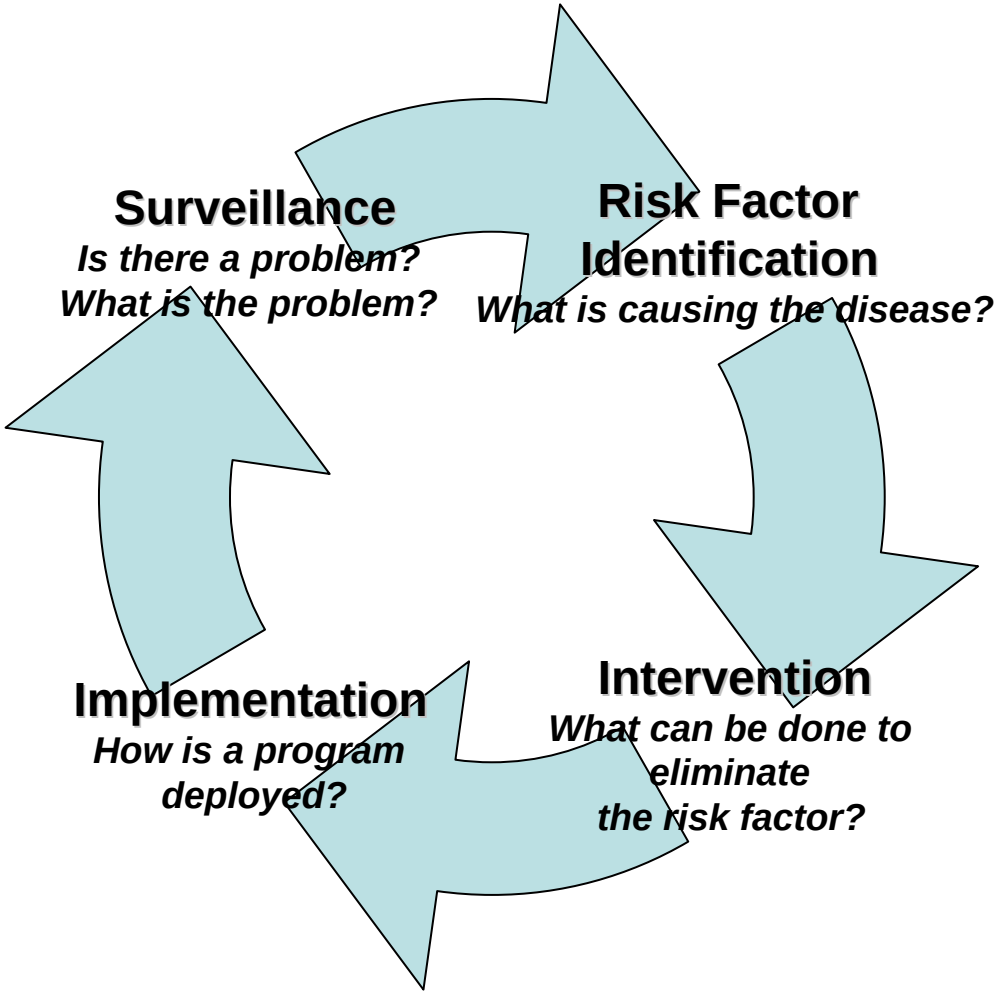
ESSENCE: Biosurveillance in Support of the DoD Health Mission

