for selection in this field.
Qualifier	Immediate Simple	The qualifier dictates the conditions that must be met in order for an anomaly to be generated.
Delay	Default No Delay One Hour Two Hours Three Hours Four Hours	The delay indicates the time period allotted between the time the surveillance task is run and 24 hour sliding window is applied. The purpose of the delay is to account for reporting latencies. For example, if a delay of one hour is selected and the recurrence is daily at noon, the surveillance task will run at noon for all records received between 11:00 am on the current day and 11:00 am on the previous day. Please note, if "default" is selected, the delay is automatically set based on the qualifier used. For "immediate," no

		delay is used as the default. For “simple,” a one hour delay is used as the default.
Inherited (applies only to sponsoring organizations)	Checkbox is checked or unchecked	This checkbox is unchecked by default indicating that the surveillance view is not viewable by organizations sponsored by the user’s organization. A surveillance task is made viewable to the sponsored organizations by checking the checkbox.
Enabled	Checkbox is checked or unchecked	This checkbox is checked by default indicating that the surveillance task is enabled. A surveillance task is disabled by unchecking the checkbox. A disabled surveillance task will remain on the list of tasks associated with a surveillance view. It can be re-enabled at a later time.
Delete	Click on icon to delete	Clicking on this icon disables a surveillance task and permanently removes it from the task list.

Once all parameters are set, click “save” to add the surveillance task. The “reset” button is used to return fields to their default values.

In addition to the values set in the surveillance task popup box, the attributes selected for the charts contained in the surveillance view will also be applied to the surveillance task. This includes analysis method, data conditioning, data representation, classifier and classification, age group, gender, totaled by. Please note, the “actual value” data representation is used for all surveillance tasks. If a data representation other than actual value is selected as a part of the surveillance view, it will be applied ***in addition to*** actual value. As such, the selected threshold must be exceeded for both data representations in order for an anomaly to be detected.

6 Anomalies

As their name suggests, anomalies in EpiCenter are anomalies detected in the data collected. Anomalies are detected by surveillance tasks. When an anomaly is detected, a notification is sent to public health users and an entry is entered into the EpiCenter user interface on the Anomalies page.

On the Anomalies and Investigations pages, the options dropdown menu allows for the viewing of both active and inactive anomalies and investigations, respectively. Select the checkbox contained in the dropdown menu to include inactive anomalies or investigations in a search (See Figure 22).

Additionally, the matching anomalies list can be exported as a CSV file by selecting "Download List as CSV" from the options dropdown. Selecting this option initiates the download process. Continue to follow the prompts from your computer's default application to open the file.

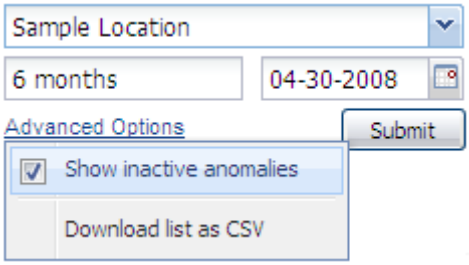


Figure 22: Advanced options for Anomalies and Investigations pages

6.1 Surveillance Tasks

A surveillance task is a set of defined parameters used to identify data anomalies. Surveillance tasks are configured by creating a surveillance view on the Charts page and subsequently entering a new surveillance task based on the surveillance view on the Summary page. Health Monitoring Systems recommends that users follow our Default Notification Configuration when creating surveillance tasks. (See Appendix 13: Default Notification Configuration).

6.2 Notifications

Standard Notifications

In the event that an anomaly is detected, automatic notification (See Figure 23) is sent via email to all users with notification subscriptions for the geography and classifier/classification of the anomaly.

Users in an area that has purchased the mobile notification feature will be provided with a link at the bottom of the notification that allows them to access either an Excel spreadsheet and customized user interface via their mobile device depending on the device type.

Please contact Health Monitoring Systems to create or update notification subscriptions for your area.

Fever Anomaly at Sample Location

Monitoring of emergency department registrations at Sample Location identified 22 interactions. Fever includes the following classifications: fever (infectious disease symptom). All interactions occurred between April 30, 2009 3:12 AM and May 01, 2009 3:12 AM.

Using Exponential Moving Average analysis, these 22 interactions exceed the predicted value of 10.60 and the threshold of 20.58.

The time of the anomaly was 3:12 AM.

Summary

Time of Anomaly	May 1, 2009 3:12:07 AM EDT
Time Detected	May 1, 2009 3:12:09 AM EDT
Indication	Emergency Department Registrations
Classification(s)	fever (infectious disease symptom)
Location	Sample Location
Analysis Method	Exponential Moving Average
Data Conditioning Method	No Data Conditioning
Results of Analysis	22 (Number of Visits)
Records Totaled By	Facility Location

Click here to view this anomaly in EpiCenter.

Download cases in Excel or mobile web

Figure 23: Notification Email Text

Update Notifications

In the event that an immediate notification has been issued for a particular location, an update notification will be issued if additional cases falling within the window of the initial anomaly are received. The subject line and body of an update notification contain the term “update” and the current count versus the count seen at the time of the initial anomaly is provided (See Figure 24).

IMMEDIATE NOTIFICATION UPDATE - Anthrax Anomaly in Sample Location

Monitoring of emergency department registrations for residents of Sample identified 1 additional interactions. Anthrax includes the following classifications: anthrax (immediate notification). All interactions occurred between April 29, 2009 11:59 PM and April 30, 2009 11:59 PM.

Using Constant Threshold analysis, these 4 interactions (current total) exceed the threshold of 0.00.

The time of the anomaly was 11:59 PM.

Please note, the purpose of this notification is to inform you that one or more emergency department registration was classified into the classification indicated above. This does not signify a confirmed diagnosis or actual case.

Summary

Time Detected	April 30, 2009 10:08:04 AM EDT
Last Occurrence	April 30, 2009 4:17:39 PM EDT
Indication	Emergency Department Registrations
Classification(s)	anthrax (immediate notification)
Location	Sample Location
Analysis Method	Constant Threshold
Data Conditioning Method	No Data Conditioning
Results of Analysis	4 (Number of Visits) (current total)
Records Totaled By	Home Location

Click here to view this anomaly in EpiCenter.

Figure 24: Update Notification Email Text

6.3 Anomaly Listing

The anomaly listing view of the Anomalies page provides a list of all matching anomalies based on the search terms entered in the upper portion of the control panel. The time period criteria used in the anomaly listing view defaults to display the oldest active anomaly for a particular location.

Each anomaly contained in the list is represented with an orange marker at the location of the anomaly on the map. The letter indicated on the matching anomalies list corresponds to the letters provided on the map. Multiple anomalies for the same location are grouped under one marker. The left and right arrows located on the bottom portion of the control panel are used to move between multiple pages of matching anomalies (See Figure 25).

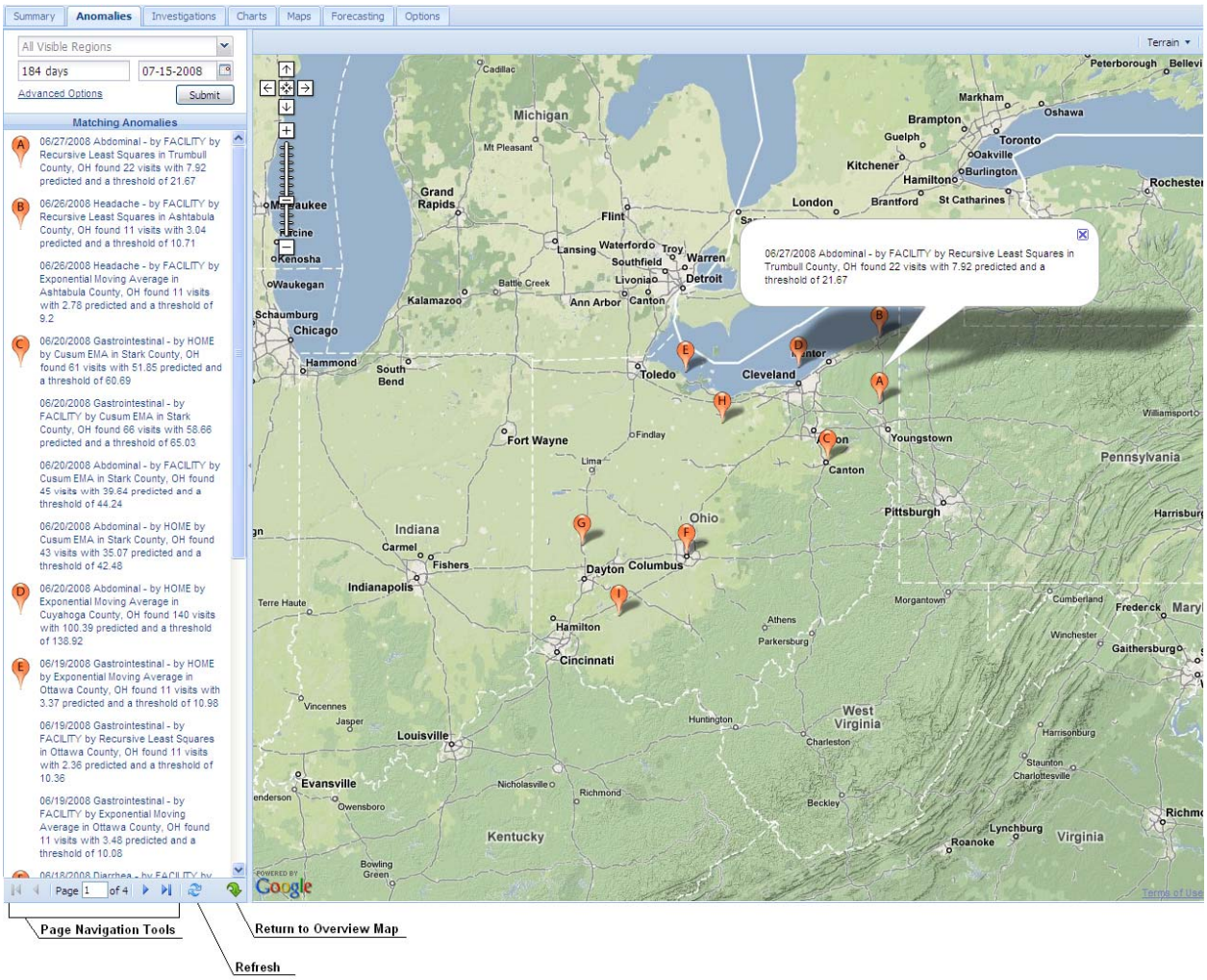


Figure 25: Anomalies Page – Overview Map

Each entry contained in the matching anomalies list provides the date of the anomaly, the classification used, the location, the analysis method used, the actual count, and the maximum count threshold. Clicking on a marker on the map will produce a popup containing the same information. If more than one anomaly is associated with one marker, all anomalies will be listed in a scrolling window.

Use the options dropdown menu located under the time period selector to show inactive anomalies.

Clicking directly on the text provided on the matching anomalies list will return the anomaly detail view for that particular anomaly.

6.4 Anomaly Detail

The anomaly detail view of the Anomalies page provides additional information for a specific anomaly. This view is accessible by clicking on an anomaly contained in the matching anomaly list included in the anomaly listing view. In addition, this view is automatically displayed when EpiCenter is launched from a link contained in a notification email.

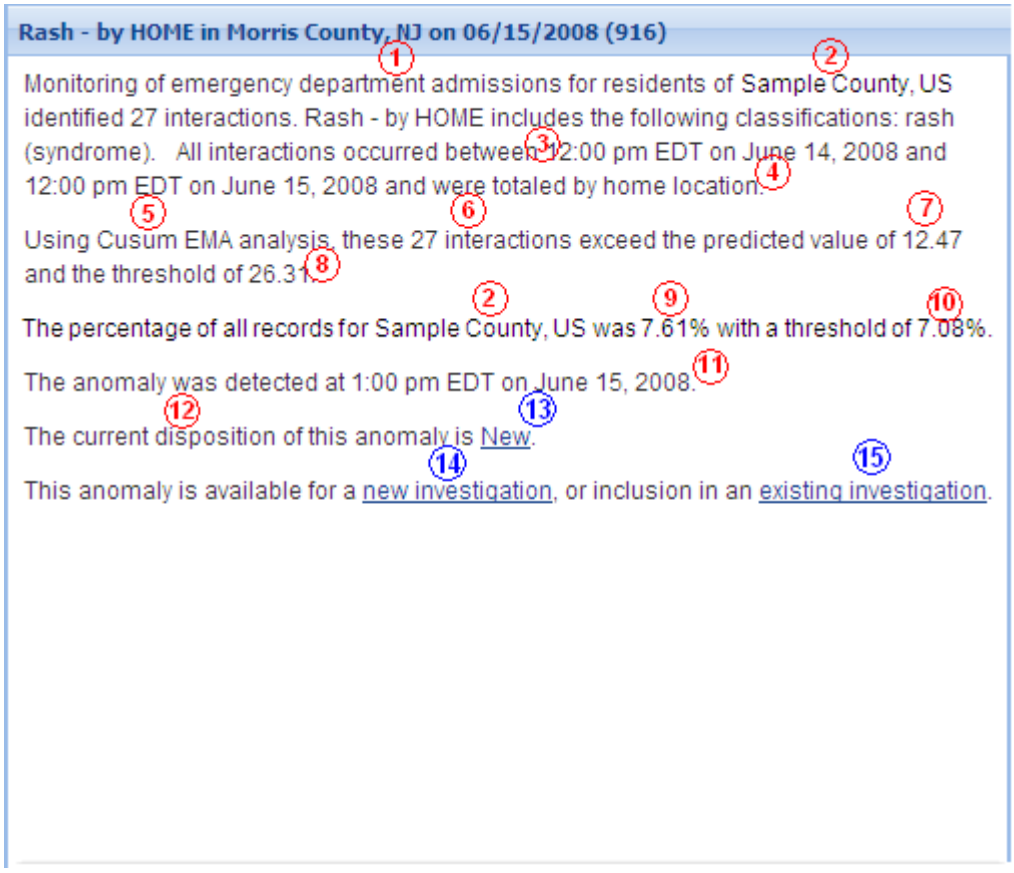
Each section of the anomaly detail view is intended to provide tools to evaluate the anomaly. After conducting an initial evaluation, a disposition can be selected for the anomaly or it can be assigned to an investigation.

A disposition is selected by clicking the underlined portion of the sentence stating the current disposition contained in the narrative. A new investigation is started by clicking "new investigation." When starting a new investigation, a popup window will appear to enter a free text name for the investigation. An anomaly is assigned to an existing investigation by clicking "existing investigation" and selecting an investigation from the list. The dropdown list contains all active investigations within a user's accessible region. After providing a name for a new investigation or after selecting an existing investigation, the Investigations page will automatically return.

The anomaly detail view contains four sections (moving clockwise from top center):

Narrative (Upper Left)

The top left portion of the anomaly detail view includes a narrative describing the anomaly as well as available actions for investigating the anomaly. Descriptive text components are indicated in red, available actions are blue:



1. Data Type
2. Location
3. Time period
4. Totaled by
5. Analysis method
6. Number of interactions
7. Predicted value
8. Threshold
9. Percentage of total
10. Percentage of total threshold
11. Detection date and time
12. Anomaly disposition
13. Update disposition
14. Create new investigation
15. Add to existing investigation

Figure 26: Anomaly Detail Narrative

All investigations with which the anomaly has been associated are listed in narrative portion of the anomaly detail view. Clicking on the name of an investigation will automatically return that particular investigation.

If an anomaly was generated as an immediate notification, the narrative portion of the anomaly detail page indicates the number of times the anomaly has been "triggered." Surveillance for an immediate notification occurs hourly. If an additional case(s) falling within the window of the anomaly are detected during the hourly surveillance run, the trigger will increase by one. The current count indicating the total number of cases associated with the anomaly is also provided.

Map (Upper Right)

The top right portion of the anomaly detail view provides a map showing the location of the anomaly and the surrounding area. Clicking on the orange marker will produce a popup containing the date of the anomaly, the classification used, the geographical location, the analysis method used, the actual count, and the maximum count threshold.

This map functions similarly to the map on the Maps page. The label on the bottom portion of the map indicates the analysis method used.

Chart (Bottom Right)

The bottom right portion of the anomaly detail view contains a chart. The blue line on the chart represents data for the classification and location of the anomaly. The red line shows the threshold based on the analysis method used to detect the anomaly. The data on this chart can be displayed as a percentage of total visits, as actual values, or per 100,000 population rate. This representation is changed by clicking on the underlined portion of the chart header. A dark blue bullet located to the left of a representation indicates that it has been selected.

The chart on the anomaly detail view displays data for 60 days prior to the date the anomaly was detected. Five days of post detection data is also displayed on the chart. This appears as a blue dotted line on the far right portion of the chart. The dotted blue line provides a visualization of data trends following the time of the anomaly and also accounts for latent messages (See Figure 27). A chart from the anomaly detail view can be reproduced on the Charts page by applying the same attributes and 24-hour sliding window using the hour selector.

Clicking directly on the chart will produce an identical popup chart. This larger chart functions similarly to the popup charts seen on the Charts page (See Charts page).

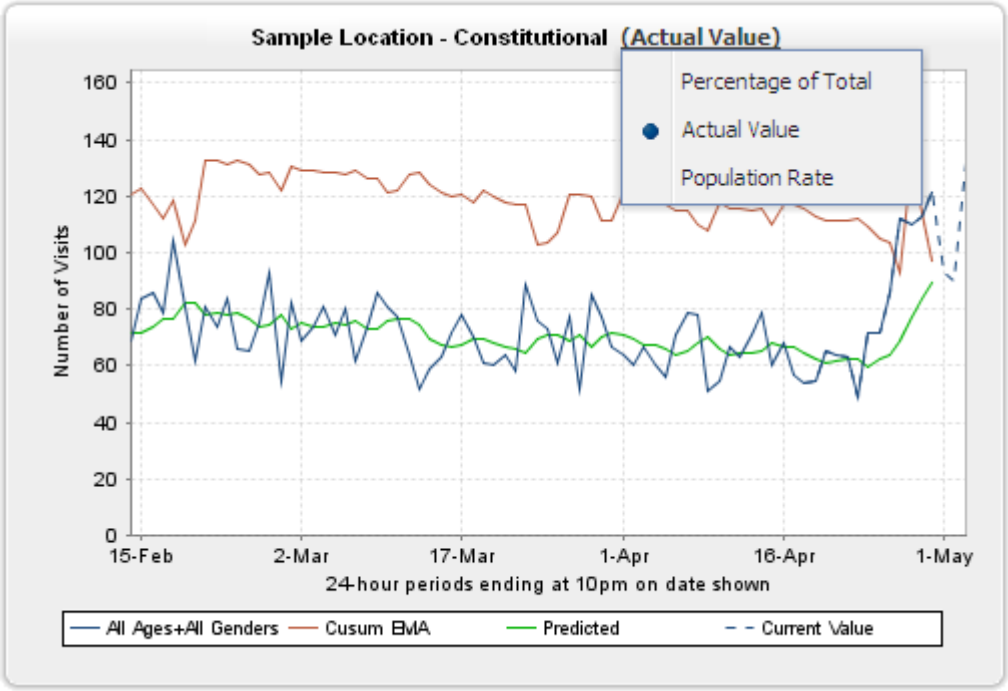


Figure 27: Anomaly Detail Chart

Descriptive Analysis (Bottom Left)

The bottom left portion of the anomaly detail view contains a descriptive analysis bar chart. This chart displays the distribution of data contained within the anomaly by age group, facility name, gender, and zip code. These distributions can be view as a percentage of total visits, as actual values, or per 100,000 population rate. The different distributions and data representations are selected by clicking on the underlined portion for the chart header. The dark blue bullet seen to the left of a distribution and representation indicates that they have been selected (See Figure 28).

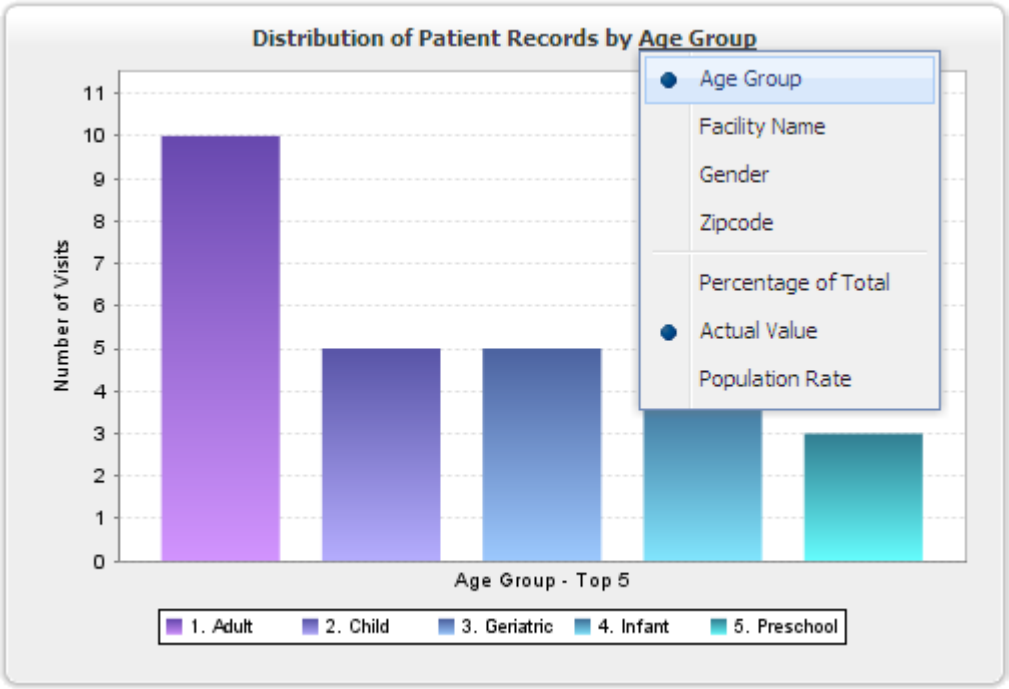


Figure 28: Descriptive Analysis

7 Investigations

The Investigations page is a tool to manage the overall workflow and processes followed when investigating anomalies.

7.1 Investigation Listing

The investigation listing view of the Investigations page provides a list of all matching investigations based on the search terms entered in the upper portion of the control panel. The time period criteria used in the investigation listing view defaults to display the oldest active investigation for a particular location.

Each investigation contained in the list is represented with a blue marker at the location of the investigators organization on the map. The letter indicated on the matching investigations list corresponds to the letters provided on the map. Multiple investigations for the same organization are grouped under one marker.

The left and right arrows located on the bottom portion of the control panel are used to move between multiple pages of matching investigations. A refresh button is also included in the bottom portion of the control to reload the matching investigation list as well as a button to create an investigation directly, without associating an anomaly (See Figure 29).

Each entry contained in the matching investigations list provides the date of the investigation was started, the name of the investigation, and the investigator's organization. Clicking on a marker on the map will produce a popup contain the name of the investigation, the investigator, and the investigator's organization. If more than one investigation is associated with one marker, all investigations will be listed in a scrolling window.