Public Health Approach

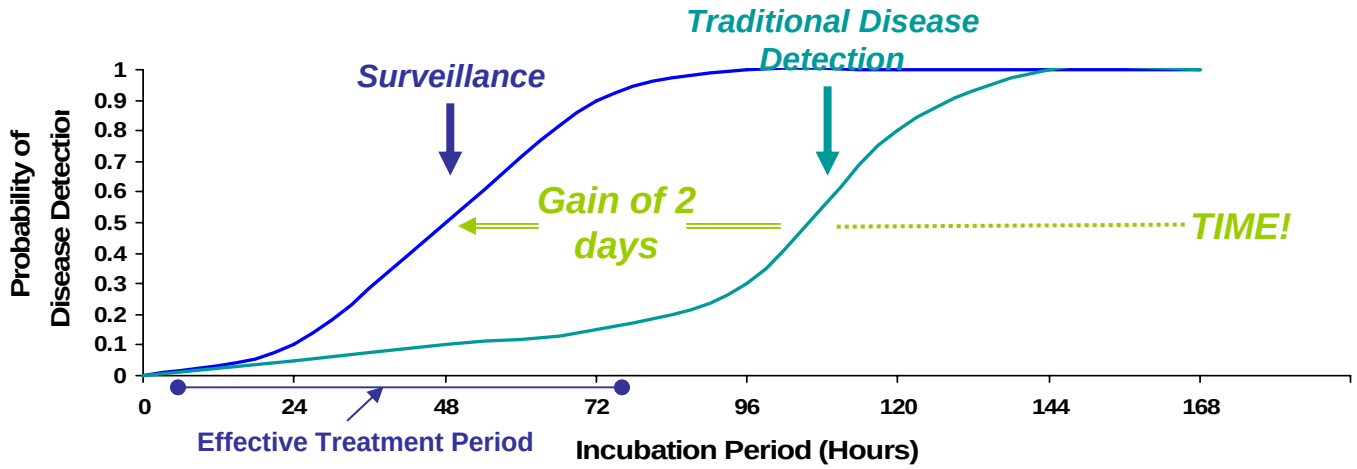


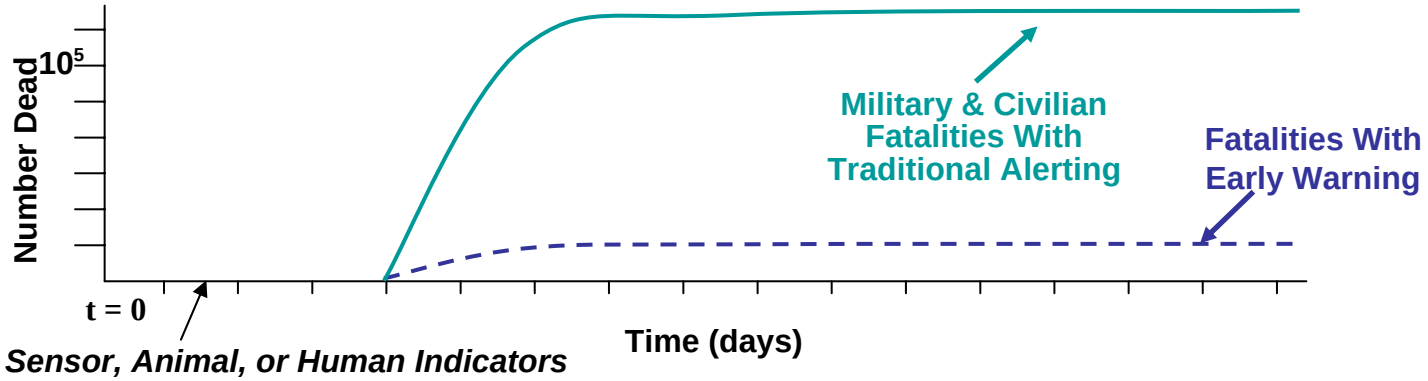
What is ESSENCE?

Electronic
Surveillance
System for the
Early
Notification of
Community-based
Epidemics

Web-based medical surveillance system developed to alert public health authorities of a possible biological warfare attack or other infectious disease outbreaks

Traditional vs. Indicator Surveillance in Outbreak Detection





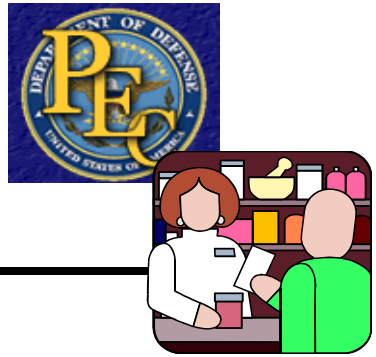
ESSENCE
Worldwide Surveillance

Standard Ambulatory Data Records are archived at military treatment facilities

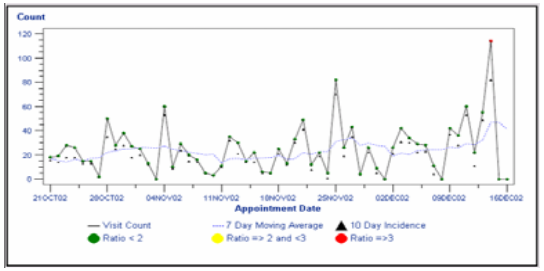
M T F

Standard Ambulatory Data is sent to EIDS

Prescription data for Department of Defense beneficiaries is captured by Pharmacy Data Transaction System and sent to TRICARE



EIDS updates ESSENCE repository



Graphs of daily visit counts by syndrome

ESSENCE Delivers

- Web-based outbreak detection and alert application
  - Provides interactive reporting, structured analysis, and ad hoc queries
- Uses sophisticated event detection algorithms to alert users to possible outbreaks of infectious diseases and biological incidents
  - With E-mail, Pagers, or Mobile Phones

ESSENCE Delivers

- For select users, shows actionable patient-identifiable data for further investigation and/or validation
- Supports investigation of reportable disease events
- Data frequency
  - Outpatient and pharmacy data updated every 24 hours
  - Demographic data updated monthly