Use the advanced options menu located under the time period selector to show inactive investigations. Clicking directly on the text provided on the matching investigations list will automatically return the investigation detail view for that particular investigation.

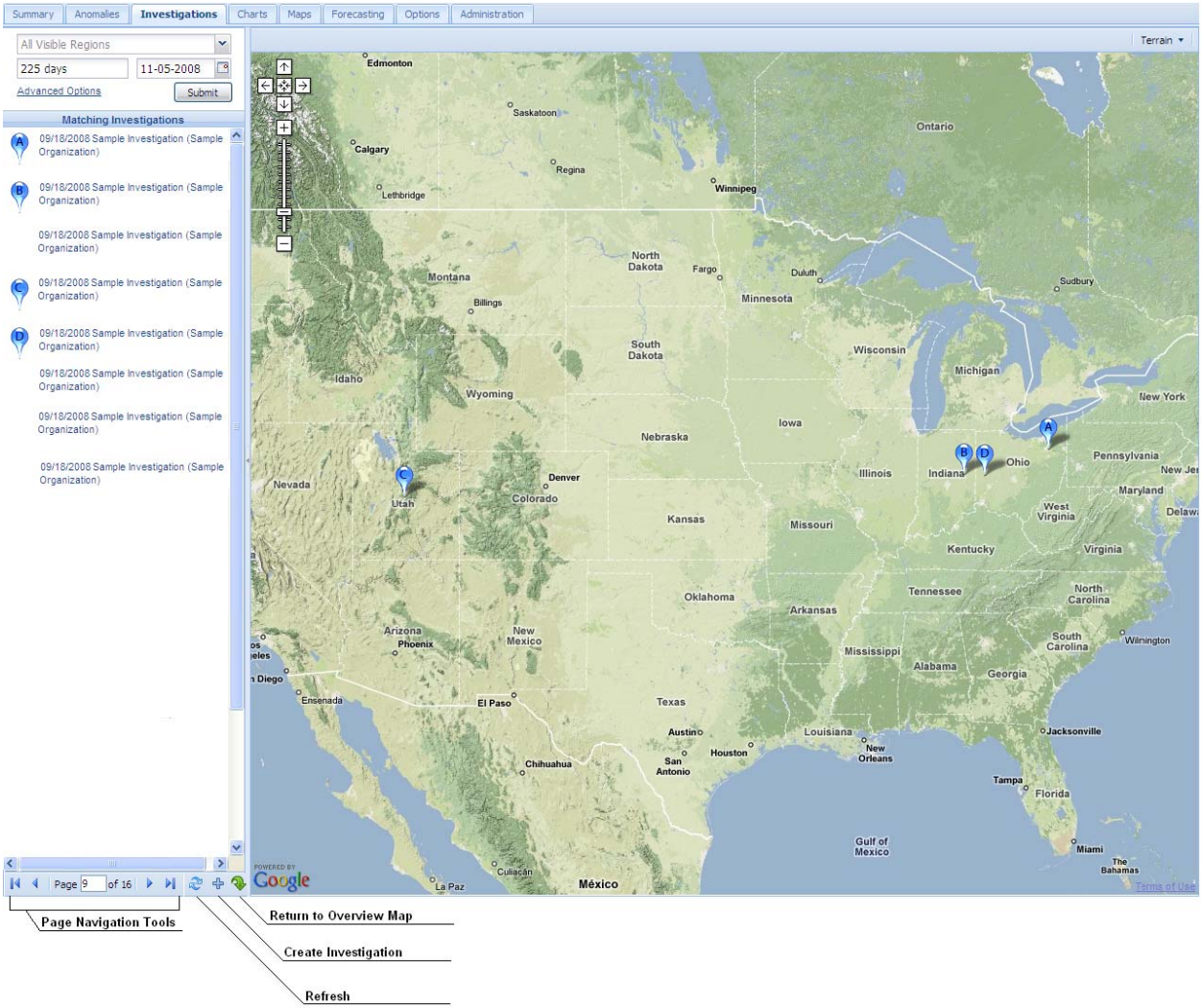


Figure 29: Investigation Overview

7.2 Investigation Detail

The investigation detail view of the Investigations page provides additional information for a specific investigation. This page is automatically displayed when creating a new investigation directly from an anomaly or when adding an anomaly to an existing investigation.

The Investigation detail view contains four sections (moving clockwise from top center):

Narrative (Upper Left)

The top left quadrant of the investigation detail view includes a narrative describing the investigation as well as available actions for conducting the investigation. Descriptive text components are indicated in red, available actions are in blue:

1. Start time of investigation
2. Individual starting investigation
3. Organization of individual starting investigation
4. Current investigator
5. Number of anomalies associated with the investigation
6. Current investigation state
7. Update the investigator
8. Associate additional anomalies
9. Add comments
10. Edit permissions
11. Update the state of the investigation

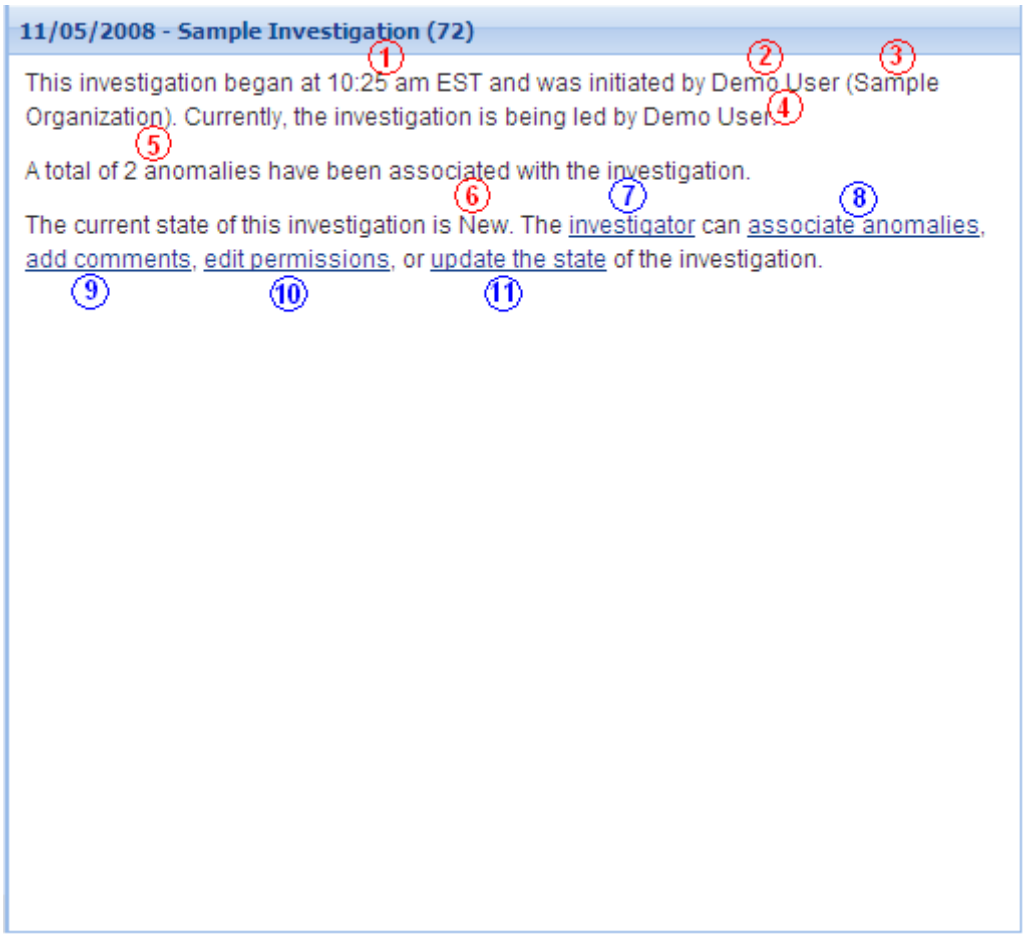


Figure 30: Investigation Detail Narrative

Update the investigator: Clicking directly on "Investigator" will produce a popup of all available investigators. This list includes all EpiCenter users within your organization. Depending on a user's preference settings for assignment emails, an email may automatically be sent to a newly assigned investigator notifying them that they have been assigned an investigation. Settings for assignment emails can be adjusted on the options page.

Associate additional anomalies: Clicking directly on “associate anomalies” produces a popup of all active anomalies in your accessible region. Selecting an anomaly from the list will automatically associate it with the investigation.

Add comments: Free-text comments can be added to the comments portion of the Investigation Detail screen by clicking directly on “add comments.” A popup window will appear after selecting this text (See Figure 31). Enter a free-text comment and click “Add Comment” to populate the comments portion of the investigation detail page.

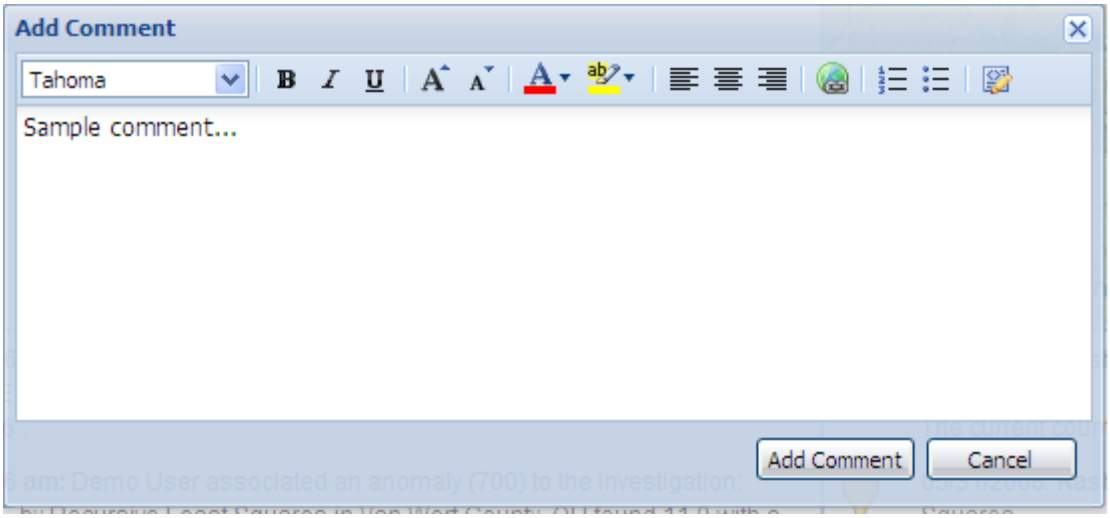


Figure 31: Add Comment Box

Edit Permissions: Organizational administrator level users are able to share investigations with EpiCenter users outside of their organization by clicking on “edit permissions.” A popup window appears after selecting this text (See Figure 32). An investigation is shared by following these steps:

1. Click on the “Add Permission” button to create a new entry in the Edit Permissions popup window.
2. Choose an organization from the “Granted To” dropdown box. This dropdown box is populated with all organizations with which your organization is authorized to share investigations. Please contact Health Monitoring Systems directly if you wish to share an investigation with an organization that is not contained in this list.
3. Assign a permission level
4. Repeat steps 1-3 to add additional organizations
5. Click the “Save” button in the bottom right corner of the popup window

To delete an entry, click on the green garbage bin located to the right of the entry. Clicking on the “Reset” button will reset the entries back to the settings last saved.

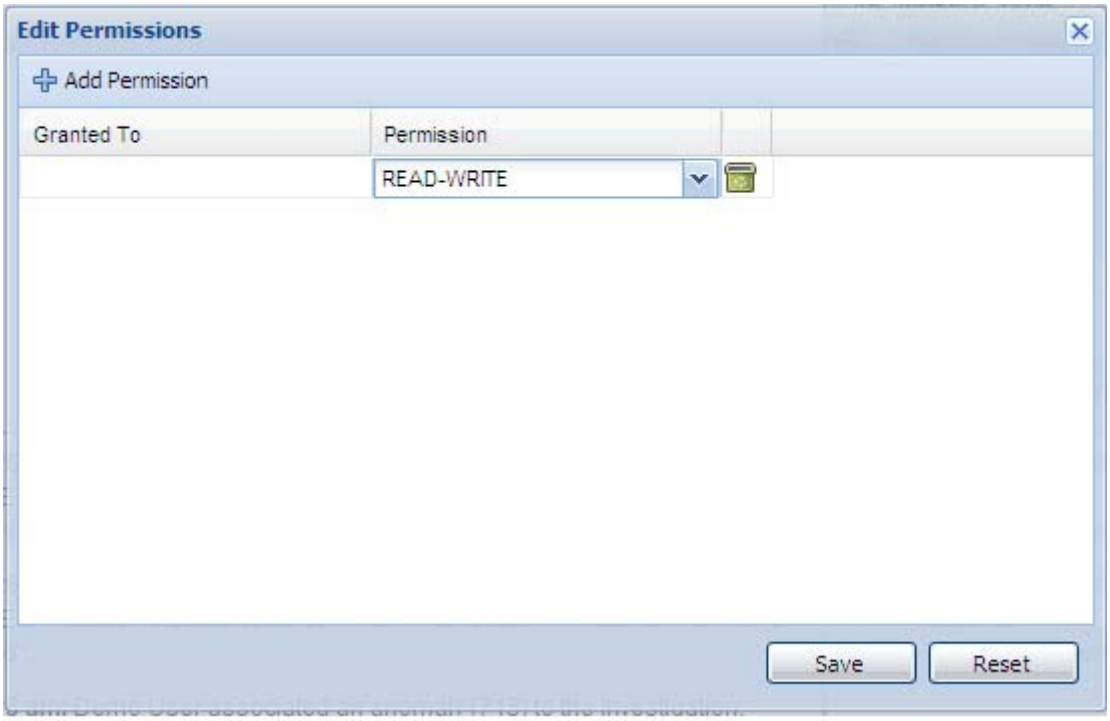


Figure 32: Edit Permissions Box

Update the state of the investigation: Clicking directly on "update the state" will produce a popup of all available states. Select a state to transition the investigation and ultimately assign an end state. The states contained in this list may vary by region.

Map (Upper Right)

The top right portion of the investigation detail view provides a map with two types of markers. The blue marker represents the location of the initial investigator's organization. The other markers, either orange or red, indicate the location of all associated anomalies. Clicking on the blue marker will produce a popup containing the name of the investigation, the current investigator, and the investigator's organization. Clicking on the orange or red marker(s) will display the date of the anomaly, the classification used, the geographical location, the analysis method used, the actual count, and the maximum count threshold for each anomaly associated with the investigation.

Anomaly Status (Lower Right)

The bottom right portion of the investigation detail view contains a listing of all anomalies associated with the investigation. Each listing indicates the date of the anomaly, the classification, location, and analysis method used to detect the anomaly. It also provides the current count for that classification and location and indicates if that value exceeds the detection threshold in place at the time of the anomaly. The detection threshold is shown in parentheses.

Figure 33: Associated Anomaly List

The marker located to the left of each anomaly listing changes color based on the current counts in relation to the detection threshold. If the marker is:

Color	Definition
Red	The current counts exceed the detection threshold
Yellow	The current counts do not exceed the detection threshold

Clicking directly on the text shown for each anomaly listing returns the anomaly detail view for that particular anomaly. Clicking the name of the investigation indicated in the narrative portion of the anomaly detail view will return the investigation detail view for the investigation selected.

To remove an anomaly from an investigation, right-click directly the text contained in the associated anomaly list and select “Remove this event.”

Comments (Lower Left)

The bottom left quadrant of the investigation detail view contains all comments for the investigation (See Figure 34). A comment is automatically inserted each time any action is taken on the investigation. This includes starting the investigation, updating the state of the investigation, changing the investigator, or associating an anomaly to the investigation. Free text comments are entered by clicking on the underlined text “add comments” in the narrative portion. All comments update in real-time.

11/05/2008 2:59 pm: Demo User: Sample comment...

11/05/2008 10:26 am: Demo User associated an anomaly (700) to the investigation: "Rash - by HOME by Recursive Least Squares in Sample County, US found 11.0 with a maximum of 7.96".

11/05/2008 10:26 am: Demo User associated an anomaly (700) to the investigation: "Rash - by HOME by Recursive Least Squares in Sample County, US found 11.0 with a maximum of 7.96".

11/05/2008 10:25 am: Demo User associated an anomaly (713) to the investigation: "Rash - by FACILITY by Recursive Least Squares in Sample County, US ".

11/05/2008 10:25 am: Demo User began the investigation "Sample Investigation". Demo is the investigator.

Figure 34: Investigation Detail Comments

8 Charts/Public Health View

The Charts/Public Health View page is available for both public health and healthcare facility users. Healthcare facility users are limited to viewing data for their facility (or facilities in the event of a health system). The Charts/Public Health View page allows users to plot and compare charts based on the specifications provided in the left control panel. The case listings associated with the parameters selected are also available for display on the Charts/Public Health View page. Charts created on the Charts/Public Health View page can be added to a new or existing surveillance view, viewable on the Summary page.

Analysis of chart data is a two step process. The first step is to generate a predicted count for the current day based on the actual counts from a specified number of days in the past. The exact number of days used is unique to each algorithm; it can either be specified directly by the user or calculated from other user-defined parameters depending on the algorithm.

The second step is to generate a threshold for the current day; actual counts above the threshold will generate an alert. Predicted counts are rarely perfect; there is always some error associated with them. Therefore, a certain amount of deviation is expected between the predicted count and the actual count. Using information on how the prediction errors are distributed under normal conditions, a threshold can be calculated which indicates a level of deviation from the predicted count that unexpected under normal conditions. This threshold can also be adjusted by the user; generally a lower threshold will result in greater sensitivity (detecting more anomalies) but reduced specificity (more false positive alerts) while a higher threshold will have the opposite effect.

Computing predicted counts and thresholds are related but separable processes; the methods for one can be combined in different ways with the methods for the other. The analysis methods in EpiCenter represent some of the most common combinations.

8.1 Plotting Charts

Follow these steps to plot a chart:

1. Enter a location in the free text location selector.
2. Specify an end date using the end date selector.
3. Define the 24-hour sliding window if the hour selector is enabled.
4. Enter a historic time period in the time period indicator.
5. Click on the options dropdown menu to choose an analysis method. Adjust analysis method parameters if desired. **If parameters are adjusted, "custom" will appear next to the analysis method name.**
6. Apply data conditioning.
7. Specify a data representation.
8. Opt to combine results.
9. Opt to plot the predicted values.
10. Expand the appropriate data type using the data type selector.
11. Select a classifier from the classifier selector.
12. Choose one or more classifications from the classification selector. **PLEASE NOTE**, if you wish to view *all visits*, regardless of classification, select "Total Counts" from the classification selector.
13. Choose one or more age groups from the age group selector.
14. Choose one or more genders from the gender selector.

15. Select a totaled by method using the totaled by selector.
16. Click on the submit button to generate a chart based on the defined attributes. The chart will appear to the right of the control panel.

Example #1: State Level View of Vomiting and Diarrhea with CuSum EMA Analysis and Day-of-Week Data Conditioning

Plot charts for "Sample Location" showing emergency department registrations that were classified as either vomiting and/or diarrhea by the symptom classifier between April 1, 2008 and May 1, 2008. Use a standard 24-hour sliding window. Display data for all age groups and genders and totaled by the patient's home location. Use the CuSum EMA analysis method with default parameters to generate a threshold. Condition data to account for day-of-week effect. Represent data as number of visits. View each classification on a separate chart.

You would take the following actions to create this chart (See Figure 35):

1. Type "Sample State" into the location selector. Select "Sample State" from the drop down box once a match is provided.
2. Use the popup calendar tool located on the end date selector to display May 2008. Select the 1st from the calendar.
3. Ensure that the hour selector is disabled to use the standard 24-hour sliding window.
4. Type "1 month" into the time period indicator.
5. Click on the option dropdown menu and select "CuSum EMA" from the dropdown list. A dark blue bullet will appear next to CuSum EMA to indicate that it has been selected.
6. Click on the options dropdown menu, highlight "Data Conditioning," and click on "Condition for Day-of-Week Effect." A dark blue bullet will appear next to Condition for Day-of-Week Effect to indicate that it has been selected.
7. Click on the options dropdown menu, highlight "Data Representation," and click on "Number of Visits." A dark blue bullet will appear next to "Number of Visits" to indicate that it has been selected.
8. Click on the options dropdown menu, highlight "Advanced Options," and deselect the checkbox next to "Combined Results." The box next to Combined Results will be empty indicating that it is not selected.
9. Click on the options dropdown menu, highlight "Advanced Options," and deselect the checkbox next to "Plot Predicted Values." The box next to Plot Predicted Values will be empty indicating that it is not selected.
10. Ensure that specifications for Emergency Department Registrations are expanded by noting the data type selector.
11. Click on the classifier selector dropdown menu and select "Infectious Disease Symptoms."
12. Highlight "vomiting" and "diarrhea" in the classification selector list by clicking on the terms and holding the CTRL key on your keyboard.
13. Highlight "All Age Groups" in the age group selector list.
14. Highlight "All Genders" in the gender selector list.
15. Click on the totaled by selector and click on "Totaled by Home Location."
16. Click on submit to produce the chart.

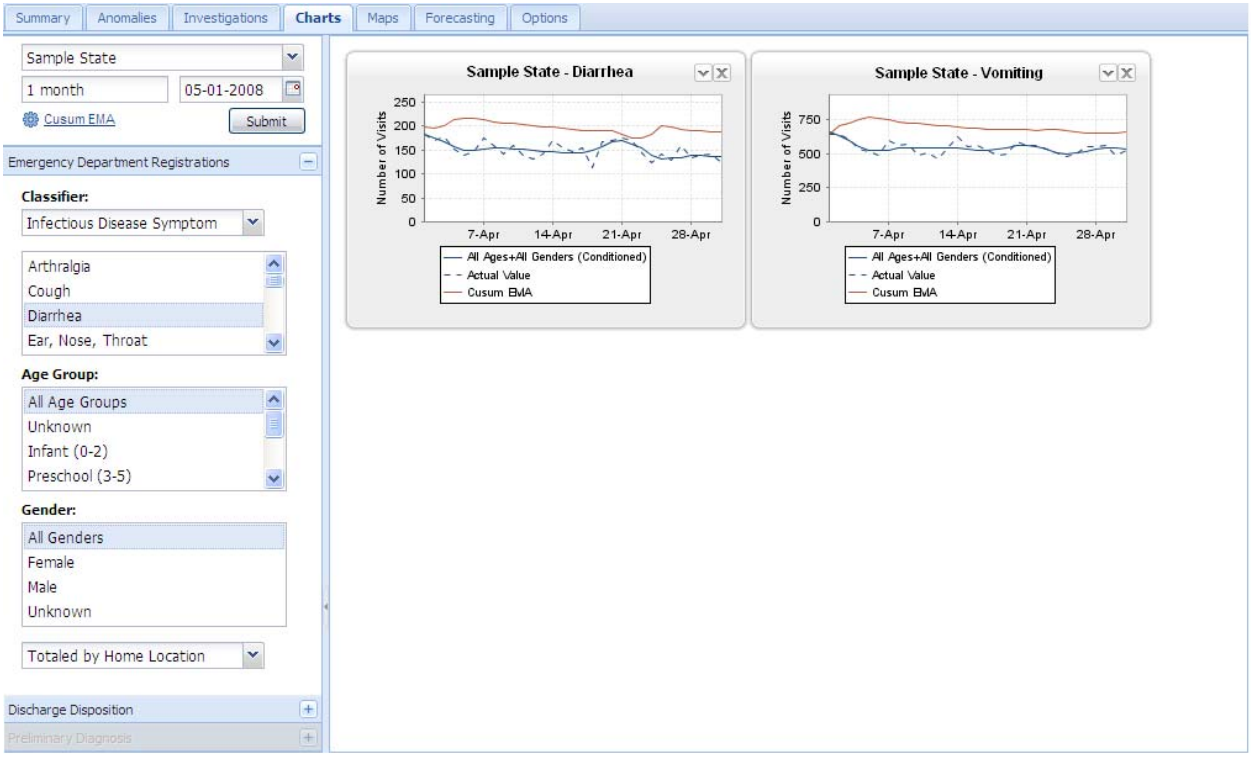


Figure 35: State Level View of Vomiting and Diarrhea with CuSum EMA Analysis and Day-of-Week Data Conditioning

Example #2: County Level View of Cough with Exponential Moving Average Analysis based on an anomaly.

Produce an actual value chart to mirror an anomaly detail chart for the purpose of applying adjusted analysis method parameters. The anomaly was detected for patients with a home zip code in Sample County at 11:00AM on June 26, 2008 for emergency department registrations classified as cough (infectious disease symptom) occurring between 10:00AM on June 25, 2008 and 10:00AM on June 26, 2008. The Exponential Moving Average analysis method was used. No data conditioning was applied.

You would take the following actions to create this chart (See Figure 36):

1. Type "Sample County" into the location selector. Select "Sample County" from the drop down box once a match is provided.
2. Use the popup calendar tool located on the end date selector to display June 2008. Select the 26th from the calendar.
3. Click on the options dropdown menu, highlight "Advanced Options," and select the checkbox next to "Hour Selector." An hour will now appear to the rights of the end date. Select 10am for the 24-hour sliding window.
4. Type "1 month" into the time period indicator.
5. Click on the options dropdown menu and select "Exponential Moving Average" from the dropdown list. A dark blue bullet will appear next to "Exponential Moving Average" to indicate that it has been selected. Click on the tool icon to generate the parameters popup window. Adjust parameters as desired. Click "Apply."

6. Click on the options dropdown menu, highlight “Data Conditioning,” and click on “No Data Conditioning.” A dark blue bullet will appear next to “No Data Conditioning” to indicate that it has been selected.
7. Click on the options dropdown menu, highlight “Data Representation,” and click on “Actual Value.” A dark blue bullet will appear next to “Actual Value” to indicate that it has been selected.
8. Combined results is not applicable when viewing one chart.
9. Click on the options dropdown menu, highlight “Advanced Options,” and deselect the checkbox next to “Plot Predicted Values.” The box next to Plot Predicted Values will be empty indicating that it is not selected.
10. Ensure that specifications for Emergency Department Registrations are expanded by noting the data type selector.
11. Click on the classifier selector dropdown menu and select “Infections Disease Symptom.”
12. Highlight “Cough” in the classification selector list.
13. Highlight “All Ages” in the age group selector list.
14. Highlight “All Genders” in the gender selector list.
15. Click on the totaled by selector and click on “Totaled by Home Location.”
16. Click on submit to produce the chart.

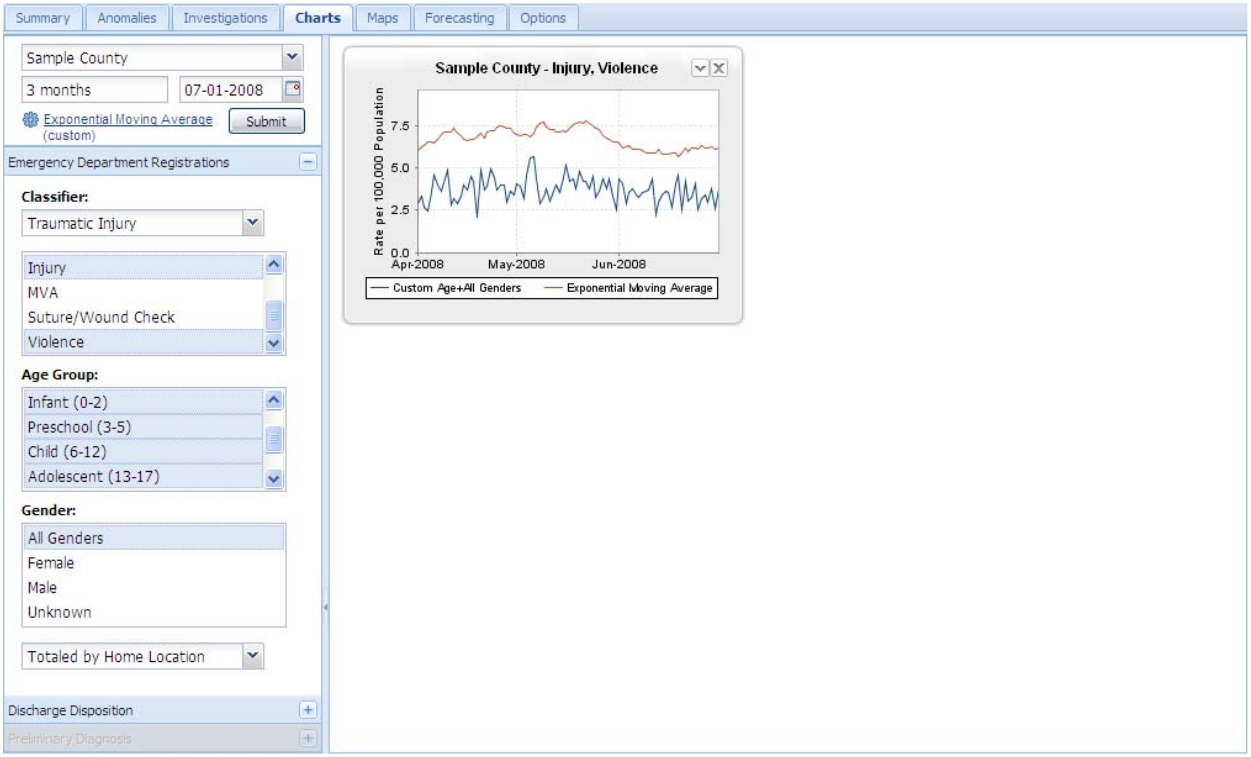


Figure 36: County Level View of Cough with Exponential Moving Average Analysis based on an anomaly

Example #3: Facility Specific View of Animal Attacks, Bites, and Scratches with Moving Average Analysis

Plot one chart for “Sample Hospital” showing emergency department registrations for that facility that were classified as either animal attack, animal bite, or animal scratch by the animal related injury classifier between September 1, 2008 and September 21, 2008. Use a standard 24-hour sliding window. Display data for all age groups and genders. Use the Moving Average analysis method with default parameters to generate a threshold. Do not apply data condition. Represent data as number of visits. View the data on one combined chart.

You would take the following actions to create this chart (See Figure 37):

1. Type “Sample Hospital” into the location selector. Select “Sample Hospital” from the drop down box once a match is provided.
2. Use the popup calendar tool located on the end date selector to display September 2008. Select the 21st from the calendar.
3. Ensure that the hour selector is disabled to use the standard 24-hour sliding window.
4. Type “3 weeks” into the time period indicator.
5. Click on the options dropdown menu and select “Moving Average” from the dropdown list. A dark blue bullet will appear next to Moving Average to indicate that it has been selected.
6. Click on the options dropdown menu, highlight “Data Conditioning,” and click on “No Data Conditioning.” A dark blue bullet will appear next to “No Data Conditioning” to indicate that it has been selected.
7. Click on the options dropdown menu, highlight “Data Representation,” and click on “Number of Visits.” A dark blue bullet will appear next to Number of Visits to indicate that it has been selected.
8. Click on the options dropdown menu, highlight “Advanced Options,” and select the checkbox next to “Combined Results.” The box next to Combined Results will be checked indicating that it is selected.
9. Click on the options dropdown menu, highlight “Advanced Options,” and deselect the checkbox next to “Plot Predicted Values.” The box next to Plot Predicted Values will be empty indicating that it is not selected.
10. Ensure that specifications for Emergency Department Registrations are expanded by noting the data type selector.
11. Click on the classifier selector dropdown menu and select “Animal Related Injury.”
12. Highlight “Animal Attack,” “Animal Bite,” and “Animal Scratch” in the classification selector list by clicking on the terms and holding the CTRL key on your keyboard.
13. Highlight “All Age Groups” in the age group selector list.
14. Highlight “All Genders” in the gender selector list.
15. The totaled by selector will automatically be set to “Totaled by Facility.”
16. Click on submit to produce the chart.

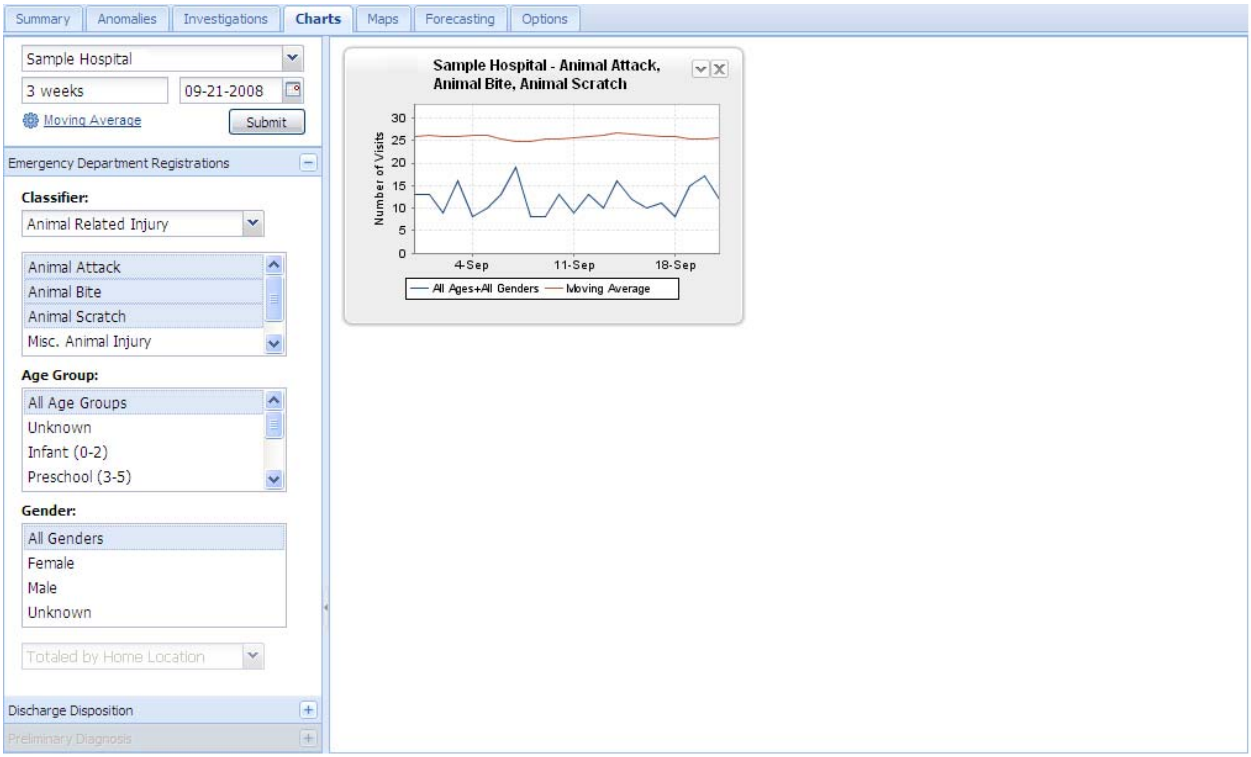


Figure 37: Facility Specific View of Animal Attacks, Bites, and Scratches with Moving Average Analysis

Example #4: All Emergency Department Registrations for a Single Hospital

Plot one chart for "Sample Hospital" showing all emergency department registrations for that facility on August 31, 2008 and three days prior. Use a standard 24-hour sliding window. Display data for all age groups and genders. Do not apply data conditioning or an analysis method. Represent data as number of visits.

You would take the following actions to create this chart (See Figure 38):

1. Type "Sample Hospital" into the location selector. Select "Sample Hospital" from the drop down box once a match is provided.
2. Use the popup calendar tool located on the end date selector to display August 2008. Select the 21st from the calendar.
3. Ensure that the hour selector is disabled to use the standard 24-hour sliding window.
4. Type "3 days" into the time period indicator.
5. Click on the options dropdown menu and select "No Analysis" from the dropdown list. A dark blue bullet will appear next to "No Analysis" to indicate that it has been selected.
6. Click on the options dropdown menu, highlight "Data Conditioning," and click on "No Data Conditioning." A dark blue bullet will appear next to "No Data Conditioning" to indicate that it has been selected.
7. Click on the options dropdown menu, highlight "Data Representation," and click on "Number of Visits." A dark blue bullet will appear next to Number of Visits to indicate that it has been selected.
8. Combined results is not applicable when viewing "Total Counts."

9. Click on the options dropdown menu, highlight “Advanced Options,” and deselect the checkbox next to “Plot Predicted Values.” The box next to Plot Predicted Values will be empty indicating that it is not selected.
10. Ensure that specifications for Emergency Department Registrations are expanded by noting the data type selector.
11. Click on the classifier selector dropdown menu and select “Total Counts.”
12. The classification selector is not applicable when viewing “Total Counts.”
13. Highlight “All Age Groups” in the age group selector list.
14. Highlight “All Genders” in the gender selector list.
15. The totaled by selector will automatically be set to “Totaled by Facility.”
16. Click on submit to produce the chart.

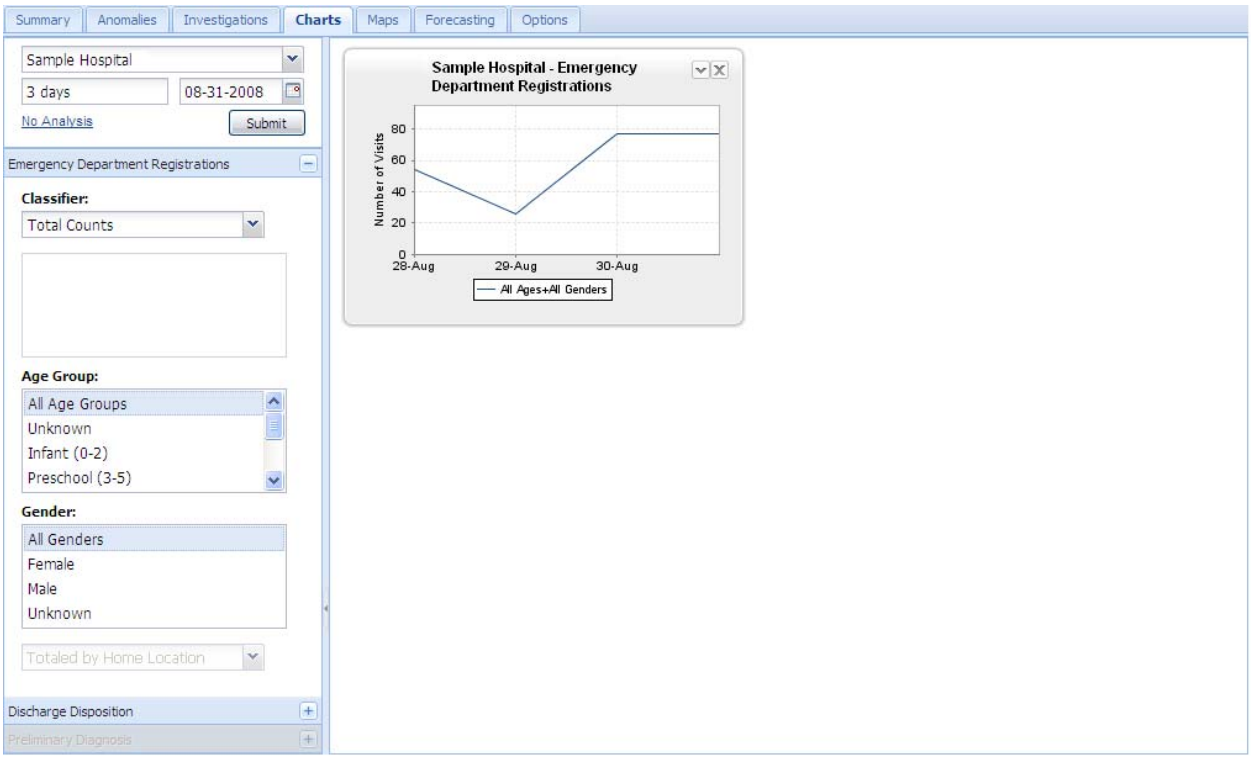


Figure 38: All Emergency Department Registrations for a Single Hospital

8.2 Surveillance Views

Each chart plotted on the Charts page can be added to a new or existing surveillance view. To view the surveillance view drop down menu, click on the down arrow located in the top right corner of each individual chart (see Figure 39).

Figure 39: Surveillance View Creation Popup

To add the chart to an existing view, highlight "Add to Existing View." A listing of all existing views will appear to the right. Click on the desired view.

To add the chart to a new surveillance view, click on "Create New View." A popup box will appear prompting you to name the new surveillance view. The surveillance view must be given a unique name. Type the desired name of the surveillance view into the free text box on the popup and press "OK." Selecting "Cancel" will terminate the request to create a new surveillance view. Confirmation of surveillance view creation will be given after clicking "OK" and the chart will automatically be added to the surveillance view. Additional charts can then be added to the newly created view by following the instructions in the previous paragraph.

A maximum of 37 charts can be added to a single surveillance view.

Surveillance views can be viewed and edited on the Summary page.

8.3 Chart Details Popup Window

Clicking directly on a chart on the Charts/Public Health View page produces a popup window containing a larger version of the selected chart and line listings for the associated cases. The popup window contains two tabs, Chart and Cases. The Chart tab is the default view.

8.3.1 Chart Tab

The Chart tab contains a chart identical to the smaller chart selected on the Charts page. Attributes cannot be changed from the popup chart; only from the smaller chart. Daily counts displayed on the popup chart are available for automatic download by clicking on the "Download" button located in the bottom left corner of the popup window. The counts file can be downloaded as a CSV or Excel file (when purchased). (See Figure 40). Selecting this option initiates the download process. Continue to follow the prompts from your computer's default application to open the file.

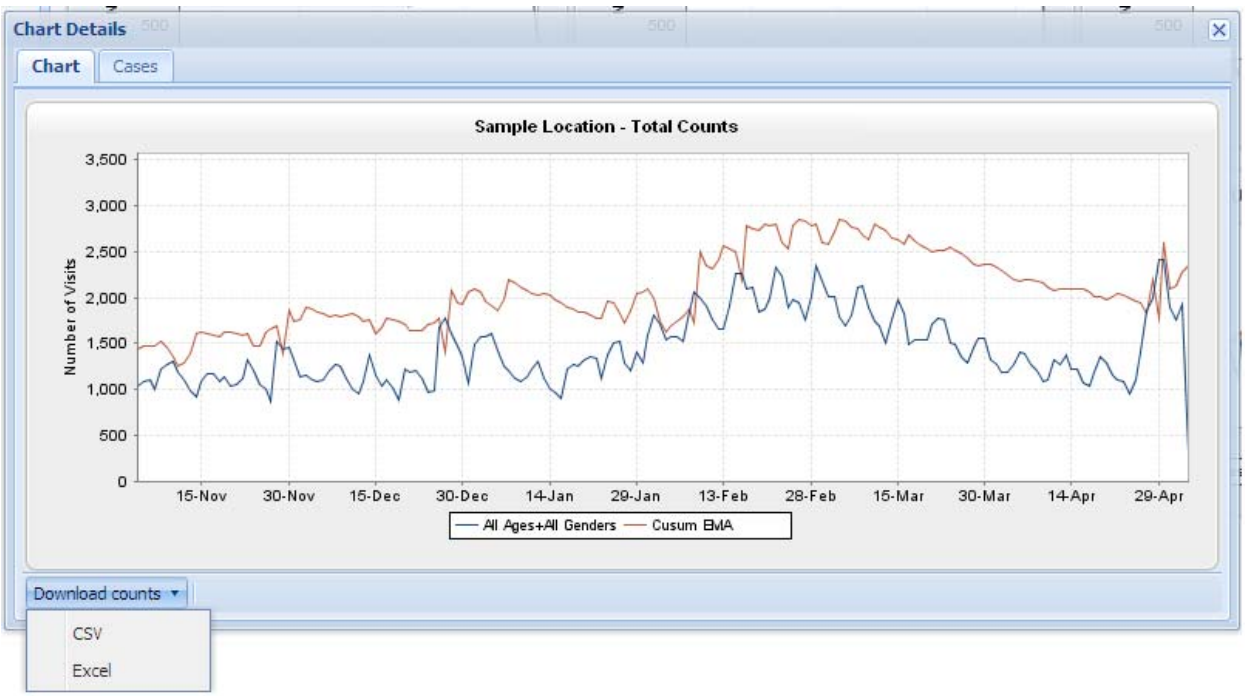


Figure 40: Popup Chart

8.3.2 Cases Tab

Individual line listings for all cases associated with the chart are available by selecting the "Cases" tab located in the top left portion of the popup window. The date and time associated with each record, the patient's age, the patient's gender, the patient's home zip code, the facility name, visit number, free-text chief complaint, and classification(s) are displayed for each record. Use the page controls located in the bottom left portion of the popup window to navigate between multiple pages of line listings (applicable if more than 100 records are associated with the chart) (See Figure 40).

The line listings provided in the popup window are available for automatic download by clicking on the "Download" button located in the bottom middle portion of the popup window. The cases file can be downloaded as a CSV or Excel file (when purchased). (See Figure 40). Selecting this option initiates the download process. Continue to follow the prompts from your computer's default application to open the file.

For line listings where both a patient ID and visit number are available, additional information for that particular visit can be viewed by expanding the line listing. A line listing is expanded by clicking on the + located to the left of the entry on the popup window (See Figure 41). Click on the "Expand All Rows" button in the bottom middle portion of the popup window to expand all line listings. All rows can be collapsed by clicking on the refresh button, also in the bottom middle portion of the popup window.

Where the user's security permissions allow access to detailed case histories for a region, the expanded line listing contains all available registrations, admissions, or discharges related to the patient's current visit as well as the visit number, patient ID, patient's date of birth, and patient's age group. The record type, date and time, patient class, free text chief complaint (when applicable), diagnostic code (when applicable), and classifications are provided for each individual record.

If a patient ID and/or visit number are not available for a patient, the patient history will not be displayed. If these cases are expanded, the text “Patient history is not available for this record” will appear in place of the aforementioned details.