Current Data Sources for ESSENCE

- Ambulatory data
  - Outpatient visits to Military Treatment Facilities
  - ICD9 codes (any diagnostic position, not just primary)
- Pharmacy data
  - Prescriptions ordered for military beneficiaries (MTFs, mail orders, and retail pharmacies)
  - Respiratory and gastrointestinal syndromes only

Broad Syndrome Groups

	ICD-9 Codes		ICD-9 Codes
• Neurologic	77	• Respiratory	137
• Botulism-like	18	• Influenza-like ill	29
• Shock or Coma	10	• Fever	14
• Rash	20	• Febrile disease	111
• Gastrointestinal	73	• Hemorrhagic ill.	25

Live Demonstration

[**TriCare Regions** | USACHPPM Regions | NEPMU Regions | AF-MAJCOM]

TriCare Regions Site Selection Map

System Defined Site Selection:	Select site	User Defined Site Selection:	Select site

User Defined Site Selection Editor - Used to Add/Edit/Delete User Defined Sites

[**SADR Temporal Alerts** | SADR Spatial Alerts | Pharmacy Temporal Alerts]

Site: TRICARE-NORTH

Reset 3-Level Sorting **EXPORT:** SPREADSHEET PDF CSV

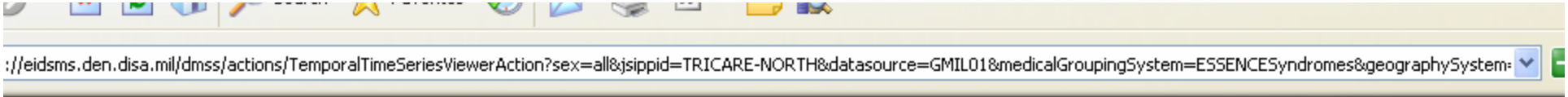
SADR Regional Temporal Alerts

Alert Date	Syndrome	Detection	Visit Count	Expected	MTF	Links
09/Mar/2007	Rash	0.024	30	18.328	All	Time Series

SADR MTF-Based Temporal Alerts

Alert Date	Syndrome	Detection	Visit Count	Expected	MTF	Links
14/Mar/2007	Rash	0.05	1	0.071	ABERDEEN PROVING GROUND - AHC KIRK	Time Series
09/Mar/2007	Feb_dis	0.039	14	9.071	ANDREWS AFB - 89th MDG	Time Series
09/Mar/2007	Fever	0.027	14	8.857	ANDREWS AFB - 89th MDG	Time Series
09/Mar/2007	Rash	0.019	1	0.036	ANNAPOLIS - NMCL	Time Series
12/Mar/2007	ILI	0.042	2	0.464	BALLSTON SPA - BMC	Time Series
09/Mar/2007	ILI	0.032	1	0.393	BALLSTON SPA - BMC	Time Series
09/Mar/2007	Resp	0.002	2	0.536	BALLSTON SPA - BMC	Time Series
13/Mar/2007	GI	0.001	3	0.321	BALTIMORE - USCG CLINIC	Time Series
09/Mar/2007	ILI	0.005	2	0.536	BALTIMORE - USCG CLINIC	Time Series
09/Mar/2007	Resp	0.002	3	0.679	BALTIMORE - USCG CLINIC	Time Series
09/Mar/2007	ILI	0.003	4	1.722	CAMP ATTERBURY OUTPATIENT CLINIC	Time Series
09/Mar/2007	Resp	0.002	5	1.739	CAMP ATTERBURY OUTPATIENT CLINIC	Time Series
14/Mar/2007	ILI	0	6	2.267	CAMP LEJEUNE - BMC BLDG 15	Time Series
14/Mar/2007	Resp	1	6	2.375	CAMP LEJEUNE - BMC BLDG 15	Time Series
13/Mar/2007	ILI	0.002	5	2	CAMP LEJEUNE - BMC BLDG 15	Time Series
13/Mar/2007	Resp	0.005	5	1.725	CAMP LEJEUNE - BMC BLDG 15	Time Series
12/Mar/2007	GI	0.015	3	0.571	CAMP LEJEUNE - BMC BLDG 15	Time Series
12/Mar/2007	ILI	0	8	2.267	CAMP LEJEUNE - BMC BLDG 15	Time Series

RED



n

Site	TRICARE-NORTH
Data Source	SADR
MTF	FT. BELVOIR - ACH DEWITT
Syndrome	GI
Age Range	All
Clinic Type	all
Start Date	14/Dec/2006
End Date	14/Mar/2007

tion Options

Data Configuration			
Site	TRICARE-NORTH	**Data Source**	SADR
MTF	All MTFs ABERDEEN PROVING GROUND - AHC KIRK ABERDEEN PROVING GROUND - TMC	**Clinic Type**	All Clinic Types ER Other
Syndrome	GI	**Age Range**	All Ages 0-4 5-17
Start Date	14/Dec/2006	**End Date**	14/Mar/2007
Change Configuration			

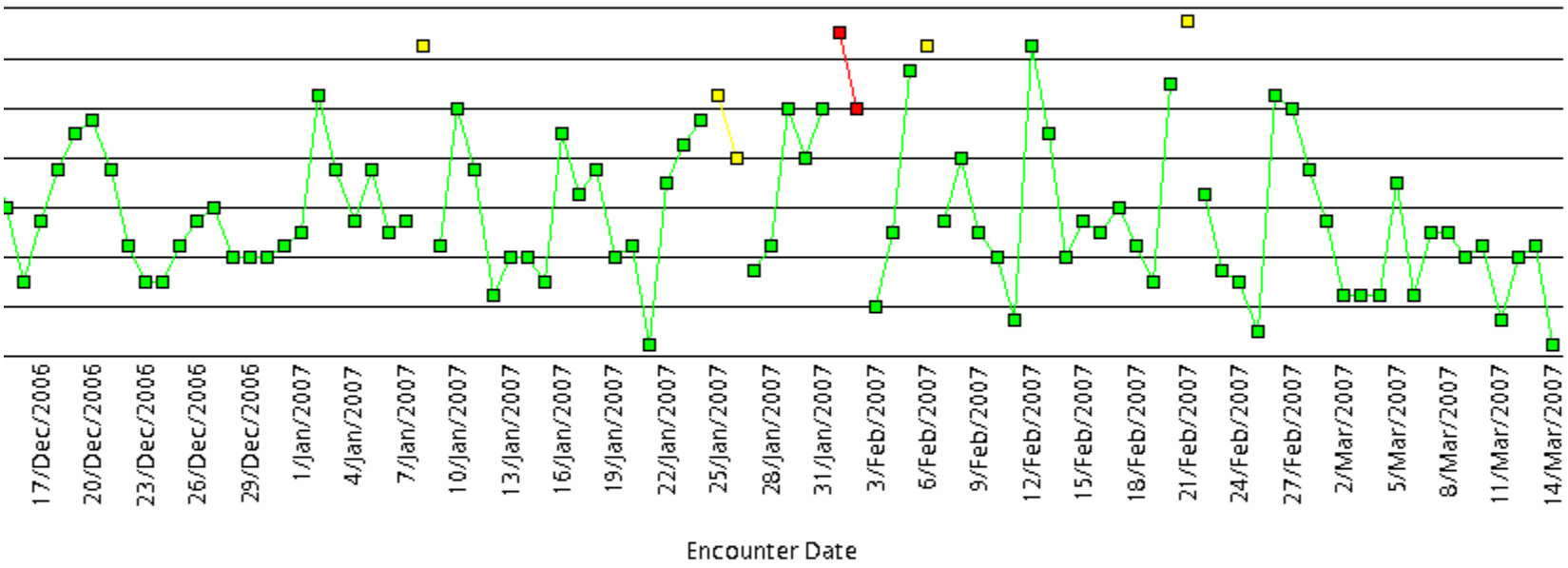
Daily Visit Counts

://eidsms.den.disa.mil/dmss/actions/TemporalTimeSeriesViewerAction?sex=all&jsippid=TRICARE-NORTH&datasource=GMIL01&medicalGroupingSystem=ESSENCESyndromes&geographySystem=

Start Date	14/Dec/2006	End Date	14/Mar/2007

Change Configuration

Daily Visit Counts



[Data Details | Map View]

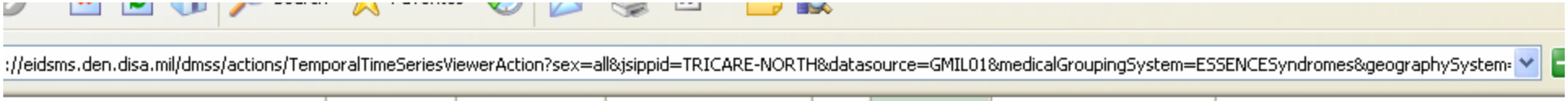
Graphs: [Age | Clinic Type | ICD9 Group | MTF | Incidence Counts]