A patient’s full history from the facility indicated in the line listing is available by clicking on the “View Full History” button located in the right portion of the expanded line listing. Clicking this button opens an additional tab in the popup window. This tab contains all available line listings for the patient’s current visit as well as any past visits to this facility. Patient history is only available for visits that occurred after the facility began submitting data to EpiCenter. Full history can be opened for multiple patients by returning to the Cases tab and selecting “View Full History” for another patient. Full history tabs can be closed by selecting the X to the right of the tab name.

The popup window containing the Chart, Cases, and Full History (if available) can be closed by selecting the X located in the top right corner of the window.

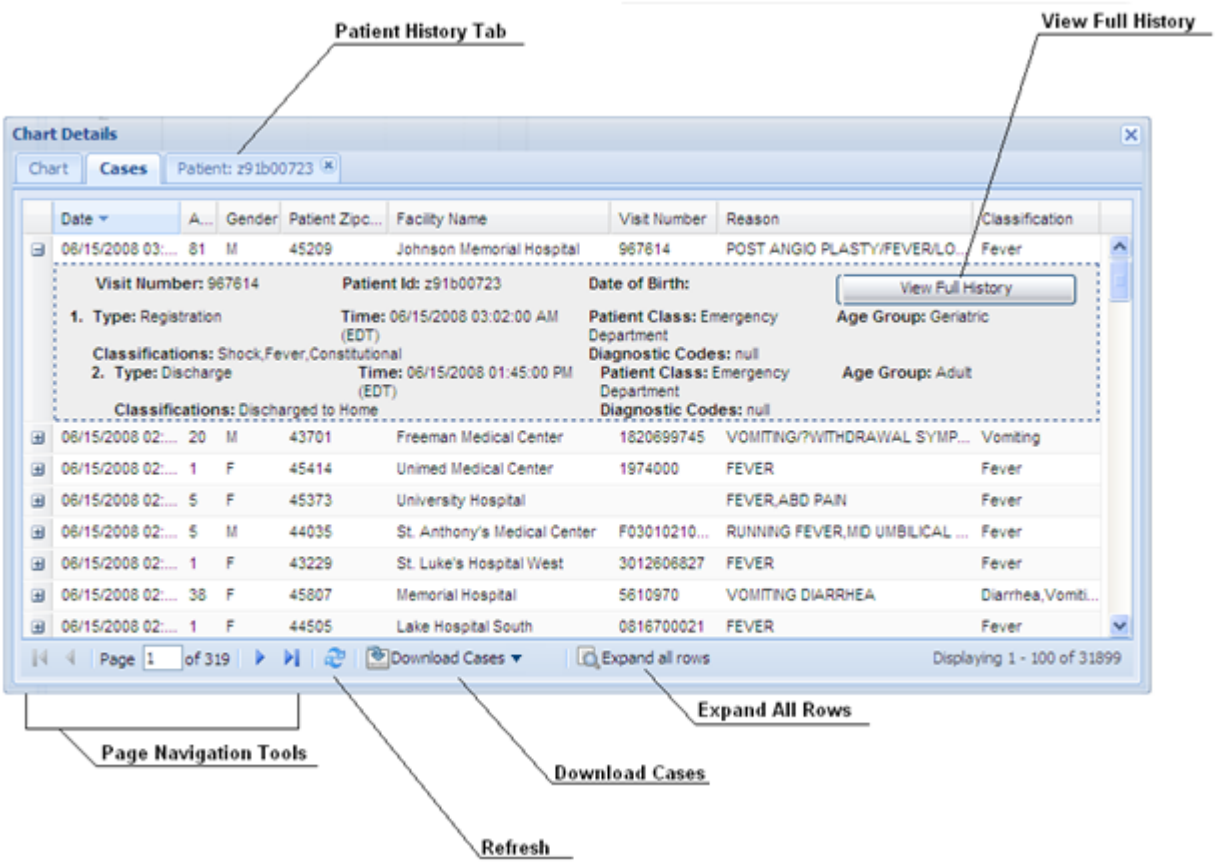


Figure 41: Cases

9 Maps

Using Google maps, the Maps page provides a geographic representation of data anomalies and trends. Charts can be derived directly from the data displayed on the map. Spatial scan can also be applied to a geographic area on the maps page.

9.1 Plotting Data on a Map

The location text box on the Maps page automatically defaults to a users assigned access level. This control is disabled as the map is navigated using the mouse cursor. The time period control is also inactive on the Maps page as data is viewed on the map for one day at a time. The end date selector is used to specify the date for which data is viewed.

Follow these steps to plot data on the map page:

1. Specify a date using the end date selector.
2. Click on the options dropdown menu to choose an analysis method. Adjust parameters if desired. **PLEASE NOTE**, the analysis method parameter window must be left open for the custom values to be applied.
3. Select a method of data conditioning if desired.
4. Specify a data representation.
5. Expand the appropriate data type using the data type selector.
6. Select a classifier from the classifier selector.
7. Choose one or more classifications from the classification selector. **PLEASE NOTE**, if you wish to view *all visits*, regardless of classification, select "Total Counts" from the classification selector.
8. Choose one or more age groups from the age group selector.
9. Choose one or more genders from the gender selector.
10. Select a totaled by method using the totaled by selector.
11. Click on the submit button to view data on the map based on your defined specifications. Shading will appear on the map to the right of the control panel.
12. Adjust the granularity using the granularity dropdown located in the upper right corner of the map
13. Focus on the area of interest by clicking and dragging with your mouse to change the viewing area and by double clicking to zoom-in.

9.2 Navigating the Map

To move to a new geographic area, you can click and drag directly on the map or use the navigation controls located in the upper left corner of the map. You can zoom-in on a specific area by double-clicking directly on the area. The zoom-in feature is also available on the navigation controls.

Data is available on the map for the granularity associated with your assigned access level and all applicable sub-granularities. The granularity is changed using the granularity dropdown located in the top right corner of the map. Labels can be applied to the map by checking the check box next to "Labels" located at the bottom of the granularity dropdown. Additionally, the map display can be changed between map and terrain view, using the map view dropdown, also located in the top right corner of the map (See Figure 42).

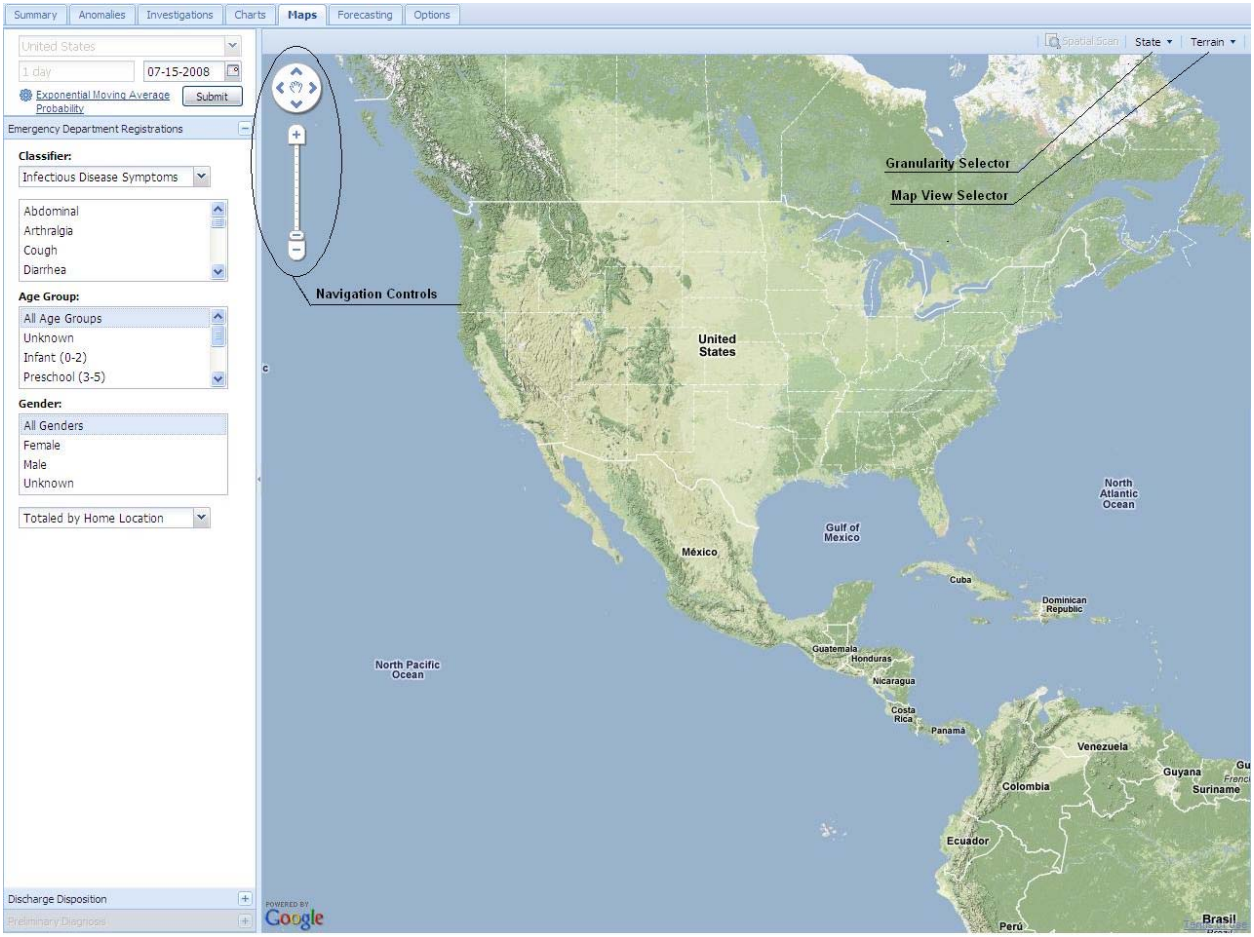


Figure 42: Map Controls

Example #1: County Level View of Diarrhea, Fever, and Vomiting for Patients Under Age 18 with Poisson Visit Frequency Analysis and Percentage of All Visits Data Representation

View data on the map for a county within your state showing emergency department registrations that were classified as diarrhea, fever, and vomiting on June 30, 2008. Display data for only patients under the age of 18 and all genders, totaled by the patient's home location. Use the Poisson Visit Frequency analysis method default parameters. Do not apply data conditioning. Represent data as a percentage of all visits.

1. Use the popup calendar tool located on the end date selector to display June 2008. Select the 30th from the calendar.
2. Click on the options dropdown menu and select "Poisson Visit Frequency" from the dropdown list. A dark blue bullet will appear next to "Poisson Visit Frequency" to indicate that it has been selected. Select the tool icon to the left of the options dropdown to adjust the analysis method parameters as desired.
3. Click on the options dropdown menu, highlight "Data Conditioning," and click on "No Data Conditioning." A dark blue bullet will appear next to "No Data Conditioning" to indicate that it has been selected.

4. Click on the options dropdown menu, highlight “Data Representation,” and click on “Percentage of all Visits.” A dark blue bullet will appear next to “Percentage of all visits” to indicate that it has been selected.
5. Ensure that specifications for Emergency Department Registrations are expanded by noting the data type selector.
6. Click on the classifier selector dropdown menu and select “Infectious Disease Symptoms.”
7. Highlight “diarrhea,” “fever,” and “vomiting” in the classification selector list by clicking on the terms and holding the CTRL key on your keyboard.
8. Highlight “Infant,” “Preschool,” “Child,” and “Adolescent” in the age group selector list.
9. Highlight “All Genders” in the gender selector list.
10. The totaled by selector will automatically be set to “Totaled by Home.”
11. Click on the submit button to view data on the map based on your defined specifications. Shading will appear on the map to the right of the control panel.
12. Change the granularity dropdown to “County” to view county level data.
13. Click and drag the map to center the desired county for viewing, double click on that county to zoom-in.

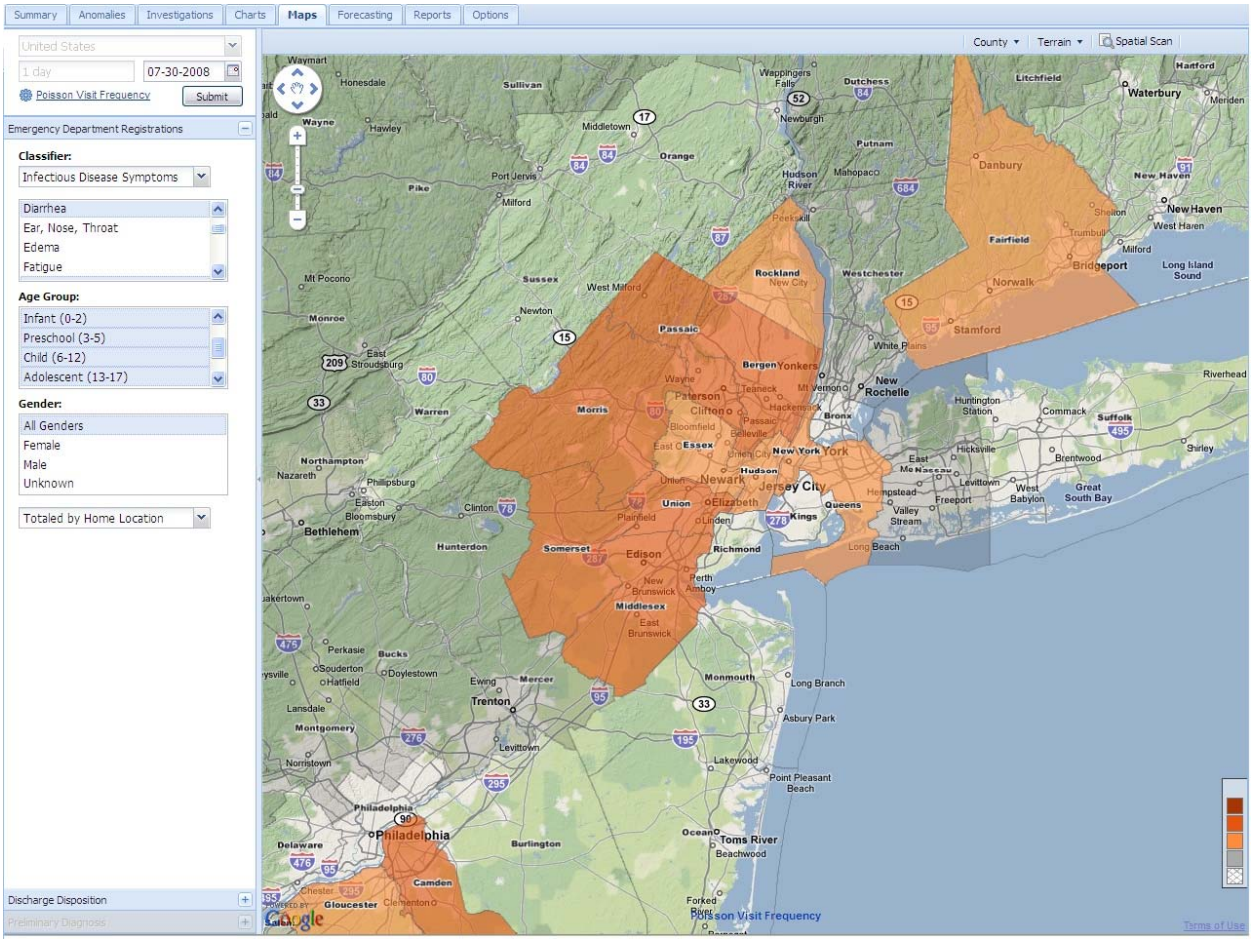


Figure 43: County Level View of Diarrhea, Fever, and Vomiting for Patients Under Age 18 with Poisson Visit Frequency Analysis and Percentage of All Visits Data Representation

Example #2: Zip Code Level View of All Emergency Department Registrations with Exponential Moving Average Probability

View data on the map for a zip code within your county showing all emergency department registrations on August 15, 2008. Display data for all age groups and all genders, totaled by the patient's home location. Use the Exponential Moving Average Probability analysis method with default parameters. Do not apply data conditioning. Represent data as number of visits.

1. Use the popup calendar tool located on the end date selector to display August 2008. Select the 15th from the calendar.
2. Click on the options dropdown menu and select "Exponential Moving Average Probability" from the dropdown list. A dark blue bullet will appear next to "Exponential Moving Average Probability" to indicate that it has been selected.
3. Click on the options dropdown menu, highlight "Data Conditioning," and click on "No Data Conditioning." A dark blue bullet will appear next to "No Data Conditioning" to indicate that it has been selected.
4. Click on the options dropdown menu, highlight "Data Representation," and click on "Number of Visits." A dark blue bullet will appear next to" Number of Visits" to indicate that it has been selected.
5. Ensure that specifications for Emergency Department Registrations are expanded by noting the data type selector.
6. Click on the classifier selector dropdown menu and select "Total Counts."
7. The classification selector is not applicable when viewing "Total Counts."
8. Highlight "All Age Groups" in the age group selector list.
9. Highlight "All Genders" in the gender selector list.
10. The totaled by selector will automatically be set to "Totaled by Home."
11. Click on the submit button to view data on the map based on your defined specifications. Shading will appear on the map to the right of the control panel.
12. Change the granularity dropdown to "Zip Code" to view zip code level data.
13. Click and drag the map to center the desired zip code for viewing, double click on that zip code to zoom-in.

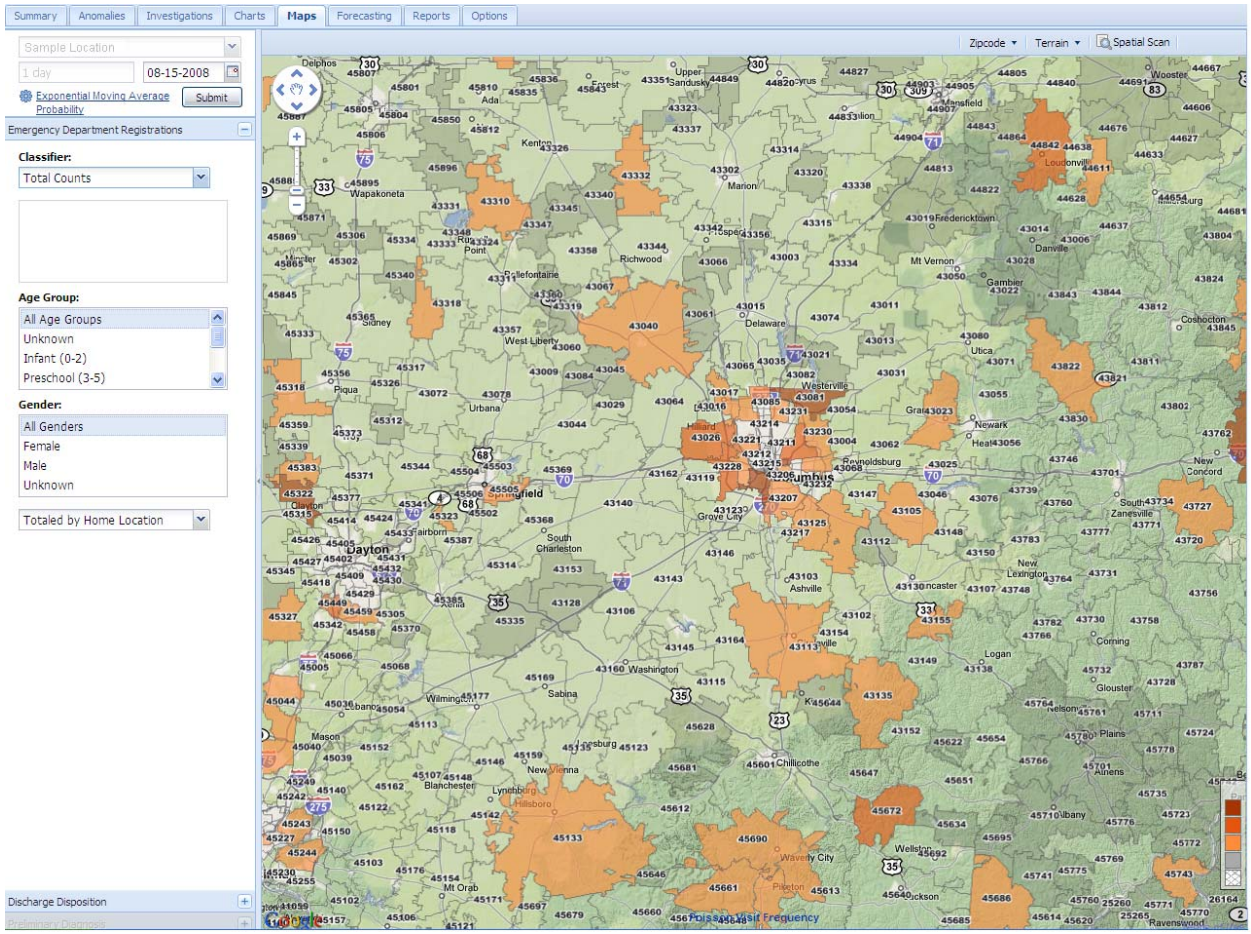


Figure 44: Zip Code Level View of All Emergency Department Registrations with Exponential Moving Average Probability

9.3 Interpreting the Map

Analysis of map data is a two step process. The first step is to generate a predicted count for the current day based on the actual counts from a specified number of days in the past. The exact number of days used is unique to each algorithm; it can either be specified directly by the user or calculated from other user-defined parameters depending on the algorithm.

The second step is to determine how unlikely the current actual count is based on actual values that have been seen in the past. This result is calculated; the lower the percentile, the more common the current actual count is relative to the past. The shading on the map represents the percentile, with darker shading indicating a higher percentile. The cutoff values for the shading levels are expressed in terms of standard deviations in a normal distribution; for example, two standard deviations is roughly the 97.7th percentile. These values are indicated on the map legend.

With the exception of the Poisson Visit Frequency method, all of the map analysis methods make the assumption that prediction errors are distributed normally. When calculating the percentile, these methods also check to see whether this assumption actually holds. When there is evidence that the normality assumption does not hold for a particular region, this will be indicated on the map by the addition of hatching to the shading for that region. This hatching is meant to indicate that the percentile

calculated for that region may be skewed. In many cases, it means that percentile may be slightly underestimated; however, there may be circumstances where it is overestimated instead.

A skew in prediction errors is generally an indication that there is structure in the data (e.g. seasonality) that is not fully captured by the model used to make predictions. Choosing an alternative analysis method, for example changing from moving average to recursive least squares, may help to improve the model fit.

The map legend is located in the bottom right corner of the map. Unless selected, only a small portion of the left side of the legend appears. Putting your mouse cursor over the legend will cause it to expand (See Figure 45).

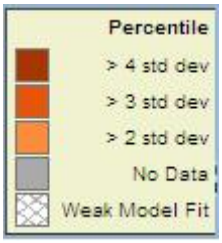


Figure 45: Map Legend

9.4 Additional Map Features

Right-clicking on a specific area on the map will produce a popup menu. The top portion of the menu provides the name of the location you have selected and also indicates the population of that location.

Selecting "Quick Chart" on the popup menu will generate a large popup chart for the area selected. The chart will automatically display counts for the parameters specified and area selected for the past 30 days. This popup window functions identically to the popup chart available on the Charts page.

Selecting "Charts" or "Local Anomalies" on the popup menu will automatically navigate you to the Charts tab or Anomalies pages, respectively. All settings selected on the left control panel as well as the location selected on the map will be carried over when navigating to the new page.