Reset 3-Level Sorting

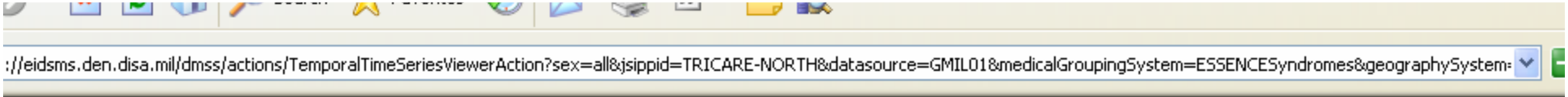
EXPORT: SPREADSHEET PDF CSV

Data Table

Date	Actual Visits	14-Day Incidence	CPT	Detection	Links
14/Mar/2007	1	1	0	0.928	Data Details Map View
13/Mar/2007	9	9	0	0.65	Data Details Map View



16/Feb/2007	10	10	0	0.744	Data Details Map View
15/Feb/2007	11	11	0	0.708	Data Details Map View
14/Feb/2007	8	7	0	0.597	Data Details Map View
13/Feb/2007	18	17	0	0.234	Data Details Map View
12/Feb/2007	25	22	0	0.08	Data Details Map View
11/Feb/2007	3	3	0	0.94	Data Details Map View
10/Feb/2007	8	8	0	0.777	Data Details Map View
09/Feb/2007	10	8	0	0.944	Data Details Map View
08/Feb/2007	16	13	0	0.966	Data Details Map View
07/Feb/2007	11	10	0	0.213	Data Details Map View
06/Feb/2007	25	21	0	0.04	Data Details Map View
05/Feb/2007	23	20	0	0.101	Data Details Map View
04/Feb/2007	10	10	0	0.657	Data Details Map View
03/Feb/2007	4	4	0	0.412	Data Details Map View
02/Feb/2007	20	15	0	0.009	Data Details Map View
01/Feb/2007	26	22	0	0.01	Data Details Map View
31/Jan/2007	20	18	0	0.075	Data Details Map View
30/Jan/2007	16	13	0	0.2	Data Details Map View
29/Jan/2007	20	16	0	0.131	Data Details Map View
28/Jan/2007	9	9	0	0.642	Data Details Map View
27/Jan/2007	7	7	1	0.375	Data Details Map View
26/Jan/2007	16	14	0	0.039	Data Details Map View
25/Jan/2007	21	15	0	0.02	Data Details Map View
24/Jan/2007	19	15	0	0.073	Data Details Map View
23/Jan/2007	17	16	0	0.145	Data Details Map View
22/Jan/2007	14	13	0	0.389	Data Details Map View
21/Jan/2007	1	0	0	0.961	Data Details Map View
20/Jan/2007	9	9	0	0.661	Data Details Map View
19/Jan/2007	8	8	0	0.56	Data Details Map View
18/Jan/2007	15	13	0	0.263	Data Details Map View
17/Jan/2007	13	10	0	0.389	Data Details Map View
16/Jan/2007	18	18	0	0.167	Data Details Map View
15/Jan/2007	6	6	0	0.88	Data Details Map View
14/Jan/2007	8	8	0	0.817	Data Details Map View
13/Jan/2007	8	8	0	0.802	Data Details Map View



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Site	TRICARE-NORTH
Data Source	SADR
MTF	all
Syndrome	GI
Age Range	All
Clinic Type	all
Start Date	14/Dec/2006
End Date	14/Mar/2007

tion Options

Data Configuration			
Site	TRICARE-NORTH	**Data Source**	SADR
MTF	All MTFs ABERDEEN PROVING GROUND - AHC KIRK ABERDEEN PROVING GROUND - TMC	**Clinic Type**	All Clinic Types ER Other
Syndrome	GI	**Age Range**	All Ages 0-4 5-17
Start Date	14/Dec/2006	**End Date**	14/Mar/2007
Change Configuration			