9.5 Spatial Scan

Spatial scan can be applied to the entire geographic area displayed in the map window by selecting the "Spatial Scan" button located in the upper right corner of the map. Once applied, shading will appear on the map to indicate the probability of an outbreak within the area displayed. Additionally, the probability of an outbreak will display in the upper left corner of the map (See Figure 46).

Spatial scan, by its nature, is scale-dependent and will produce different results depending on what regions have been selected for the scan. In particular, the results may appear misleading when an extreme zoom contains only a few regions. When the scan contains only a few regions with similar occurrences, the scan may report that none of the regions are especially different from the others. In this case, better results can be achieved by zooming farther back to include more regions in the spatial scan.

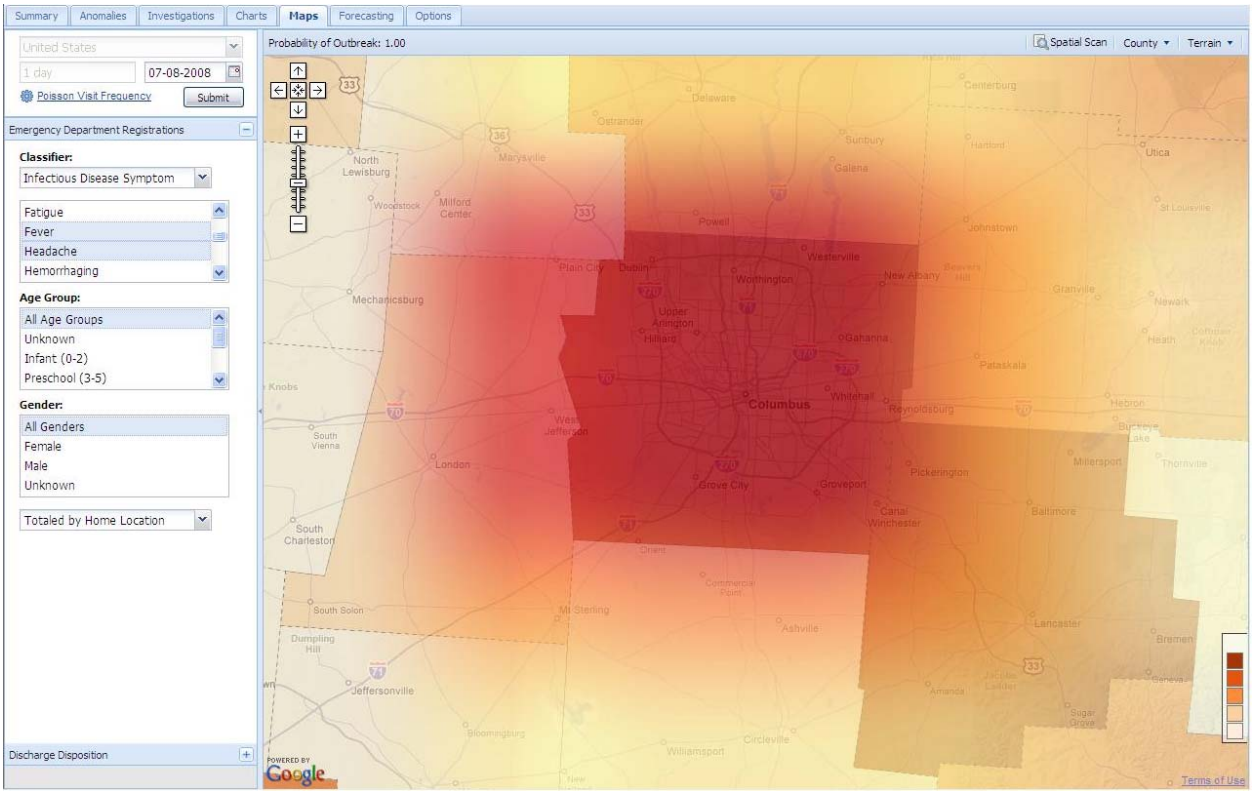


Figure 46: Spatial Scan

The Spatial Scan feature is based on research conducted at Carnegie Mellon University and the University of Pittsburgh. Please see http://www.cs.cmu.edu/~neill/papers/sss-nips05.pdf for more information.

10 Forecasting

The Forecasting page provides a forecast of seasonal changes in healthcare visits based on historic and current information. Like the Charts and Maps pages, specific attributes can be selected. The historic seasonal patterns are then considered to forecast how the selected parameters will change in the coming months.

EpiCenter models seasonality using a mathematical technique called a wavelet. Wavelets are well suited to cyclical patterns, extracting seasonal trends from the data. By using wavelets, EpiCenter is able to capture how the change of season has impacted hospital visits in the past and apply that pattern to forecast the next six months. Like fitting a jigsaw puzzle, EpiCenter looks at a fourteen-day window to best match the current year to the historic seasonal pattern.

The chart below (See Figure 47) demonstrates a seasonal forecast for cough complaints. The change from a gray to a white background in mid-February reflects when the graph was generated and shows the transition from real data to a forecast. The solid line represents the wavelet-extracted seasonal trend.

Based on historic trends, EpiCenter predicts that coughs will remain high through March and then diminish until July when they begin to rise again. Variability is illustrated by the colored bands on either side of the forecast, providing a range for the forecast.

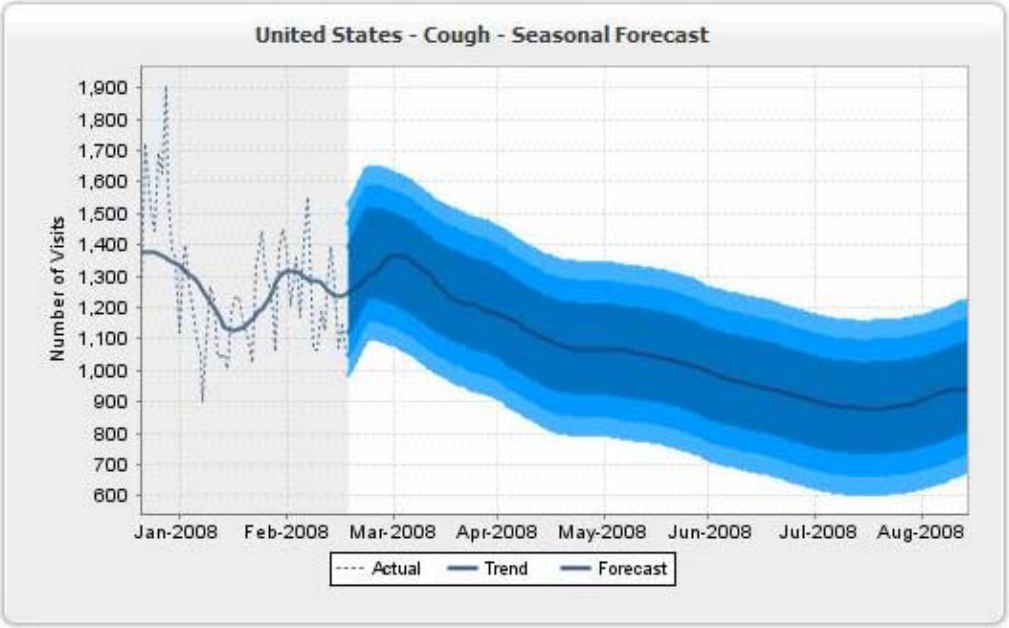


Figure 47: Sample Forecast

Please note: a warning will appear in the graph subtitle if the data available is not well suited to the seasonal forecasting model. More specifically, the warning appears when the slope of linear regression between this year's data and the historic trend cannot be confidently asserted to be non-zero.

10.1 Plotting a Forecast

Follow these steps to plot a forecast on the Forecasting page:

1. Enter a location in the free text location selector.
2. Specify an end date using the end date selector.
3. Specify a data representation.
4. Expand the appropriate data type using the data type selector.
5. Select a classifier from the classifier selector.
6. Choose one or more classifications from the classification selector. **PLEASE NOTE**, if you wish to view *all visits*, regardless of classification, select "Total Counts" from the classification selector.
7. Choose one or more age groups from the age group selector.
8. Choose one or more genders from the gender selector.
9. Select a totaled by method using the totaled by selector.
10. Click on the submit button to generate a forecast chart based on your defined specifications. The chart will appear to the right of the control panel.

10.2 Example Forecasting Scenario: Rash Seasonal Forecast

Create a forecast for "Sample State" emergency department registrations that were classified as rash by the Infectious Disease Symptom Classifier. The projection should extend for six months after February 1, 2008. Display data for all age groups and all genders and totaled by the patient's home location. Represent data as Number of Visits.

1. Type "Sample State" into the location selector. Select "Sample State" from the drop down box once a match is provided.
2. Use the popup calendar tool located on the end date selector to display February 2008. Select the 1st from the calendar.
3. Click on the options dropdown menu, highlight "Data Representation," and click on "Number of Visits." A dark blue bullet will appear next to Number of Visits to indicate that it has been selected.
4. Ensure that specifications for Emergency Department Registrations are expanded by noting the data type selector.
5. Click on the classifier selector dropdown menu and select "Symptoms."
6. Highlight "Rash" in the classification selector list by clicking on the text "Rash.
7. Highlight "All Age Groups" in the age group selector list.
8. Highlight "All Genders" in the gender selector list.
9. Click on the totaled by selector and click on "Totaled by Home Location."
10. Click on submit to produce the chart.

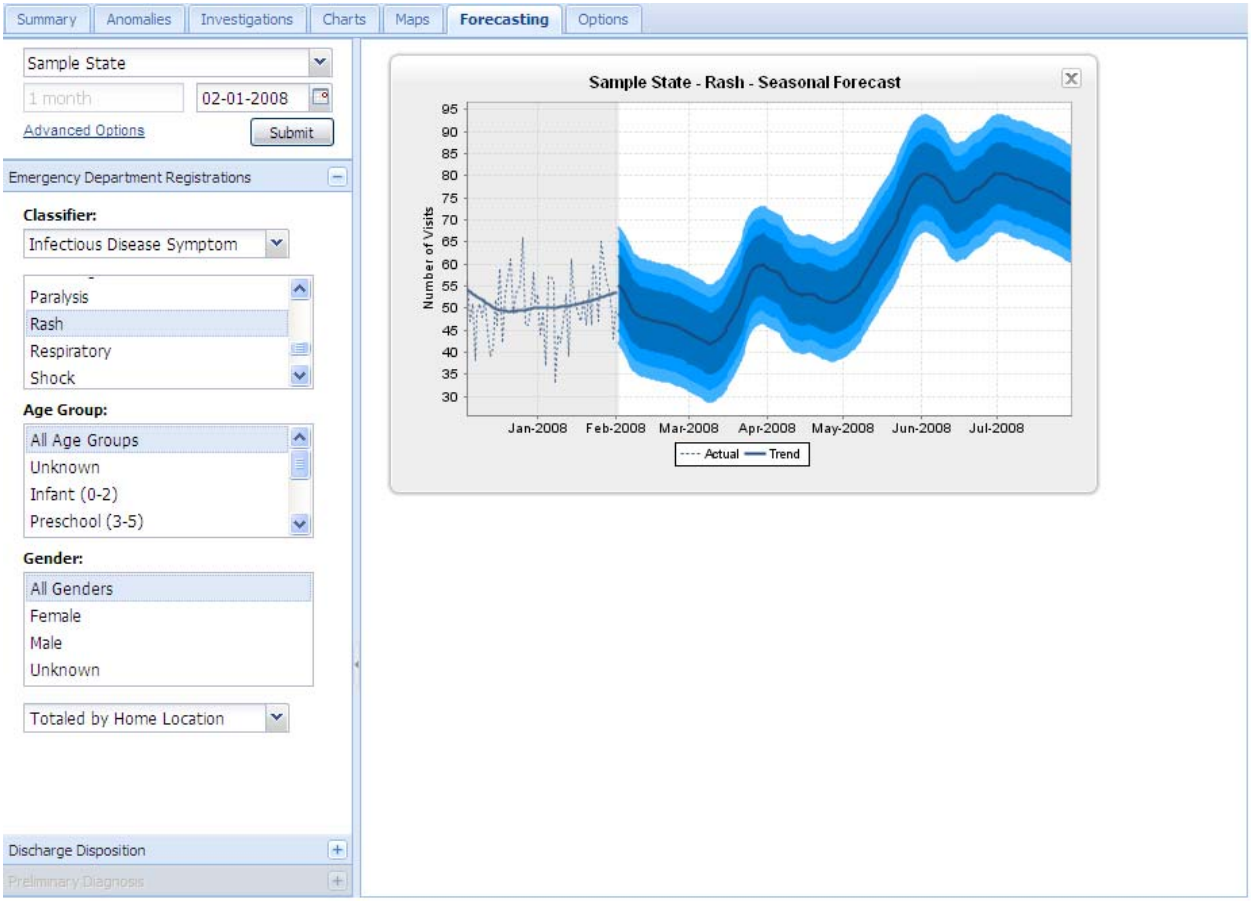


Figure 48: Rash Seasonal Forecast

11 Reports

The Reports page contains a variety reports pertaining to the healthcare data collected in a user's region. Many of these reports were formerly accessible through the Pulse Monitoring System application.

11.1 Navigating Reports

A report is viewed by selecting it from the "Report" dropdown located on the left control panel. Some reports require additional input prior to submitting. Click "Submit" to view the results of a report.

Results for each report appear as a tab on the right portion of the page. Click directly on these tab to navigate between open reports. A report is closed by clicking on the X located on the right side of each tab.

Finally, a report can be exported to a spreadsheet by clicking on the "Download" button located in the top right portion of each tab.

11.2 Types of Reports

The availability of reports may vary by user and/or region. Users should contact Health Monitoring Systems directly to request custom reports. The table below provides information about the standard reports contained on the Reports page.

Report Name	Description	Input	Output
In-process facilities	A list of facilities, including current status, that are in the process of connecting to the EpiCenter system	N/A	Facility Name City State County Latest Note Date of Latest Note
Late Reporting	Number of facilities sending latent data (records sent more than 24 hours after the patient's admit date and time) by date	Begin Date End Date	Date Late Facilities Reporting Percent Late *Click on the date to automatically open the corresponding Late Reporting on Date Report
Late Reporting on Date	A list of facilities sending latent data on a	Date	Facility Identifier Facility Name

	specific date		Total Late Percent Late
Less Than 50% Daily	A list of facilities sending less than 50% of their 20-day average for the 24-hour period prior to the date specified	Date	Facility Name 20-Day Average Yesterday Percent
Live by State	A list of all facilities currently submitting data to the EpiCenter system	State (results are only available for facilities in the user's accessible region)	Facility Identifier Facility Name State Live Date Facility Type
Not Reporting	A list of facilities that have not sent data within the defined window	Hours back	Facility Name City State Last Reported Last Note Entered By Last Note Time
Over 80% Not Classified	A list of facilities with more than 80% of their records not receiving a classification for the 24-hour period prior to the date specified based on their 20-day average	N/A	Facility Name Total Received Total Others Percent Others

12 Options

The Options page allows you to update your user information, change your password, set your preferences, and manage your notification subscriptions (See Figure 49Figure 49: User Options).

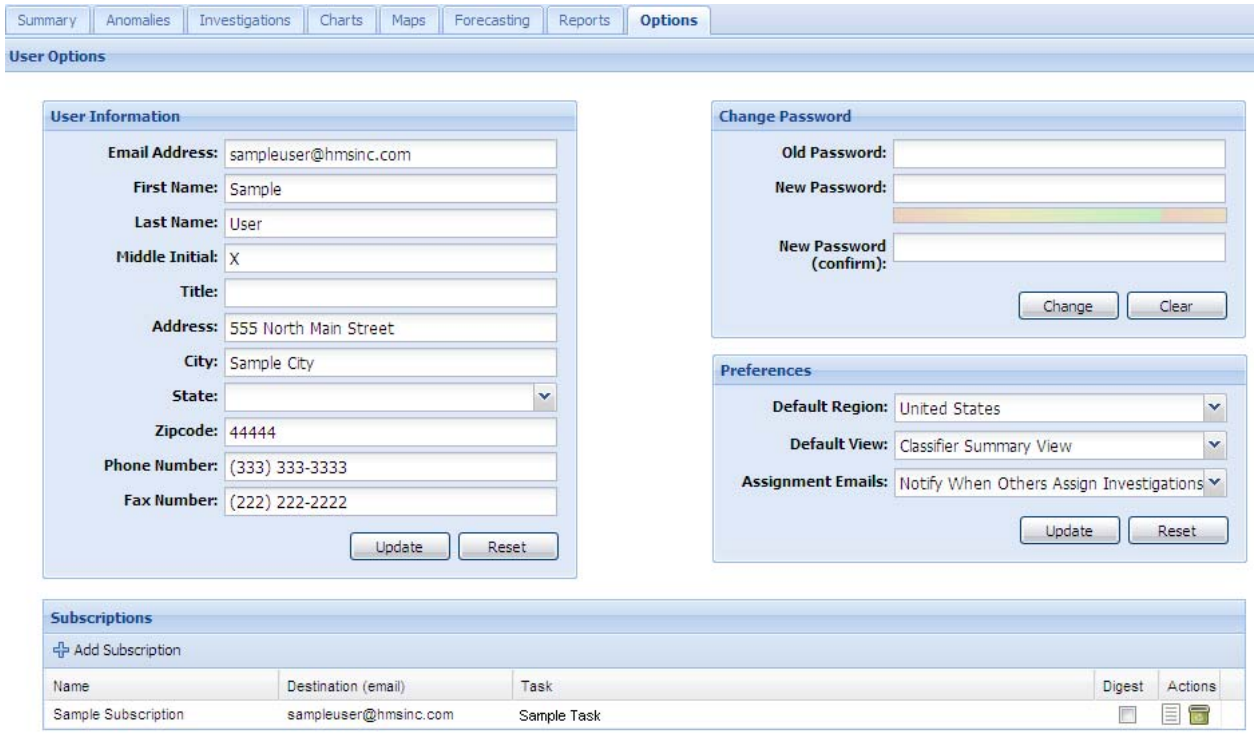


Figure 49: User Options

12.1 User Information

Enter updates to user information directly into the free-text boxes associated with each field. Click "Save" to save the updates. Clicking "Reset" will return each field to its original value.

12.2 Changing Your Password

Your password can be changed by entering your existing password into the first field in the Change Password box. Please enter your new password in the middle field and confirm it in the bottom field. The security level of your new password is indicated under the "New Password" field, with red representing least secure and green representing most secure. Press "Change" to submit your password change. Confirmation will be given that the new password was accepted.

A password change will be denied if the password entered into the "Old Password" field is incorrect or if the text entered in the "New Password" and "New Password (confirm)" fields do not match. If the password change is denied, the problematic field will be highlighted in red. Selecting "Clear" will remove the text from all fields in the Change Password box.

12.3 Setting Preferences

The "Default Region" field indicates the default location that will appear in the Location selector upon login. The Default Region field can be set to your overall accessible region or a sub-region within the larger region.

The “Default View” field indicates the surveillance view that will appear on the Summary page upon login. All available surveillance views are listing in the “Default View” dropdown list.

The “Assignment Emails” field is used to adjust the settings for investigator notification emails. There are three assignment email settings:

- Never notify me of investigation assignments – Notification emails are not sent when an investigation is assigned to a specific user
- Notify when others assign investigations to me – Notification emails are sent to a user when an investigation is assigned to them by anyone else.
- Notify when anyone assigns investigations to me – Notification emails are sent to a user when an investigation is assigned to by anyone, including themselves.

Click “Save” to save the updated default region and/or default view. Clicking “Reset” will return each field to its original value.

12.4 Subscription Management

The subscription box will appear at the bottom of the Options page for limited users. Clicking “Add Subscription” in the top left portion of this box will produce the “Edit Subscription” popup window. Enter a meaningful subscription name in the “Subscription Name” text box and provide the email address to which notifications will be sent in the “Destination (email)” text box. The “Surveillance Task” dropdown menu contains a listing of all available surveillance tasks. Click directly on the surveillance task to which you want to receive email notifications.

After selecting a surveillance task, the “Surveillance Sets” text box will become populated with all surveillance sets associated with the surveillance view. Each chart that was associated with the surveillance view during creation is represented as a surveillance set. Pressing and holding the CTRL key on your keyboard allows for the selection of more than one surveillance set. To select a consecutive list of surveillance sets, click on the first and last surveillance set while holding the SHIFT key on your keyboard. This highlights the first and last surveillance set as well as those in between.

The “Geographies” text box contains all available geographies based on the geography and aggregation method selected when the surveillance task was created. Pressing and holding the CTRL key on your keyboard allows for the selection of more than one geography. To select a consecutive list of geographies, click on the first and last geographies while holding the SHIFT key on your keyboard. This highlights the first and last geographies as well as those in between.

Check the checkbox next to “Digest” to receive only one email at 8:00am ET for all anomaly notifications generated during the prior 24 hours.

Click “Save” to submit the subscription or “Cancel” to close the popup window without submitting the subscription (See Figure 50: Edit Subscription).

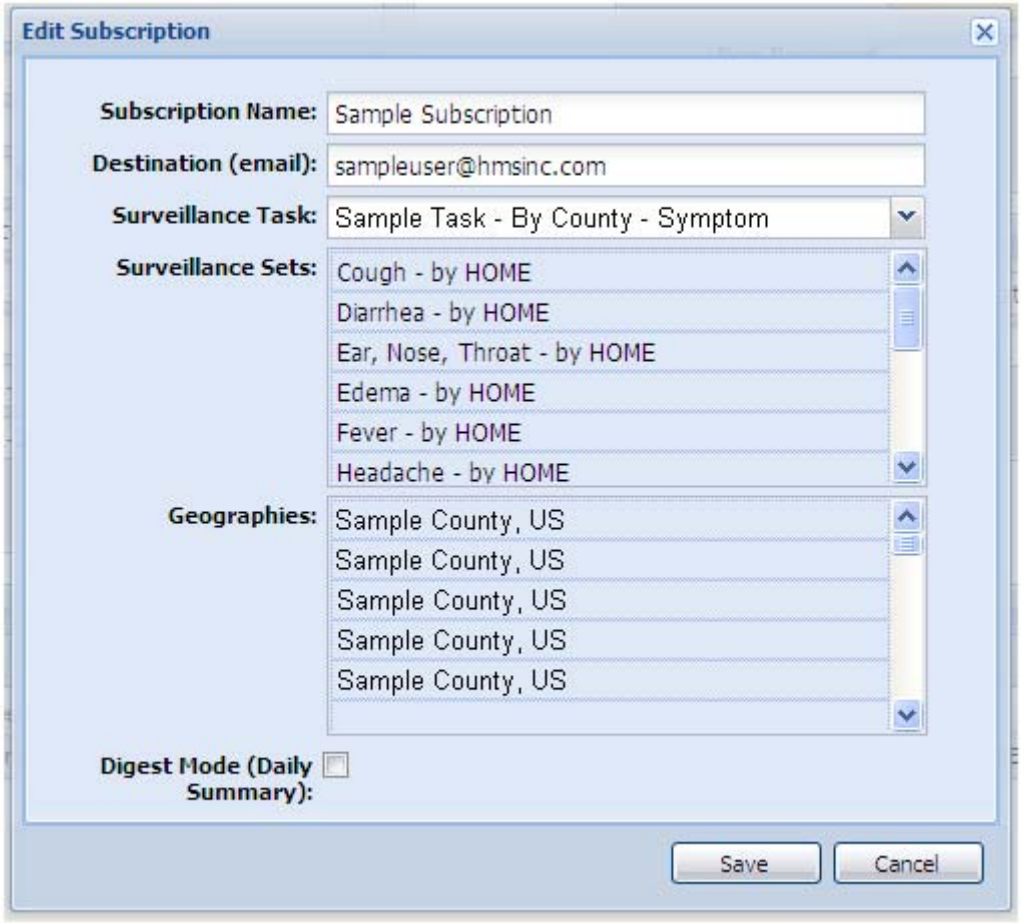


Figure 50: Edit Subscription

All subscriptions are listed in the "Subscriptions" portion of the Options page. An existing subscription can be edited by clicking on the left icon in the "Actions" column. Click on the right icon to delete a subscription.