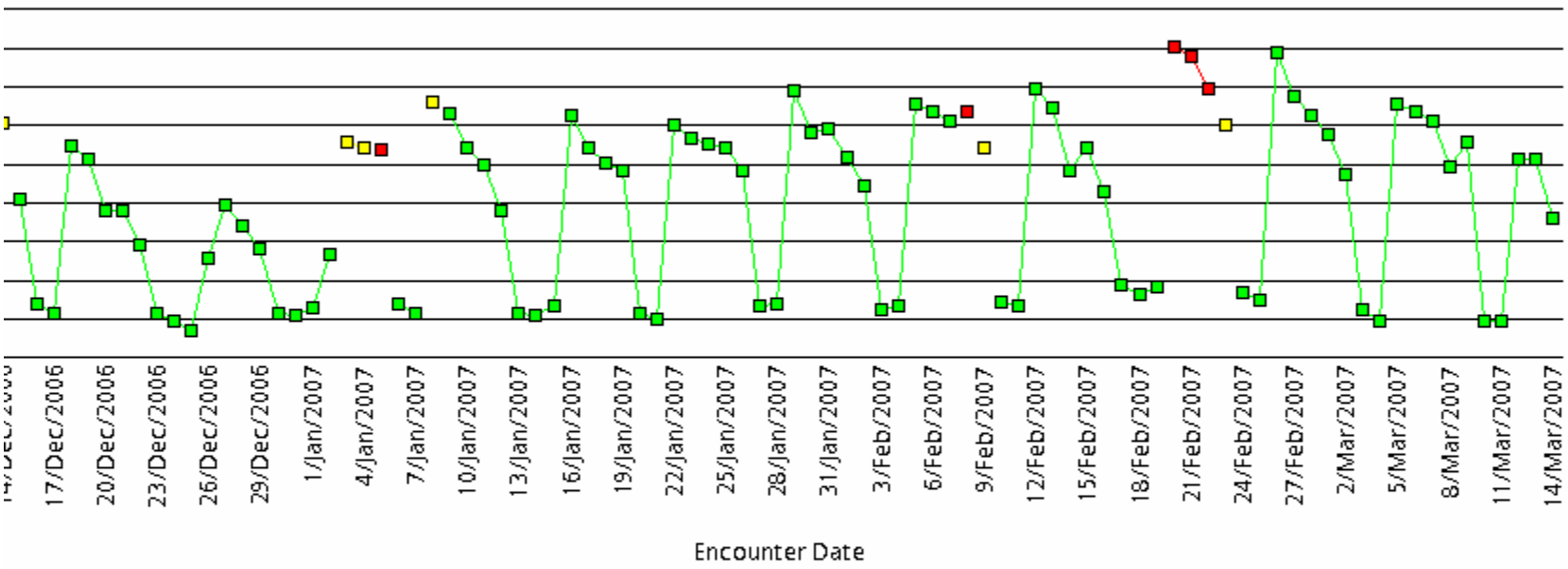
Daily Visit Counts

://eidsms.den.disa.mil/dmss/actions/TemporalTimeSeriesViewerAction?sex=all&jsippid=TRICARE-NORTH&datasource=GMIL01&medicalGroupingSystem=ESSENCESyndromes&geographySystem=

Start Date	14/Dec/2006	End Date	14/Mar/2007

Change Configuration

Daily Visit Counts



[Data Details | Map View]

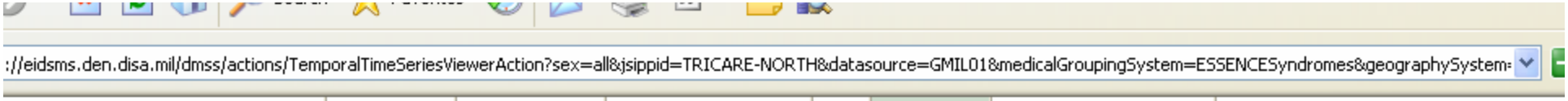
Graphs: [Age | Clinic Type | ICD9 Group | MTF | Incidence Counts]

Reset 3-Level Sorting

EXPORT: SPREADSHEET PDF CSV

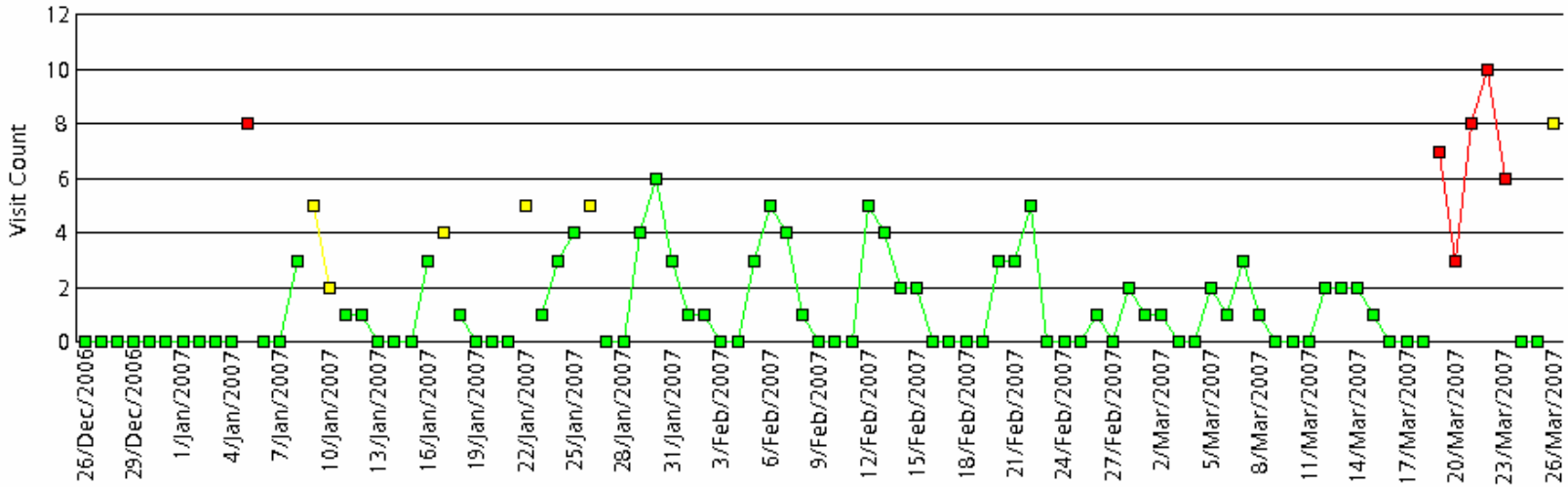
Data Table

Date	Actual Visits	14-Day Incidence	CPT	Detection	Links
14/Mar/2007	359	299	0	0.998	Data Details Map View
13/Mar/2007	513	449	0	0.946	Data Details Map View



04/Mar/2007	93	87	0	0.973	Data Details	Map View
03/Mar/2007	124	111	0	0.961	Data Details	Map View
02/Mar/2007	474	401	0	0.975	Data Details	Map View
01/Mar/2007	578	506	0	0.949	Data Details	Map View
28/Feb/2007	626	539	0	0.846	Data Details	Map View
27/Feb/2007	674	577	0	0.711	Data Details	Map View
26/Feb/2007	791	693	0	0.422	Data Details	Map View
25/Feb/2007	150	138	0	0.843	Data Details	Map View
24/Feb/2007	167	146	0	0.704	Data Details	Map View
23/Feb/2007	600	504	0	0.039	Data Details	Map View
22/Feb/2007	694	596	0	0.005	Data Details	Map View
21/Feb/2007	779	691	0	0	Data Details	Map View
20/Feb/2007	805	713	0	0.008	Data Details	Map View
19/Feb/2007	183	168	0	0.266	Data Details	Map View
18/Feb/2007	166	151	0	0.435	Data Details	Map View
17/Feb/2007	188	167	0	0.317	Data Details	Map View
16/Feb/2007	430	384	0	0.999	Data Details	Map View
15/Feb/2007	543	462	0	0.949	Data Details	Map View
14/Feb/2007	482	414	0	1	Data Details	Map View
13/Feb/2007	645	563	0	0.34	Data Details	Map View
12/Feb/2007	697	623	0	0.391	Data Details	Map View
11/Feb/2007	136	128	0	0.864	Data Details	Map View
10/Feb/2007	143	124	0	0.703	Data Details	Map View
09/Feb/2007	545	459	0	0.024	Data Details	Map View
08/Feb/2007	637	544	0	0.004	Data Details	Map View
07/Feb/2007	613	517	0	0.135	Data Details	Map View
06/Feb/2007	636	556	0	0.227	Data Details	Map View
05/Feb/2007	658	573	0	0.506	Data Details	Map View
04/Feb/2007	135	115	0	0.469	Data Details	Map View
03/Feb/2007	123	108	0	0.638	Data Details	Map View
02/Feb/2007	447	370	0	0.601	Data Details	Map View
01/Feb/2007	519	435	0	0.736	Data Details	Map View
31/Jan/2007	590	494	0	0.465	Data Details	Map View
30/Jan/2007	584	511	0	0.673	Data Details	Map View
29/Jan/2007	692	600	0	0.09	Data Details	Map View