Users without access to subscription management should contact their project sponsor or Health Monitoring Systems for more information on creating or editing their current notifications subscriptions.

Appendix 1: Syndrome Classifier

Classification	Indicators (+)	Indicators (-)
Botulinic	blurred	
	blurry	
	diff speak	
	diplopia	
	double vis	
	eye problem	
	language pbx	
	loss of vis	
	photophobia	
	seeing double	
	sees double	
	slurred speach	
	slurred speech	
	slurring	
	speaking problems	
	speech disturb	
	vis diff	
	vis dist	
	vision loss	
	vision not good	
	vision problems	
	visual change	
	visual diff	
	visual dist	
Constitutional	ache all over	
	achey	
	aching	
	achy	
	all over pain	
	bady aches	
	bady hurt	
	body ac he	
	body ache	
	body hurt	
	body pain	

body wide pain
bodyache
can barely walk
cant eat
chills
dec po
decreased po
dka
does not feel well
doesnt feel well
dont feel good
excs cry
fatigue
febrile
feel bad
feeling bad
fev
flu
flulike
fussines
fussy
fver
generalized pain
gland swell
gland swoll
glands swell
glands swoll
groin pain
hasnt ate
hurt all over
hurts all over
hypotens
ill
illnes
ilnes
increased sleep
inflamed lymph
influenza

inside are hurting
latharg
letharg
listless
lo blood pres
lo bp
low blood pres
low bp
lump in groin
lump in neck
lump under arm
lymph node
malaise
mono
mumps
muscle aches
myalgia
no appet
not eat
not feeling right
not feeling well
not responding well
note eat
oth general sym
other general
pain all over
pain allover
pain generalized
pain in groin
painful groin
painful lump
pains all over
pains allover
pancreatit
poltcythem
polycythem
pooraptite
septic shock

septicemia	
sleeping alot	
sleeping hard	
sleeping too	
sluggish	
sweats	
swollen gland	
swollen groin	
swollen lymph node	
swollen neck	
t\w*[0-9]+	
temp	
temperature	
tender groin	
tired	
toxic shock	
unable to walk	
uneasiness	
uneasy	
unspecified	
viral syndrome	
viralsyndrome	
whiny	
wont eat	
worn out	
weak	side
weekness	
cryin	
screamin	
sick	me sick
	revisit
	sick for
	sick in
	sick of
	sick to
collapsed	lung
aches	ear
	head

		stomach
	anorexia	nervosa
Gastrointestinal	ab pai	preg
	ab pn	
	abd apin	
	abd cram	
	abd discom	
	abd pa	
	abd pai	
	abd pn	
	abd px	
	abdl pai	
	abdm pai	
	abdminal pai	
	abdmn pai	
	abdmnal pai	
	abdo cramp	
	abdo pai	
	abdom pai	
	abdomen pai	
	abdomianl pai	
	abdomin pai	
	abdominal cram	
	abdominal discom	
	abdominal pai	
	abdominalpai	
	abdompai	
	abdonimal pai	
	abdoninal pai	
	abdpai	
	abodminal pai	
	abominal pai	
	abpai	
	adb pai	
	adbominal pai	
	adominal pai	
	appendicitis	
	belly cram	

belly hur
belly pai
gastic pai
gastric pai
lq pai
pain abd
pain abdomen
pain in ab
pain in abd
pain in stomach
pain in stomach
pain llq
pain lrq
pain luq
pain rlq
pain ruq
pain ulq
pain urq
pains in stomach
q pain
quad pai
quadrant pai
rq pai
stom cram
stom hur
stom pai
stom pn
stomach cram
stomach hur
stomach pai
stomach pn
stomache pai
stomachpai
uq pai
black stool
bld in stool
blood in stool
bloodstool

bloody red stool	
bloody stool	
dark stool	
diaa	
diah	
diar	
diea	
diha	
dirrhea	
emesis	
food pois	
loose stool	
na vo	
naus	
nausvomdia	
nd	
nv	
nvd	
runny stool	
runs	
sick to stomach	
stomach ache	
stomachach	
stomache ache	
stomacheach	
tarry stool	
trots	
upset stomach	
vmt	
vmtg	
watery stool	
gastroenteritis	noninf
food poison	blood
nausvomdia	
throw up	
throwing up	
vom	
dair	dairy

Hemorrhagic	abortion	
	anemi	
	blood comin	
	blood in sput	
	blood in stool	
	blood in urin	
	blood urin	
	bloodurin	
	bloody cough	
	bloody diar	
	bloody sneez	
	bloody stool	
	bloody urine	
	coughing blood	
	dysent	
	hematuria	
	hemoptysis	
	ing blood	
	ing up blood	
	miscar	
	misscar	
	passing clots	
	petechiae	
	rectal bleeding	
	sneezed blood	
	sneezing blood	
	vag bleed	
	vag blood	
	vag pain	
	vaginal bleed	
	vaginal blood	
	vaginal pain	
	bleed	site
	hemorr	hemorrhoid
Neurological	aloc	
	alter mentaion	
	altered	
	ams	

ankle pain
aphasia
arm immobile
arms tingling
arthr
ataxia
back pain radiating
bell palsy
bells palsy
blacking out
blackout
cannot focus eyes
cant move
cant remember
cant see
cant speak
cant talk
cephalgia
change in level of
change in level of
change in ms
confused
confusion
confussion
convulsions
cva
decreased level of
delirium
diff speak
diffculty with
disoriented
disorinted
dizin
dizz
droopy eyelids
dysphag
dysphon
dystonic reaction

ear ringing
elbow pain
epileptic
face droop
face feels numb
facial droop
faint
flaccid
floaters
ha
hdache
head ache
head feels funny
head hurts
head pain
head pounding
headace
headache
headpain
hearing loss
imp spch
incoherent
ischemia
joint
knee pain
language pbx
light headed
lighthead
loc
lose voice
losing hearing
losing voice
loss of coordination
lost vision
lost voice
lthead
memory loss
meningitis

ment stat
mental stat
migr
mirgr
mra
muscle stiffness
neck pain
neck stiff
nerve pain
neuro
none responsive
not responging
not speaking right
not talking right
numbness
other alter
pain neck/chest nka
paral
paresthesia
pinched nerve
presenile dementia
problem waking up
sciatic
seeing things
shakes
shakey
shakiness
shaking
shaky
shoulder pain
side weak
sided weak
skin sensation
slurred speach
slurred speech
slurring
snycop
speaking problems

	speech disturb	
	spinal biffen	
	spot in vision	
	stiff neck	
	stroke	
	sycop	
	syncop	
	synope	
	tia	
	tingling	
	trans alter	
	tremors	
	trouble hearing	
	twitching	
	un sure on feet	
	unable to move	
	unable to speak	
	unable to talk	
	vertigo	
	wrist pain	
	black out	alcohol
	blacked out	etoh
	loss of concious	
	loss of conscious	
	loss of consious	
	nonrepons	
	nonrespons	
	pass out	
	passed out	
	passedout	
	passes out	
	passing out	
	passsed out	
	unconcious	
	unconscious	
	unconsious	
	unrepons	
	unrespons	

	seiaure	fb
	seizrures	febrile
	seizur	
	seizure	
	seizure	
	seizures	
	seziure	
	siezur	
	siiezur	
	sz	
	convuls	react
	halluc	rxn
Respiratory	apnea	
	barky	
	breath pain	
	breath prob	
	breathing difficulty	
	breathing fast	
	breathing hard	
	breathing prob	
	breating pain	
	bronc	
	bronchitis	
	cannot swall	
	cannot swoll	
	cant breath	
	cant catch brea	
	cant swall	
	cant swoll	
	check brea	
	chest cong	
	chest conj	
	chest discom	
	chest heavines	
	chest heavy	
	chest press	
	chest tight	
	ck ears	

cold
cold
croup
cyano
dec o2
decreased o2
decreased o2
dif breathing
diff bre
diff brthg
diff in brea
diff swallow
diffbrea
diffculity bre
diffi brea
diffi culty brea
difficulity brea
difficult bre
difficult to brea
difficulty bre
difficulty in brea
difficulty of brea
difficulty swallow
difficuly brea
difficulyt brea
difficuoty bre
difficutly bre
diffuculty brea
dificulty brea
diif brea
does not breath
dyspnea
ear ache
ear drain
ear inf
ear pain
ear pian
ear swell

ear swoll
earache
emphysema
ent
flulike
flulike
hard time brea
hard to brea
heaviness in chest
hoarse
hurts to brea
hypervent
hypoxi
influenza
influenza
labored breath
low o2
low oxygen
low pulse ox
lung
lung pain
not breat
o2 level low
otalgia
otitis media
out of o2
pertussis
pharyng
pleuri
pnemon
pneum
pnuem
pressure in chest
pressure on chest
problems br
pullin
pulm cong
pulm conj

pulmonary cong
pulmonary conj
res distress
resp
resp arrest
resp diff
resp failure
respir
respiratory arrest
respiratory failure
respitory distress
respritory distress
rsv
runny nose
shallow brth
sinus
sore thoa
sore thor
sore thr
sorethr
stopped brea
stopped brea
strep
stuffy
substernal discom
swell tonsil
swoll tonsil
swollen tonsil
tonsil swell
tr brea
trbl brea
trouble bre athing
trouble brea
trouble brea
trouble swall
uri
wheez
worse inhalation

coigh	syr
cough	vag
flu	stomach flu
chock	on
chok	
nasal	septum
throat	in throat
	fb throat
st	abn st
	at st
	bf st
	blood in st
	bloody st
	boyfriend st
	brea st
	by st
	che st
	cy st
	da st
	dad st
	dau st
	daughter st
	elm st
	ems st
	fa st
	family st
	from st
	gall st
	gf st
	girlfriend st
	gram st
	grandma st
	hu st
	hus st
	husb st
	husband st
	in st
	kidney st

	la st
	left st
	loose st
	mental st
	mo st
	mom st
	mt st
	non st
	nt st
	nurse st
	pa st
	pat st
	patient st
	po st
	police st
	pt st
	pts st
	ra st
	sister st
	son st
	sp st
	spcf st
	specified st
	spouse st
	sq st
	sqd st
	squad st
	st agn
	st ann
	st art
	st ate
	st bar
	st bf
	st boy
	st by
	st cat
	st cha
	st cl

st da
st dau
st el
st ems
st fa
st family
st fra
st geo
st gf
st girl
st gram
st grand
st hu
st itc
st jam
st jo
st jud
st luk
st mar
st mic
st mik
st mo
st mt
st nurse
st of
st omach
st one
st ool
st pa
st police
st pt
st rit
st sis
st son
st spou
st spt
st sq
st step

	st tho
	st tom
	st tp
	st tro
	st vin
	st wife
	te st
	ther st
	to st
	wi st
	wife st
ashma	ashma hist
asthma	asthma hist
athsma	athsma hist
	hist of ashma
	hist of asthma
	hist of athsma
	history of ashma
	history of asthma
	history of athsma
copd	copd hist
	hist of copd
	history of copd
aob	chest pain
bronchospasm	
gasping	
pain when brea	
pain with brea	
painful breat	
sh of brea	
short brea	
short of brea	
shortnes of brea	
shortness brea	
shortness of br	
shortness ofbrea	
shortness off brea	
shortnessofbrea	

	shotness of brea	
	shrtbreath	
	soa	
	sob	
	congest	congestive heart
	conjest	conjestive heart
Rash	angioedemna	
	blis ter	
	blister	
	blotch	
	boil	
	buboes	
	bumps	
	burning to skin	
	candidiasis	
	chickenpox	
	chickpox	
	cknpox	
	cpox	
	derm	
	eschar	
	ezcema	
	facial sore	
	fleash eating	
	hives	
	ithciness	
	lesion	
	lumps	
	measles	
	mrsa	
	nonspecif skin	
	open sore	
	pox	
	red and swollen	
	red painful	
	red sore	
	red spots	
	red streak	

red swelling	
red swol len	
red swollen	
reddened	
redness	
ring worm	
ring worm	
ringworm	
scabies	
shingles	
skin burning	
skin eruption	
skin infection	
skin inflammation	
skin irritation	
skin lesions	
skin problem	
skin red	
skin sore	
skin ulcer	
skininfct	
skn irrit	
sore beside eye	
sore on	
sores	
splotch	
spots	
staff infection	
staph	
swollen red	
thrush	
ulcers	
urticaria	
vag cyst	
welts	
abces	dental
absces	fluid
	teeth

		tooth
	iching	throat
	ichy	
	itch	
	itches	
	itching	
	itchy	
	cyst	cystic
		cystitis
		ovar
		renal cyst
	rahs	diaper rash
	rash	
	rashes	
Classifier Negative Indicators		accident
		assault
		fall
		fb in
		fb to
		fell
		fo in
		fo to
		foreign body
		foreign obj
		injur
		mva
		mvc
		recheck
		refill
		swallowed fb
		fb
		fo

Appendix 2: Infectious Disease Symptom Classifier

Classification	Indicators (+)	Indicators (-)
Abdominal	ab pai	preg
	ab pn	
	abd apin	
	abd cram	
	abd discom	
	abd pa	
	abd pai	
	abd pn	
	abd px	
	abdl pai	
	abdm pai	
	abdminal pai	
	abdmn pai	
	abdmnal pai	
	abdo cramp	
	abdo pai	
	abdom pai	
	abdomen pai	
	abdomianl pai	
	abdomin pai	
	abdominal cram	
	abdominal discom	
	abdominal pai	
	abdominalpai	
	abdompai	
	abdonimal pai	
	abdoninal pai	
	abdpai	
	abodminal pai	
	abominal pai	
	abpai	

adb pai
adbominal pai
adominal pai
appendicitis
belly cram
belly hur
belly pai
gastic pai
gastric pai
lq pai
pain abd
pain abdomen
pain in ab
pain in abd
pain in stomach
pain in stomach
pain llq
pain lrq
pain luq
pain rlq
pain ruq
pain ulq
pain urq
pains in stomach
q pain
quad pai
quadrant pai
rq pai
stom cram
stom hur
stom pai
stom pn
stomach cram
stomach hur
stomach pai
stomach pn
stomache pai
stomachpai

	uq pai	
Arthralgia	ankle pain	
	arthr	
	elbow pain	
	joint	
	knee pain	
	shoulder pain	
	wrist pain	
Congestion	chest cong	
	chest conj	
	chest discom	
	chest heavines	
	chest heavy	
	chest press	
	chest tight	
	heaviness in chest	
	lung pain	
	pressure in chest	
	pressure on chest	
	pulm cong	
	pulm conj	
	pulmonary cong	
	pulmonary conj	
Cough	coigh	syr
	cough	vag
	barky	
	cold	
	croup	
	flulike	
	hoarse	
	influenza	
	pertussis	
	flu	stomach flu
Diarrhea - Not Watery/Bloody	food poison	
	nausvomdia	
	nd	
	nvd	
	runny stool	

runs	
trots	
loose stool	bloody loose stool
diah	black diah
	blood in diah
	bloody diah
	explosive diah
	watery diah
diar	black diar
	blood in diar
	bloody diar
	explosive diar
	watery diar
dirrhea	black dirrhea
	blood in dirrhea
	bloody dirrhea
	explosive dirrhea
	watery dirrhea
dair	black dair
	blood in dair
	bloody dair
	dairy
	explosive dair
	watery dair
diea	black diea
	blood in diea
	bloody diea
	explosive diea
	watery diea
diaa	black diaa
	blood in diaa
	bloody diaa
	explosive diaa
	watery diaa
diha	black diha
	blood in diha
	bloody diha
	explosive diha

		watery diha
	gastroenteritis	noninf
Diarrhea - Watery/Bloody	black dair	
	black diaa	
	black diah	
	black diar	
	black diea	
	black diha	
	black dirrhea	
	black stool	
	bld in stool	
	blood in dair	
	blood in diaa	
	blood in diah	
	blood in diar	
	blood in diea	
	blood in diha	
	blood in stool	
	bloodstool	
	bloody dair	
	bloody diaa	
	bloody diah	
	bloody diar	
	bloody diea	
	bloody diha	
	bloody dirrhea	
	bloody loose stool	
	bloody red stool	
	bloody stool	
	dark stool	
	diahhrea small	
	diahhrea with	
	diahorea small	
	diahorea with	
	diahrea small	
	diahrea with blood	
	diahrrea small	
	diahrrea with blood	

diarhea small
diarhea with blood
diarr small amount
diarr with blood
diarrea small
diarrea with blood
diarreah small
diarreah with blood
diarreha small
diarreha with blood
diarrhea small
diarrhea with blood
diarrhhea small
diarrhhea with
diarrhia small
diarrhia with blood
dierreah small
dierreah with blood
dirrahea small
dirrahea with blood
dirrhea small
dirrhea with blood
explosive dair
explosive diaa
explosive diah
explosive diar
explosive diea
explosive diha
explosive dirrhea
tarry stool
watery dair
watery diaa
watery diah
watery diar
watery diea
watery diha
watery dirrhea
watery stool

Ear, Nose, Throat	cannot swall	
	cannot swoll	
	cant swall	
	cant swoll	
	ck ears	
	diff swallow	
	difficulty swallow	
	ear ache	
	ear drain	
	ear inf	
	ear pain	
	ear pian	
	ear swell	
	ear swoll	
	earache	
	ent	
	otalgia	
	otitis media	
	pharyng	
	pullin	
	runny nose	
	sinus	
	sore thoa	
	sore thor	
	sore thr	
	sorethr	
	strep	
	stuffy	
	swell tonsil	
	swoll tonsil	
	swollen tonsil	
	tonsil swell	
	trouble swall	
	chock	on
	chok	
	congest	chest cong
	conjest	chest conj
		congestive heart

	conjestive heart
	pulm cong
	pulm conj
	pulmonary cong
	pulmonary conj
nasal	septum
throat	in throat
	fb throat
st	abn st
	at st
	bf st
	blood in st
	bloody st
	boyfriend st
	brea st
	by st
	che st
	cy st
	da st
	dad st
	dau st
	daughter st
	elm st
	ems st
	fa st
	family st
	from st
	gall st
	gf st
	girlfriend st
	gram st
	grandma st
	hu st
	hus st
	husb st
	husband st
	in st
	kidney st

	la st
	left st
	loose st
	mental st
	mo st
	mom st
	mt st
	non st
	nt st
	nurse st
	pa st
	pat st
	patient st
	po st
	police st
	pt st
	pts st
	ra st
	sister st
	son st
	sp st
	spcf st
	specified st
	spouse st
	sq st
	sqd st
	squad st
	st agn
	st ann
	st art
	st ate
	st bar
	st bf
	st boy
	st by
	st cat
	st cha
	st cl

st da
st dau
st el
st ems
st fa
st family
st fra
st geo
st gf
st girl
st gram
st grand
st hu
st itc
st jam
st jo
st jud
st luk
st mar
st mic
st mik
st mo
st mt
st nurse
st of
st omach
st one
st ool
st pa
st police
st pt
st rit
st sis
st son
st spou
st spt
st sq
st step

		st tho
		st tom
		st tp
		st tro
		st vin
		st wife
		te st
		ther st
		to st
		wi st
		wife st
Edema	edema	ankle
	swell	ear
	swoll	eye
		finger
		gland
		groin
		incision
		knee
		lymph node
		neck
		shunt
		site
		throat
Exacerbation	bronchitis	
	emphysema	
	ashma	ashma hist
	asthma	asthma hist
	athsma	athsma hist
		hist of ashma
		hist of asthma
		hist of athsma
		history of ashma
		history of asthma
		history of athsma
	copd	copd hist
		hist of copd
		history of copd