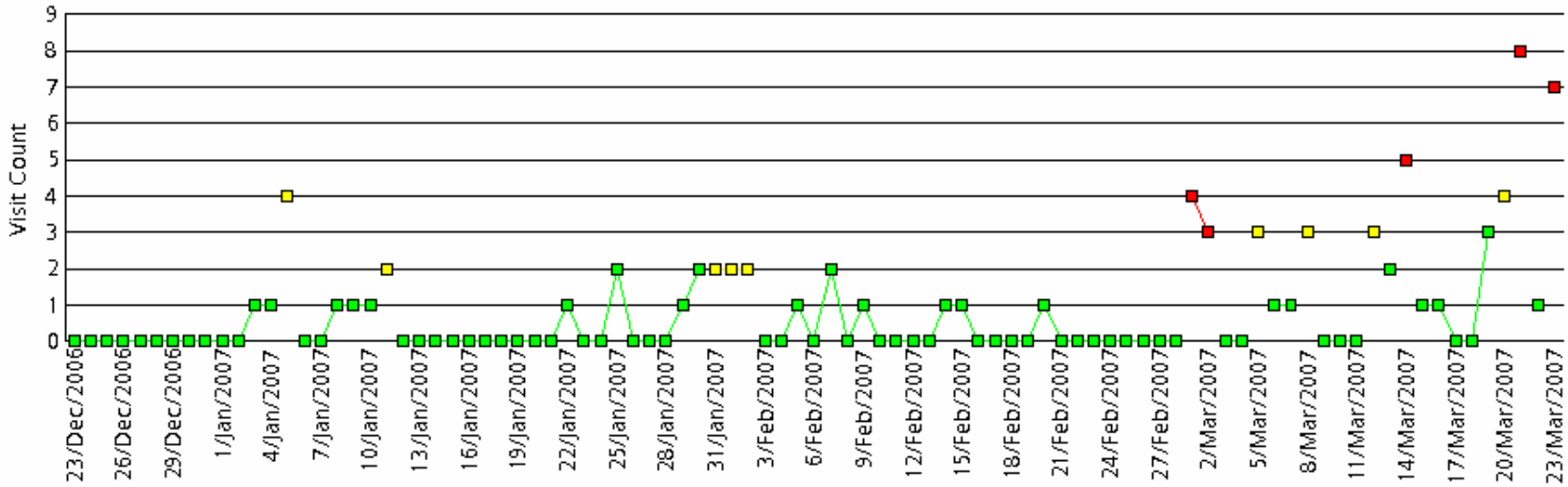
Febrile Illness



Ft. B.

#7

Febrile Disease

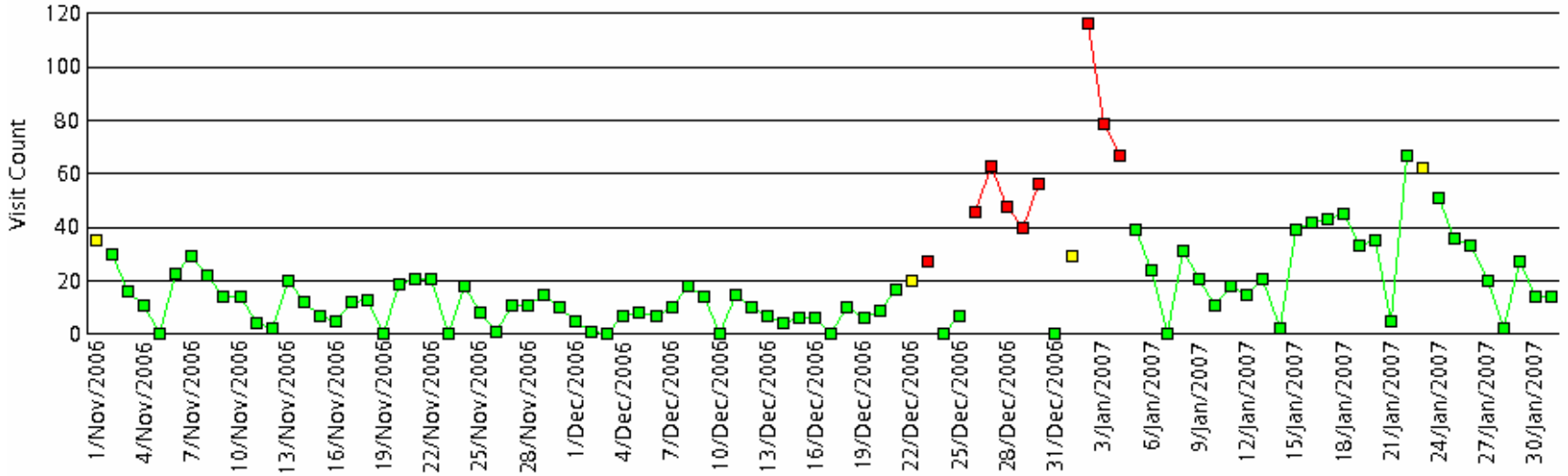


Ft. B.

#5

Febrile Disease

Gastrointestinal Disease Outbreak



Back-up Slides

DoD Enhanced Surveillance Experience to Date

- Most alerts unlikely to be significant if
  - Low total number of cases (less than three)
  - Small, unsustained spike
  - No plausibly concerning pattern in specific ICD-9 diagnoses
- Local public health and preventive medicine staff are **almost always** aware of problem before electronic system triggers alarm associated with real outbreak
- Evidence of improving coding practices, data completion, and timely data submission since instituting an enhanced health surveillance program

Planned Enhancements

- New data sources
  - Laboratory and radiology test orders
  - Chief complaint text parsing
- Add field for local input regarding validity of alarms and findings or status of any investigation
- Explore potential power of MEDCIN structured note analysis
- Environmental and occupational health hazard assessments
- Preventable disease and injury control
- System evaluation and planning based on population health requirements rather than historical workload data