Eyes	conjunctivit	
	eye drain	
	eye inf	
	eye irritat	
	eye itching	
	eye pain	
	eye pian	
	eye red	
	eye swell	
	eye swoll	
	eyes red	
	eyes swoll	
	irritated eyes	
	irritation eyes	
	pink eye	
	pinkeye	
	red eye	
	swollen eye	
Fatigue	dka	
	fatigue	
	increased sleep	
	latharg	
	letharg	
	listless	
	mono	
	poltcythem	
	polycythem	
	sleeping alot	
	sleeping hard	
	sleeping too	
	sluggish	
	tired	
	worn out	
	weak	side
	weekness	
Fever	chills	
	febrile	
	fev	

	flu
	flulike
	fver
	influenza
	pancreatit
	sweats
	t\w*[0-9]+
	temp
	temperature
Headache	cephalgia
	ha
	hdache
	head ache
	head feels funny
	head hurts
	head pain
	head pounding
	headace
	headache
	headpain
	migr
	mirgr
Hemorrhaging	anemi
	blood comin
	blood in sput
	blood in stool
	blood in urin
	blood urin
	bloodurin
	bloody cough
	bloody diar
	bloody sneez
	bloody sputum
	bloody stool
	bloody urin
	coughing blood
	dysent
	hematuria

	hemoptysis	
	ing blood	
	ing up blood	
	petechiae	
	rectal bleeding	
	sneezed blood	
	sneezing blood	
	bleed	preg
		site
		vag
		vaginal
	hemorr	hemorrhoid
Hypoxia	cyano	
	dec o2	
	decreased o2	
	decreased o2	
	hypoxi	
	low o2	
	low oxygen	
	low pulse ox	
	o2 level low	
	out of o2	
Jaundice	jaundic	
	pancreati	
	yellow	
Lymphadenitis	gland swell	
	gland swoll	
	glands swell	
	glands swoll	
	groin pain	
	inflamed lymph	
	lump in groin	
	lump in neck	
	lump under arm	
	lymph node	
	mumps	
	pain in groin	
	painful groin	

	painful lump
	swollen gland
	swollen groin
	swollen lymph node
	swollen neck
	tender groin
Malaise	can barely walk
	cant eat
	dec po
	decreased po
	does not feel well
	doesnt feel well
	dont feel good
	excs cry
	feel bad
	feeling bad
	fussines
	fussy
	hasnt ate
	ill
	illnes
	ilnes
	inside are hurting
	malaise
	no appet
	not eat
	not feeling right
	not feeling well
	not responding well
	note eat
	oth general sym
	other general
	pooraptite
	unable to walk
	uneasiness
	uneasy
	unspecified
	viral syndrome

	viralsyndrome	
	whiny	
	wont eat	
	cryin	
	screamin	
	sick	me sick
		revisit
		sick for
		sick in
		sick of
		sick to
	collapsed	lung
	anorexia	nervosa
Mental	aniexty	
	anixety	
	anxiety	
	anxious	
	behavior	
	chem dep	
	chemical dep	
	depression	
	detox	
	hearing voices	
	not acting normal	
	od	
	overdose	
	panic	
	psych	
	suicid	
	abus	phys
		physical
	mental	stat
Miscarriage	abortion	
	miscar	
	misscar	
	passing clots	
	vag bleed	
	vag blood	

	vag pain	
	vaginal bleed	
	vaginal blood	
	vaginal pain	
	preg	blood press
		blood sugar
		blood test
Myalgia	ache all over	
	achey	
	aching	
	achy	
	all over pain	
	bady aches	
	bady hurt	
	body ac he	
	body ache	
	body hurt	
	body pain	
	body wide pain	
	bodyache	
	generalized pain	
	hurt all over	
	hurts all over	
	muscle aches	
	myalgia	
	pain all over	
	pain allover	
	pain generalized	
	pains all over	
	pains allover	
	aches	ear
		head
		stomach
Nausea	na vo	
	naus	
	sick to stomach	
	stomach ache	
	stomachach	

	stomache ache
	stomacheach
	upset stomach
Neurological	aloc
	alter mentaion
	altered
	ams
	aphasia
	arm immobile
	arms tingling
	ataxia
	back pain radiating
	bell palsy
	bells palsy
	blacking out
	blackout
	cannot focus eyes
	cant remember
	cant see
	change in level of
	change in level of
	change in ms
	confused
	confusion
	confussion
	convulsions
	cva
	decreased level of
	delirium
	diff speak
	diffculty with
	disoriented
	disorinted
	dizin
	dizz
	dystonic reaction
	ear ringing
	epileptic

face droop
face feels numb
facial droop
faint
floaters
hearing loss
imp spch
incoherent
ischemia
language pbx
light headed
lighthead
loc
losing hearing
loss of coordination
lost vision
lthead
memory loss
meningitis
ment stat
mental stat
mra
muscle stiffness
nerve pain
neuro
none responsive
not responging
not speaking right
not talking right
other alter
pain neck/chest nka
pinched nerve
presenile dementia
problem waking up
sciatic
seeing things
shakes
shakey

shakiness	
shaking	
shaky	
skin sensation	
slurred speach	
slurred speech	
slurring	
snycop	
speaking problems	
speech disturb	
spinal biffen	
spot in vision	
stroke	
sycop	
syncop	
synope	
tia	
tingling	
trans alter	
tremors	
trouble hearing	
twitching	
un sure on feet	
vertigo	
voice symptom	
black out	alcohol
blacked out	etoh
loss of concious	
loss of conscious	
loss of consious	
nonrepons	
nonrespons	
pass out	
passed out	
passedout	
passes out	
passing out	
passsed out	

	unconcious	
	unconscious	
	unconsious	
	unrepons	
	unrespons	
	seiaure	fb
	seizrures	febrile
	seizur	
	seizure	
	seizure	
	seizures	
	seziure	
	siezur	
	siiezur	
	sz	
	convuls	react
	halluc	rxn
Paralysis	cant move	
	cant speak	
	cant talk	
	droopy eyelids	
	dysphag	
	dysphon	
	flaccid	
	lose voice	
	losing voice	
	lost voice	
	numbness	
	paral	
	paresthesia	
	side weak	
	sided weak	
	unable to move	
	unable to speak	
	unable to talk	
Rash	angioedemna	
	blis ter	
	blister	

blotch
boil
buboes
bumps
burning to skin
candidiasis
chickenpox
chickpox
cknpox
cpox
derm
eschar
ezcema
facial sore
fleash eating
hives
ithciness
lesion
lumps
measles
mrsa
nonspecif skin
open sore
pox
red and swollen
red painful
red sore
red spots
red streak
red swelling
red swol len
red swollen
reddened
redness
ring worm
ring worm
ringworm
scabies

shingles	
skin burning	
skin eruption	
skin infection	
skin inflammation	
skin irritation	
skin lesions	
skin problem	
skin red	
skin sore	
skin ulcer	
skininfct	
skn irrit	
sore beside eye	
sore on	
sores	
splotch	
spots	
staff infection	
staph	
swollen red	
thrush	
ulcers	
urticaria	
vag cyst	
welts	
abces	dental
absces	fluid
	teeth
	tooth
iching	throat
ichy	
itch	
itches	
itching	
itchy	
cyst	cystic
	cystitis

		ovar
		renal cyst
	rahs	diaper rahs
	rash	diaper rash
	rashes	
Respiratory	apnea	
	breath pain	
	breath prob	
	breathing difficulty	
	breathing fast	
	breathing hard	
	breathing prob	
	breating pain	
	bronc	
	cant brea	
	cant catch brea	
	check breathing	
	cold	
	dif brea	
	diff bre	
	diff brea	
	diff brthg	
	diff in brea	
	diffbrea	
	diffculity bre	
	diffi brea	
	diffi culty brea	
	difficulity brea	
	difficult bre	
	difficult to brea	
	difficulty bre	
	difficulty in brea	
	difficulty of brea	
	difficuly brea	
	difficulyt brea	
	difficuoty bre	
	difficutly bre	
	diffuculty brea	

dificulty brea
diif brea
does not breath
dyspnea
flulike
hard time brea
hard to brea
hurts to brea
hypervent
influenza
labored brea
lung
not breat
pleuri
pnemon
pneum
pnuem
problems br
res distress
resp
resp arrest
resp diff
resp failure
respir
respiratory arrest
respiratory failure
respitory distress
respritory distress
rsv
shallow brth
stopped brea
substernal discom
tr brea
trbl brea
trouble bre athing
trouble brea
uri
wheez

	worse inhalation	
	aob	chest pain
	bronchospasm	
	gasping	
	pain when brea	
	pain with brea	
	painful breat	
	sh of brea	
	short brea	
	short of brea	
	shortnes of brea	
	shortness brea	
	shortness of br	
	shortness ofbrea	
	shortness off brea	
	shortnessofbrea	
	shotness of brea	
	shrtbrea	
	soa	
	sob	
	flu	stomach flu
Shock	hypotens	
	lo blood pres	
	lo bp	
	low blood pres	
	low bp	
	septic shock	
	septicemia	
	toxic shock	
Stiff Neck	neck pain	
	neck stiff	
	stiff neck	
Vision	blurred	
	blurry	
	diplopia	
	double vis	
	eye problem	
	loss of vis	

	photophobia	
	seeing double	
	sees double	
	vis diff	
	vis dist	
	vision loss	
	vision not good	
	vision problems	
	visual change	
	visual diff	
	visual dist	
Vomiting	food pois	blood
	na vo	
	throw up	
	throwing up	
	vmt	
	vmtg	
	vom	
	emesis	
	nv	
	nvd	
Classifier Negative Indicators		accident
		assault
		fall
		fb in
		fb to
		fell
		fo in
		fo to
		foreign body
		foreign obj
		injur
		mva
		mvc
		recheck
		refill
		swallowed fb
		fb

fo

Appendix 3: Animal Related Injury Classifier

Classification	Indicators (+)	Indicators (-)
Animal Attack	animal att	
	bear att	
	cat att	
	claw	
	dog att	
	maul	
Animal Bite	animal bi	bitten + child
	bat bi	bite + sis
	bitten	bite + woman
	bunny bi	bit by + sis
	dog bi	bitten +kid
	feret bi	bite + friend
	ferret bi	bite + bro
	ferrett bi	bite + man
	gerbil bi	bite + child
	hamster bi	bit by + friend
	horse bi	bitten + friend
	kitten bi	bitten + man
	lizard bi	bite +kid
	monkey bi	bit by + bro
	mouse bi	bit by + man
	puppy bi	bitten + woman
	rabbit bi	bit by +kid
	raccoon bi	bitten + sis
	raccoon bi	bitten + bro
	rat bi	bit by + woman
	squirrel bi	bit by + child
Animal Scratch	animal scr	
	cat scr	
	dog scr	
	kitten scr	
	maul	
	puppy scr	
	raccoon scr	
	racoon scr	
	scratch by cat	
	scratch by dog	
	scratch by kitten	
	scratch by puppy	
	scratch by rac	
	scratch from cat	
	scratch from dog	
	scratch from kitten	
	scratch from puppy	
	scratch from rac	

	scratched by cat
	scratched by dog
	scratched by kitten
	scratched by puppy
	scratched by rac
Misc. Animal Injury	fall from horse
	fell from hors
	fell off hors
	fell off of hors
	horse kick
	kick by hors
	kicked by hors
Rabies	rabid
	rabies

Appendix 4: Influenza Related Illness Classifier

Classification	Indicators (+)	Indicators (-)
ILI Symptoms	Fever	etoh
*Chief complaint must contain	Febrile	withdrawl
two or more positive indicators	Temperature	post
	Sweats	tube
	Chills	alcohol
	Fevef	surgery
	Fevr	denies
	Fver	no
	Temp	cold
	Fiver	accident
	t/w*[0-9]+	mva
	Headache	crash
	head ache	hit
	head hurts	sinus
	head pounding	fell
	head pain	assault
	h/a	fall
	Myalgia	fibro
	body ache	syncope
	body aches	faint
	hurt all over	pain
	huts all over	blood
	Bodyache	cp
	body pain	tightness
	Prostration	pressure
	Weakness	sinus
	Fatigue	syr
	Weak	vag
	worn out	
	sleeping a lot	
	Tired	
	Coryza	
	runny nose	
	Rhinorrhea	
	nose running	
	sore throat	
	throat hurts	
	hurts to swallow	
	Sorethroat	
	throat sore	
	chest congestion	
	trouble breathing	
	Congestion	
	Sob	
	shortness of breath	

	unable to breath short of breath difficult breathing diff. breathing diff breathing tr breathing Dyspnea weezing stuffy head breathing difficulties breathing diff breathing problem breathing trouble cant breath can't breath hard to breath Diffbreath sh of breath stuffy nose hard time breathing hurts to breath problem breathing other dyspnea respiratory abnormality Shrtbreath Pain Cough Coigh Hoarse coughing nausea (if age <13) vomiting (if age <13) vomit (if age <13) vomit (if age <13) emesis (if age <13) throwing up (if age <13) throw up (if age <13) vomt (if age <13) vomi (if age <13) vommin (if age <13) nv (if age <13) ving (if age <13) diarrhea (if age <13) loose stool (if age <13) runs (if age <13) diah (if age <13) nvd (if age <13) n, v, d (if age <13)

	diarrhea (if age <13)	
	runny stool (if age <13)	
	nd (if age <13)	
ILI Symptoms + Fever *Chief complaint must contain a “fever” positive indicator (highlighted in yellow) and one additional positive indicator	fever+	etoh
	febrile+	withdrawl
	temperature+	post
	sweats+	tube
	chills+	alcohol
	fevef+	surgery
	fevr+	denies
	fev+	no
	fver+	cold
	temp+	accident
	fiver+	mva
	t/w*[0-9]+	crash
	headache	hit
	head ache	sinus
	head hurts	fell
	head pounding	assault
	head pain	fall
	h/a	fibro
	prostration	side
	weakness	syncopal
	fatigue	syncope
	weak	faint
	worn out	blood
	sleeping a lot	cp
	tired	tightness
	coryza	pressure
	runny nose	sinus
	rhinorrhea	syr
	nose running	vag
	running nose	
	sore throat	
	throat hurts	
	hurts to swallow	
	sorethroat	
	throat sore	
	chest congestion	
	trouble breathing	
	congestion	
	sob	
	shortness of breath	
	difficulty breathing	
	diff. breathing	
	diff breathing	
	tr breathing	
	dydyspnea	

	wheezing	
	stuffy head	
	breathing difficulties	
	breathing diff	
	breathing problem	
	breathing trouble	
	cant breath	
	can’t breath	
	hard to breath	
	diffbreath	
	sh of breath	
	stuffy note	
	hard time breathing	
	hurts to breath	
	problem breathing	
	other dyspnea	
	respiratory abnormality	
	shrtbreath	
	cough	
	coigh	
	hoarse	
	caughing	
	nausea (if age <13)	
	vomiting (if age <13)	
	vomit (if age <13)	
	vomit (if age <13)	
	emesis (if age <13)	
	throwing up (if age <13)	
	throw up (if age <13)	
	vomt (if age <13)	
	vomi (if age <13)	
	vommin (if age <13)	
	nv (if age <13)	
	ving	
	diarrhea (if age <13)	
	loose stool (if age <13)	
	runs (if age <13)	
	diah (if age <13)	
	nvd (if age <13)	
	n, v, d (if age <13)	
	diarrhea (if age <13)	
	runny stool (if age <13)	
	nd (if age <13)	
ILI Specified	cold	urin
	uri	uric
	respiratory	uria
	upper resp	urie
	flu	sweats

Appendix 5: Traumatic Injury Classifier

Classification	Indicators (+)	Indicators (-)
MVA	auto	
	bus	
	car	
	hit by bus	
	hit by car	
	hit by tru	
	hit with bus	
	hit with car	
	hit with tru	
	motorcy	
	mva	
	mvc	
	ped	
	pedestrian	
	ran over	
	run over	
	van	
	vehic	
	wrec	
	accident	accidental
Gunshot	bullet	
	bullit	
	gun	
	gunshot	
	pistol	
	shoot	
	shot	alerg
		allerg
		dpt
		flu
		glob
		need shot
		needs shot
		rabies
		shotness

		tet
		want shot
		wants shot
Violence	asaul	
	assaul	
	beat up	
	beaten	
	beaten	
	beatup	
	figh	
	jumped	
	kick	
	knif	
	punch	
	rape	
	stab	
	violen	
	attac	bear
		cat
		dog
		squirrel
		wolf
	hit with	bike
		bus
		car
		motor
		truc
		van
	hit by	bike
		bus
		car
		motor
		truc
		van
Suture/Wound Check	cast	
	ch wnd	
	change dres	
	change pack	

	ck wnd	
	drain	
	dressing ch	
	drsg ch	
	pack ch	
	packing ch	
	remov	
	stapl	
	sultu	
	surtu	
	sutur	
	wnd ch	
	wnd ck	
	wndch	
	wndck	
	wound care	
	wound ch	
	wound ck	
Injury	abras	ch
	bang	check
	brok	ck
	bust	
	concus	
	contus	
	crush	
	fall	
	fb in	
	fb to	
	fell	
	fo in	
	fo to	
	foreign body in	
	foreign body to	
	foreign object in	
	foreign object to	
	fract	
	fx	
	hit	

	injur
	jam
	jamm
	lac
	slam
	smash
	sprain
	trama
	traum
	truam
	wnd
	wound
Drugs	cocain
	coke
	crack
	crank
	crystal met
	drug abu
	drug od
	drug use
	drugs
	ecsta
	extacy
	extasy
	heroin
	idu
	ivdu
	ketamin
	ketemin
	marij
	methadon
	methamp
	od
	opiat
	opio
	opium
	overdose
	pills

	shooting drug	
	shooting heroi	
	shoting drug	
	shoting heroi	
	smack	
	sub abu	
	subst abu	
	substance abu	
	substence abu	
	withdraw	
	speed	acci
		car
		mva
Classifier Negative Indicators		no inj
		no known inj
		refill

Appendix 6: Immediate Notification Classifier

Classification	Indicators (+)	Indicators (-)
Anthrax	anthrax	no
		not
	eschar	minus
		no
		not
		sans
		without
Plague	plague	arterial
		no
		not
		retinal
	buboe	minus
		no
		not
		sans
		without
Smallpox	smallpox	no
		not
Bioterrorism	biological agent	no
	bioterror	not

Appendix 7: Patient Concern Classifier

In order for a chief complaint to be classified into a specific classification, it must contain at least one positive indicator, at least one co-indicator, and no negative indicators.

If an indicator is noted as a "segment," it must appear as a distinct word, as opposed to part of a longer word.

Classification	Positive Indicators	Negative Indicators
Novel Flu Keyword	H1N1	body ache
	swine	body aches
	swing flu	body pain
		bodyache
		breathing diff
		breathing problem
		breathing trouble
		cant breath
		caughing
		check
		chest congestion
		chills
		coigh
		cold
		cold sym
		congestion
		coryza
		cough
		cough
		diff breathing
		diffbreath
		difficulty breathing
		dyspnea
		eval
		expos
		fatigue
		febrile
		fev
		fevef
		fever
		fevr

	fiver flu like flu sum flu sx flu sym flue like flue sum flue sx flue sym fver h/a ha (segment) hard time breathing hard to breath has symptom head ache head hurts head pain head pounding headache hoarse hurt all over hurts all over hurts to breath hurts to swallow kaswine mex myalgia nose running other dyspnea and respiratory abnormality pneumonia poss problem breathing prostration request respiratory infection rhinorrhea ro swine rule out running nose runny nose sh of breath

		short of breath
		shortness of breath
		shrtbreath
		sign
		sleeping a lot
		sob
		sore throat
		sorethroat
		stuffy head
		stuffy nose
		susp
		sweats
		symptoms of flu
		symptoms of swine
		t/w*[0-9]+ (segment)
		temp
		temperature
		test
		think
		throat hurts
		throat sore
		tired (segment)
		tr breathing
		travel
		trouble breathing
		unable to breath
		upper resp
		uri (segment)
		want
		weak
		weakness
		wheezing
		worn out
Novel Flu Concerns	**Positive Indicators**	**Negative Indicators**
	H1N1	body ache
	swine	body aches
	swing flu	body pain
		bodyache
	Co-Indicators	breathing diff
	check	breathing problem
	eval	breathing trouble
	request	cant breath
	test	caughing

think	chest congestion
want	chills
worrie	coigh
	cold
	cold sym
	congestion
	coryza
	cough
	cough
	diff breathing
	diffbreath
	difficulty breathing
	dyspnea
	expos
	fatigue
	febrile
	fev
	fevef
	fever
	fevr
	fiver
	flu like
	flu sum
	flu sx
	flu sym
	flue like
	flue sum
	flue sx
	flue sym
	fver
	h/a
	ha (segment)
	hard time breathing
	hard to breath
	has symptom
	head ache
	head hurts
	head pain
	head pounding
	headache
	hoarse
	hurt all over
	hurts all over

	hurts to breath hurts to swallow kaswine mex myalgia nose running not swine not swing flu other dyspnea and respiratory abnormality pneumonia poss problem breathing prostration respiratory infection rhinorrhea ro swine rule out running nose runny nose sh of breath short of breath shortness of breath shrtbreath sign sleeping a lot sob sore throat sorethroat stuffy head stuffy nose susp sweats symptoms of flu symptoms of swine t/w*[0-9]+ (segment) temp temperature throat hurts throat sore tired (segment) tr breathing travel

		trouble breathing
		unable to breath
		upper resp
		uri (segment)
		weak
		weakness
		wheezing
		worn out
Novel Flu Exposure	**Positive Indicators**	**Negative Indicators**
	H1N1	
	swine	body ache
	swing flu	body aches
		body pain
	Co-Indicators	bodyache
	exos	breathing diff
	mex	breathing problem
	travel	breathing trouble
		cant breath
		caughing
		chest congestion
		chills
		coigh
		cold
		cold sym
		congestion
		coryza
		cough
		cough
		diff breathing
		diffbreath
		difficulty breathing
		dyspnea
		fatigue
		febrile
		fev
		fevef
		fever
		fevr
		fiver
		flu like
		flu sum
		flu sx
		flu sym

	flue like flue sum flue sx flue sym fver h/a ha (segment) hard time breathing hard to breath has symptom head ache head hurts head pain head pounding headache hoarse hurt all over hurts all over hurts to breath hurts to swallow kaswine myalgia no expos no travel nose running not mex not swine not swing flu other dyspnea and respiratory abnormality pneumonia poss problem breathing prostration respiratory infection rhinorrhea ro swine rule out running nose runny nose sh of breath short of breath shortness of breath

		shrtbreath
		sign
		sleeping a lot
		sob
		sore throat
		sorethroat
		stuffy head
		stuffy nose
		susp
		sweats
		symptoms of flu
		symptoms of swine
		t/w*[0-9]+ (segment)
		temp
		temperature
		throat hurts
		throat sore
		tired (segment)
		tr breathing
		trouble breathing
		unable to breath
		upper resp
		uri (segment)
		weak
		weakness
		wheezing
		worn out
Possible Novel Flu Case	**Positive Indicators**	**Negative Indicators**
	H1N1	accident
	mex	alcohol
	swine	assault
	swing flu	crash
	mex	denies
	travel	etoh
		fall
	Co-Indicators	fell
	body ache	hit
	body aches	kaswine
	body pain	mva
	bodyache	no flu
	breathing diff	no swine
	breathing problem	no travel
	breathing trouble	not flu

cant breath	not mex
caughing	not swine
chest congestion	post (segment)
chills	sinus
coigh	surgery
cold	tube (segment)
cold sym	withdrawl
congestion	
coryza	
cough	
cough	
diff breathing	
diffbreath	
difficulty breathing	
dyspnea	
fatigue	
febrile	
fev	
fevef	
fever	
fevr	
fiver	
flu like	
flu sum	
flu sx	
flu sym	
flue like	
flue sum	
flue sx	
flue sym	
fver	
h/a	
ha (segment)	
hard time breathing	
hard to breath	
has symptom	
head ache	
head hurts	
head pain	
head pounding	
headache	
hoarse	
hurt all over	

hurts all over
hurts to breath
hurts to swallow
myalgia
nose running
other dyspnea and respiratory abnormality
pneumonia
problem breathing
prostration
respiratory infection
rhinorrhea
ro swin
rule out swin
running nose
runny nose
sh of breath
short of breath
shortness of breath
shrtbreath
sign
sleeping a lot
sob
sore throat
sorethroat
stuffy head
stuffy nose
sweats
symptoms of flu
symptoms of swine
t/w*[0-9]+ (segment)
temp
temperature
throat hurts
throat sore
tired (segment)
tr breathing
trouble breathing
unable to breath
upper resp
uri (segment)
weak
weakness

	wheezing worn out

Appendix 8: Discharge Disposition Classifier

Classification	Included Dispositions
Admitted	09 - Admitted as an inpatient to this hospital
AMA	07 - Left against medical advice or discontinued care
DAA	20 - Expired (ie. dead)
Deceased TBD	21…29 - Expired to be defined at a state level, if necessary
Discharge TBD	10…19 - Discharge to be defined at state level, if necessary
Discharged to Home	01 - Discharged to home or self care (routine discharge)
DOA Home	40 - Expired (ie. died) at home
DOA Other Facility	41 - Expired (ie. died) in a medical facility; eg. Hospital, SNF, ICF, or free standing hospice
DOA Unknown	42 - Expired (ie. died) - place unknown
Home Health Transfer	06 - Discharge/transferred to home under care of organized home health service organization
Home IV Transfer	08 - Discharge/transferred to home under care of home IV provider
Hospital Transfer	02 - Discharge/transferred to another short term general hospital for inpatient care
ICF Transfer	04 - Discharged/transferred to an intermediate care facility (ICF)
Other Transfer	05 - Discharged/transferred to another type of institution for inpatient care or referred for outpatient services to another institution
SNF Transfer	03 - Discharged/transferred to skilled nursing facility (SNF)
Still a Patient	30 - Still a patient or expected to return for outpatient services (ie. still a patient)
Still a Patient TBD	31…39 - Still a patient to be defined at the state level, if necessary (ie. still a patient)

Appendix 9: Bioterrorism/Agents Classifier

Classification	Clinical Effects
Blister Agents	CoughChoke
	ExcSecretions
	Rash
	Therapies - BAL FluidsIV Intubation Succimer
Botulism	Blurred Vision
	Dyspnea
	MuscleWeak
	Paralysis
	PeriphNeuropathy
	SlurredSpeech
	Therapies - AntiveninAntitox Intubation Ventilator
Choking Agent	Bronchospasm
	CoughChoke
	Cyanosis
	Dyspnea
	HyperventTachypnea
	Pneumonitis
	PulmonaryEdema
	RespArrest
	RespDepression
	Therapies - Bronchodilators Intubation Oxygen Ventilator
	XRayFindings
Nerve Agents	AgitatedIrritable
	Diarrhea
	Dyspnea
	ExcSecretions
	Fasciculations
	FecalIncontinence
	IrritationPain
	Lacrimation
	Miosis
	MuscleWeak
	Nausea
	Paralysis
	Photophobia
	Pneumonitis
	PulmonaryEdema
	RespArrest
	RespDepression
	SeizureMultiple

	SeizureSingle
	SeizureStatus
	Therapies - Anticonvulsants Atropine Bronchodilators Intubation Oxygen 2PAM Ventilator
	Vomiting
	XRayFindings
Plague	Cough/choke
	Dyspnea
	FeverHyperthermia
	Headache
	Hypotension
	RASH
	Therapies - Oxygen Ventilator
Smallpox	FeverHyperthermia
	Rash
	Throat Irritation

Appendix 10: Body Systems Classifier

Classification	**Clinical Effects**
Cardio Conduction	Asystole
	Bradycardia
	Cardiac arrest
	Conduction disturbance
	Dysrhythmia (other)
	Dysrhythmia (v tach/v fib)
	Tachycardia
Cardio Volume	Hypertension
	Hypotension
Dermal Rash	Burns (superficial)
	Dermal – Irritation/pain
	Ecchymosis
	Erythema/flushed
	Hives/welts
	Pallor
	Pruritis
	Rash
	Puncture wound/sting
Dermal Swelling	Cellulitis
	Edema
	Bullae

Gastrointestinal Disturbances	Anorexia
	Blood per rectum (other)
	Constipation
	Dehydration
	Diarrhea
	Dysphagia
	Fecal incontinence
	Hematemesis
	Melena
	Throat irritation
	Vomiting
Miscellaneous Systemic	Diaphoresis
	Excess secretions
	Fever/hyperthermia
	Hypothermia pain (not dermal, GI, ocular)
Neurological Muscular	Muscle rigidity
	Muscle weakness
	Paralysis
	Tremor
Neurological Nerve	Agitated/irritable
	Confusion
	CVA
	Dizziness/verigo
	Drowsiness/lethargy
	Fasciculations
	Hallucinations/delusions
	Headache
	Numbness
	Seizure (single)
	Seizures (multi/discrete)
	Seizures (status)
	Slurred speech
	Syncope
	Tinnitus
Ocular Disturbances	Blurred vision
	Photophobia
	Red eye/conjunctivitis
	Ocular – Irritation/pain
Respiratory Breathing	Bronchospasm
	Cyanosis
	Dyspnea
	Hyperventilation/tachypnea

Appendix 11: Special Clinical Effects Classifier

Classification	Clinical Effect(s)
Abdominal Pain	Abdominal Pain
Bleeding (other)	Bleeding (other)
Blurred vision	Blurred vision
Chest pain (incl. noncardiac)	Chest pain (incl. noncardiac)
Cough/choke	Cough/choke
Diarrhea	Diarrhea
Fever/hyperthermia	Fever/hyperthermia
Headache	Headache
Pain (not dermal, GI, ocular)	Pain (not dermal, GI, ocular)
Rash	Rash
Slurred speech	Slurred speech
Vomiting	Vomiting

Appendix 12: Analysis Method Parameters

Constant Threshold (Charts)

Value	Default	Range	Implications
Simple Constant Threshold			
The constant threshold to use	0	0 to ∞	The threshold selected indicates the value that must be exceeded to generate an anomaly notification.

CuSum EMA (Charts)

Value	Default	Range	Implications
Predicted Value (Exponential Moving Average)			
The weighting exponential, or smoothing factor, alpha	0.2	0 to 1, exclusive	Smaller values decrease the weight placed on the current count when calculating the predicted count, and increase the weight of past counts; larger values have the opposite effect. Smaller values also increase the length of the weighting window, while larger values decrease it.
Desired statistical significance, used to calculate the weighting window	0.9	0 to 1, exclusive	Smaller values decrease the desired statistical significance and thus the length of the weighting window; larger values increase the length of the weighting window.
CuSum Normalized Residual Threshold			
The training window	14 days	1 day to the number of days for which data is available	Smaller values decrease the training window and thus decrease the smoothness of the threshold calculations, while larger values increase the window and the threshold smoothness.
Threshold multiplier	4 standard deviations	0 to ∞	Smaller values will reduce the number of standard deviations from the predicted count used to define the threshold, leading to lower thresholds and more alerts.

			Larger values will increase lead to higher thresholds and fewer alerts.
The allowed deviation from the reference value before impacting the cumulative sum	0.5 standard deviations	0 to ∞	Smaller values generally decrease the tolerance of the method for deviations between observed and predicted counts, leading to lower thresholds and more alerts. Larger values generally increase this tolerance, leading to higher thresholds and fewer alerts.

Exponential Moving Average (Charts)

Value	Default	Range	Implications
Predicted Value (Exponential Moving Average)			
The weighting exponential, or smoothing factor, alpha	0.2	0 to 1, exclusive	Smaller values decrease the weight placed on the current count when calculating the predicted count, and increase the weight of past counts; larger values have the opposite effect. Smaller values also increase the length of the weighting window, while larger values decrease it.
Desired statistical significance, used to calculate the weighting window	0.9	0 to 1, exclusive	Smaller values decrease the desired statistical significance and thus the length of the weighting window; larger values increase the length of the weighting window.
EMA Residual Threshold			
The weighting exponential, or smoothing factor, alpha	0.2	0 to 1, exclusive	Smaller values decrease the weight placed on the current error when calculating the standard deviation of the errors, and increase the weight of past errors; larger values have the opposite effect. Smaller values also increase the length of the weighting window, while larger values decrease it.

Desired statistical significance, used to calculate the weighting window	0.9	0 to 1, exclusive	Smaller values decrease the desired statistical significance and thus the length of the weighting window; larger values increase the length of the weighting window.
Threshold multiplier	4 standard deviations	0 to ∞	Smaller values will reduce the number of standard deviations from the predicted count used to define the threshold, leading to lower thresholds and more alerts. Larger values will increase lead to higher thresholds and fewer alerts.

Moving Average (Charts)

Value	Default	Range	Implications
Simple Moving Average (Predicted Value)			
Window used for averaging results	14 days	1 day to the number of days for which data is available	Smaller numbers will decrease the amount of smoothing in the predicted counts and also decrease the lag between changes in the actual values and changes in the predicted values. Larger values will increase smoothing and increase this lag.
EMA Residual Threshold			
The weighting exponential, or smoothing factor, alpha	0.2	0 to 1, exclusive	Smaller values decrease the weight placed on the current error when calculating the standard deviation of the errors, and increase the weight of past errors; larger values have the opposite effect. Smaller values also increase the length of the weighting window, while larger values decrease it.
Desired statistical significance, used to calculate the weighting window	0.9	0 to 1, exclusive	Smaller values decrease the desired statistical significance and thus the length of the weighting window; larger values increase the length of the weighting window.
Threshold multiplier	4 standard	0 to ∞	Smaller values will reduce the number of

	deviations	standard deviations from the predicted count used to define the threshold, leading to lower thresholds and more alerts. Larger values will increase lead to higher thresholds and fewer alerts.

Recursive Least Squares (Charts)

Value	Default	Range	Implications
Recursive Least Squares			
Training period	60 days	1 to the number of days for which data is available	Smaller values decrease the training window and thus decrease the smoothing of the threshold calculations, while larger values increase the window and the threshold smoothing.
Average period	7 days	1 to the length of the training period	Smaller values will tend to decrease the amount of smoothing in the predicted counts, while larger values will tend to increase the amount of smoothing.
Threshold multiplier	4 standard deviations	0 to ∞	Smaller values will reduce the number of standard deviations from the predicted count used to define the threshold, leading to lower thresholds and more alerts. Larger values will increase lead to higher thresholds and fewer alerts.
The 'Forgetting factor', lambda, which controls the exponential decay of past value influence	0.99	0 (exclusive) to 1 (inclusive)	Smaller values decrease the influence of past counts on predicting the current count, while larger values increase it. A value of 1 means that all counts within the average period are treated equally.

Exponential Moving Average Probability (Maps)

Value	Default	Range	Implications
Exponential Moving Average			
The weighting exponential, or smoothing factor, alpha	0.2	0 to 1, exclusive	Smaller values decrease the weight placed on the current count when calculating the predicted count, and increase the weight of past counts; larger values have the opposite effect. Smaller values also increase the length of the weighting window, while larger values decrease it.
Desired statistical significance, used to calculate the weighting window	0.9	0 to 1, exclusive	Smaller values decrease the desired statistical significance and thus the length of the weighting window; larger values increase the length of the weighting window.
Probability Analyzer			
Training window to use	60 days	1 day to the number of days for which data is available	Smaller values decrease the training window and thus tend to decrease the validity of the assumption that errors follow a normal distribution, which decreases the reliability of the probability estimate. The assumption of normality becomes completely invalid for values less than 5. Larger values increase the training window, which will tend to lower the probability calculated for the current count.
Kurtosis of training distribution must be <= sekMultiplier * SEK	2 standard deviations	0 to ∞	In order to confirm the assumption of normality, the algorithm checks to see if the kurtosis of the observed distribution is within acceptable limits for a normal distribution. This parameter defines the width of those limits. Smaller values will increase the strictness of this check, while larger values make it less strict.
Skew of training distribution must be <= sesMultiplier * SES	2 standard deviations	0 to ∞	In order to confirm the assumption of normality, the algorithm checks to see if the skew of the observed distribution is within acceptable limits for a normal distribution. This parameter defines the width of those limits. Smaller values will increase the strictness of this check, while larger values make it less strict.

Poisson Visit Frequency (Maps)

Value	Default	Range	Implications
Poisson			
Window to use for averaging results	14 days	1 day to the number of days for which data is available	Smaller numbers will decrease the amount of smoothing in the predicted counts and also decrease the lag between changes in the actual values and changes in the predicted values. Larger values will increase smoothing and increase this lag.

Recursive Least Squares Probability (Maps)

Value	Default	Range	Implications
Recursive Least Squares			
Training period	60 days	1 day to the number of days for which data is available	Smaller values decrease the training window and thus decrease the smoothing of the threshold calculations, while larger values increase the window and the threshold smoothing.
Average period	7 days	1 day to the length of the training period	Smaller values will tend to decrease the amount of smoothing in the predicted counts, while larger values will tend to increase the amount of smoothing.
Threshold multiplier	*Not applicable for this analysis method		
The 'Forgetting factor', lambda, which controls the exponential decay of past value influence	0.99	0 (exclusive) to 1 (inclusive)	Smaller values decrease the influence of past counts on predicting the current count, while larger values increase it. A value of 1 means that all counts within the average period are treated equally.
Probability Analyzer			
Training window to use	60 days	1 day to the number of days for which data is available	Smaller values decrease the training window and thus tend to decrease the validity of the assumption that errors follow a normal distribution, which decreases the reliability of the probability estimate. The assumption of normality becomes completely invalid for values less than 5. Larger values increase the training window, which will tend to lower the probability calculated for the current count.
Kurtosis of training distribution must be <= sekMultiplier * SEK	2 standard deviations	0 to ∞	In order to confirm the assumption of normality, the algorithm checks to see if the kurtosis of the observed distribution is within acceptable limits for a normal distribution. This parameter defines the width of those limits. Smaller values will increase the strictness of this check, while

			larger values make it less strict.
Skew of training distribution must be <= sesMultiplier * SES	2 standard deviations	0 to ∞	In order to confirm the assumption of normality, the algorithm checks to see if the skew of the observed distribution is within acceptable limits for a normal distribution. This parameter defines the width of those limits. Smaller values will increase the strictness of this check, while larger values make it less strict.

Simple Moving Average Probability (Maps)

Value	Default	Range	Implications
Simple Moving Average (Predicted Value)			
Window to use for averaging results	14 days	1 day to the number of days for which data is available	Smaller numbers will decrease the amount of smoothing in the predicted counts and also decrease the lag between changes in the actual values and changes in the predicted values. Larger values will increase smoothing and increase this lag.
Probability Analyzer			
Training window to use	60 days	1 day to the number of days for which data is available	Smaller values decrease the training window and thus tend to decrease the validity of the assumption that errors follow a normal distribution, which decreases the reliability of the probability estimate. The assumption of normality becomes completely invalid for values less than 5. Larger values increase the training window, which will tend to lower the probability calculated for the current count.
Kurtosis of training distribution must be <= sekMultiplier * SEK	2 standard deviations	0 to ∞	In order to confirm the assumption of normality, the algorithm checks to see if the kurtosis of the observed distribution is within acceptable limits for a normal distribution. This parameter defines the width of those limits. Smaller values will increase the strictness of this check, while larger values make it less strict.
Skew of training distribution must be <= sesMultiplier * SES	2 standard deviations	0 to ∞	In order to confirm the assumption of normality, the algorithm checks to see if the skew of the observed distribution is within acceptable limits for a normal distribution. This parameter defines the width of those limits. Smaller values will increase the strictness of this check, while larger values make it less strict.

Appendix 13: Default Notification Configuration

Approach to Notifications

The still somewhat novel methods of syndromic surveillance that have been developed are designed to monitor health-related events in entire populations at once and indicate the local occurrence of epidemic clusters or widespread increases of endemic disease. EpiCenter permits the monitoring of symptom trends using a symptom-based analysis of emergency department patient chief complaints as a proxy for disease.

While all categories of symptoms have the potential to indicate unexpected increases in health events in the population, Health Monitoring Systems recognizes that not all health events warrant immediate notification of public health authorities. Therefore, we have developed a tiered approach to anomaly notification based upon public health's tiered approach to notifiable/reportable diseases.

A. Immediate Notifications

The diseases of most concern to public health are those that are infectious and have the potential to result in serious illness or death in a significant portion of the population, generally those that are subject to national quarantine as established by the World Health Organization. Reporting of these diseases to public health is deemed immediate. The diseases on the resulting list are commonly referred to as immediately reportable or notifiable. A roster of these immediately reportable diseases that are common among various states appears in Table 1.

The default analysis and notification configuration within EpiCenter is designed to provide users more immediate awareness of health-related conditions that might be the result of one of these diseases. This is accomplished by frequent/regular, ZIP code-level analysis of (priority) symptom categories comprised of chief complaint key words associated with the signs and symptoms of these immediately notifiable diseases. Additionally, certain words and phrases entered as a chief complaint will also result in an immediate notification regardless of the number of cases involved (i.e. threshold = 1 case). These key words and phrases are associated with generally zero prevalence diseases that pose the risk of serious harm to people. They are listed in Table 2.

When analysis reveals an anomaly in the trends of any of these priority symptoms, EpiCenter makes an immediate notification to the user/s pre-designated by the Organizational Administrator. Notifications will not be repeated more frequently than once every 12 hours (i.e. subsequent anomalies of the same category, even if generated by different algorithms, will not result in another user notification until 12 hours has passed since the initial anomaly was detected). However, record of the subsequent anomalies will be recorded and viewable by users within EpiCenter.

Analyses of these trends in the priority symptom categories are completed using Exponentially Weighted Moving Averages- and Cumulative Sums-based algorithms on an hourly schedule. These methods are attractive because of their simplicity. They are likely to outperform methods that are more

complex in situations where counts may be routinely low. Default threshold values are four standard deviations from the average value over 34 days (EWMA) and 31 days (CuSum).

1. Exponentially Weighted Moving Average (EWMA) – a simple and robust statistical process control method for surveillance of sparse data. Observed values are weighted with increased value given to those more recent counts. Where recent epidemics could seriously affect the accuracy of forecasts, it is possible to enhance the sensitivity of this method through the use of a short guard band to avoid contamination of the baseline.
2. Cumulative Sums (CuSum) – A CuSum chart is a type of control chart used to detect small changes. CuSum charts plot the cumulative sum of the deviations between each data point (actual count) and a reference value, expected count. A useful method for monitoring high prevalence conditions[4], it detects smaller shifts in and from the mean. The method is made more robust by employing a two-in-a-row rule.

Disease	Primary Symptoms
Anthrax	fever, malaise, cough
Botulism	paralysis, weakness, dysphagia, dry mouth, diplopia
Brucellosis	fever, headache, weakness, sweating, arthralgia
Cholera	watery stools, nausea, vomiting
Diptheria	sore throat, swollen neck
***Escherichia coli* O157:H7**	watery to bloody diarrhea
Haemophilus influenzae	fever, vomiting, lethargy, stiff neck
Meningitis	stiff neck, fever, intense headache
Measles	fever, conjunctivitis, cough, red blotchy rash beginning on face
Pertussis	cough with “whooping” inhalations
Plague	eschar, fever, chills, malaise, myalgia, headache, sore throat
Rabies	headache, fever, paralysis, convulsions
Q Fever	fever, headache, weakness, sweats
Smallpox	Fever, malaise, headache, severe backache, deep-seated to maculopapular rash
Tularemia	Indolent ulcer at organism site, swollen regional lymph nodes, painful swollen throat, abdominal pain, diarrhea, vomiting
Typhoid (Salmonellosis)	headache, diarrhea, abdominal pain
Viral Hemorrhagic Fevers	fever, prostration, flushed face and chest, hemorrhaging

Table 1: Diseases, common among various states, which are immediately reportable to public health.

Anthrax
Plague
Eschar
Smallpox
Bioterror

Table 2: Words, roots, and phrases that will, as a chief complaint, generate an immediate notification

B. Daily Summary Notifications

Other diseases that appear on the various reportable lists do not create the same level of urgency that the immediately reportable diseases do. However, an epidemic of any of these diseases is a concern to public health and earlier awareness could still be of benefit. Examples of such diseases include mumps, cryptosporidiosis, and shigellosis. EpiCenter uses the same methods discussed in the previous section to analyze trends in the categories of symptoms associated with these diseases. However, the geographic base used for analysis of symptom categories associated with these diseases is at the County level rather than the ZIP code level to reduce the sensitivity of analysis and the number of risk of false positives. Anomalies in any of these categories of non-priority symptoms are reported to designated users in a summary style e-mail that is distributed once daily.

Certain variations that occur within symptom categories may be related to the seasonal variation of incidence that occurs in certain diseases, for example seasonal influenza or certain diarrheal diseases. Recognizing these seasonal trends requires the use of modeling techniques that are sometimes more advanced than the EWMA and CuSum methods routinely used to establish expected counts. Often times EWMA and CuSum analysis of these seasonal trends will generate anomalies that may indicate certain changes in these trends such as more rapid onset of a season, more severe season, or simply the increases expected with the seasonal trend.

C. No Notifications

An important capability is provided to public health users of EpiCenter; the ability to track health-related conditions that are associated with non-notifiable diseases within populations. As important as this function is, it does not require users to be notified of trend deviations in these related symptom categories. These deviations and the associated analyses remain available to EpiCenter users as an on demand feature.

Summary of Default Notification Configuration

The EpiCenter default notification configuration has been developed under the premise that not everything detected by the system warrants immediate notification of public health users. Indeed, immediate notification of all anomalies in every category available in EpiCenter would most likely create much more e-mail than desired by users and very quickly result in decreased satisfaction and sense of

trust in the system. Therefore, only those categories associated with the most common of the more serious infectious diseases have been identified to generate immediate notifications when analysis reveals counts that are significantly above what is expected. Users are advised of above threshold counts in those other categories associated with less serious diseases in a single daily summary e-mail or not at all for diseases that are not reportable. The frequency of analysis for each symptom category is derived from this same hierarchy of urgency and is presented in Table 3.

Table 3. Frequency of category analysis and user notifications of significant deviations from expected values

		Analysis		Notification Frequency		
Symptom Category	**Frequency**	**Threshold**	**Geographic Level**	**Immediate**	**Daily**	**None**
Fever	Hourly	4.0σ	ZIP code	X		
Paralysis	Hourly	4.0σ	ZIP code	X		
Stiff neck	Hourly	4.0σ	ZIP code	X		
Hemorrhaging	Hourly	4.0σ	ZIP code	X		
Watery or Bloody Diarrhea	Hourly	4.0σ	ZIP code	X		
Non-specific Diarrhea	Daily	4.0σ	County		X	
Influenza-like Illness	Daily	4.0σ	County		X	
Myalgia	On demand	UD	UD			X
Headache	On demand	UD	UD			X
Rash	Daily	4.0	ZIP code		X	
Malaise	On demand	UD	UD			X
Lymphadenitis	Hourly	4.0σ	ZIP code	X		
Fatigue	On demand	UD	UD			X
Neurologic	Hourly	4.0σ	ZIP code	X		
Cough	Daily	4.0σ	County		X	
Vomiting	Daily	4.0σ	County		X	
Vision	Hourly	4.0σ	ZIP code	X		
Miscarriage	Daily	4.0σ	ZIP code		X	
ENT	On demand	UD	UD			X
Arthralgia	Daily	4.0σ	County		X	
Jaundice	Daily	4.0σ	County		X	
Abdominal	Daily	4.0σ	ZIP code		X	

*UD = User Defined

Deviations from Default Notification Configuration

Unique characteristics of certain areas (e.g. chemical manufacturing plant), or local interest in certain infectious disease (e.g. Sin Nombre virus in the southwest U.S.) may foster a desire to deviate from this default configuration and include automated notifications for unexpected changes in the trends of other symptoms. For example, a health department with a chemical manufacturing facility in their jurisdiction may desire EpiCenter to analyze respiratory, cough, and/or non-specific rash categories more frequently and have immediate notification of anomalies detected in the counts of these categories.

The functionality built into EpiCenter permits Organizational Administrators to deviate from the default analysis and notification configuration. This capability is intended to provide the level of customization desired by users by permitting focus on local and/or seasonal events of concern. Organizational Administrators that decide to deviate from these default settings should realize that the probability of the number of false positive notifications (i.e. statistical anomalies that result from other than true disease events) may significantly increase.

The staff at Health Monitoring Systems can assist Organizational Administrators considering deviations in identifying appropriate categories based on concerns and threshold levels given the historical trends of those categories.