



Mapping Healthcare Associated Infections

California Department of Public Health

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Esri Pacific User Conference

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Sacramento, California





Healthcare Associated Infections (HAI)

- CDPH's Center for Health Care Quality (CHCQ) is responsible for regulatory oversight of California health facilities and certain classifications of healthcare workers.
- They have two major programs in this arena:
 - the Licensing and Certification (L&C) Program and
 - the Healthcare Associated Infections (HAI) Program
- The mission of the HAI Program is to improve care quality and patient safety through prevention of infections in healthcare facilities. They accomplish this by
 - assisting with prevention activities,
 - develop infection prevention recommendations, and
 - implementing mandatory public reporting of HAI data

HAI Program Web Pages

<http://www.cdph.ca.gov/programs/hai/Pages/default.aspx>

Healthcare Associated Infections (HAI) Program - Google Chrome
www.cdph.ca.gov/programs/hai/Pages/default.aspx

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Healthcare-Associated Infections (HAI) Program

The Healthcare-Associated Infections (HAI) Program is one of two programs in the [Center for Health Care Quality](#) of the [California Department of Public Health](#). The Program was created by mandate to oversee the prevention, surveillance and reporting of healthcare-associated infections in California's general acute care hospitals. HAIs are the most common complication of hospital care. It is estimated that each year there are 722,000 infections, 75,000 deaths, and 1 in 25 hospital patients at any given time has an infection contracted during the course of their hospital care. HAIs result in an estimated \$30 billion in excess healthcare costs nationally each year. Since 2010, the HAI Program has produced annual public reports of hospital HAI data to inform choices of healthcare consumers and prompt providers to take actions to prevent infections. Actively engaged in HAI prevention by performing site visits to hospitals with high infection rates, convening prevention collaboratives, and providing infection prevention education; and provided consultation and assistance to local public health for infection outbreaks that occur in healthcare facilities. The vision of the HAI Program is to eliminate HAIs for all Californians.

What You Can Do To Prevent HAI

- Me And My Family
- Healthcare Providers
- Public Health Partners
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- My Hospital 411 Infections Map
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Healthcare Associated Infections - Advisory Committee

- HAI Advisory Committee

Antimicrobial Resistance

- [California Antimicrobial Stewardship Program Initiative](#)
- [Spotlight on Antimicrobial Stewardship Program Project Invitation 2014](#)

Public Reporting - Healthcare Associated Infections

- [My Hospital 411 - Healthcare Associated Infections Interactive Map 2012 Data](#)
- [HAI Information and Reports](#)
Links to All Pages on HAIs and Mandatory Public Reporting

HAI Education for Healthcare Professionals

- [New Educational Offerings by HAI Program Staff -- 2014 Educational Calendar](#)

Resources

- [Association of Professionals in Infection Control and Hospital Epidemiology \(APIC\) -- selected links](#)
- [Centers for Disease Control and Prevention \(CDC\) -- selected links](#)
- [Society for Healthcare Epidemiology of America \(SHEA\) -- selected links](#)
- [Infectious Diseases Society of America \(IDSA\) \(New Window\) -- selected links](#)
- [UCSD Infection Prevention Course -- Designed to Meet CA SB 158 Requirements \(PDF, New Window\)](#)

Contact Us

- [HAI Program](#)

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What are HAIs?

- Complications are intrinsic to medical/surgical intervention; some preventable, some not. Can occur in hospitals, surgery clinics, nursing homes, even at home.
- HAIs are infections developed in the course of treatment for other conditions; most common complication of hospital care.
- Nationally, an estimated 722,000 infections and 75,000 deaths occur annually, 1 in 20 patients will develop an HAI.
- In California, select HAIs occurring in hospitalized patients are reported to CDPH by way of the National Healthcare Safety Network (Centers for Disease Control and Prevention) for all California general acute care hospitals ([Health and Safety Code Section 1288.55](#)).

Table 1
List of Potentially Preventable Complications Groups (PPCs)

Group	Description
1*	Stroke & Intracranial Hemorrhage
2*	Extremity Cerebral Complications
3*	Acute Lung Edema & Respiratory Failure
4*	Pneumonia, Lung Infection
5*	Aspiration Pneumonia
6*	Pulmonary Embolism
7*	Complications of Thoracic Surgery & Other Pulmonary Complications
8*	Shock
9*	Congenital Heart Failure
10*	Acute Myocardial Infarct
11	Cardiac Arrhythmia & Conduction Disturbances
12	Other Cardiac Complications
13*	Ventricular Fibrillation/Cardiac Arrest
14	Hypotension
15*	Peripheral Vascular Complications Except Venous Thrombosis
16	Venous Thrombosis
17	Major GI Complications without Significant Bleeding
18*	Major GI Complications with Significant Bleeding
19*	Major Liver Complications
20	Other GI Complications without Report Of Significant Bleeding
21*	Other GI Complications with Report Of Significant Bleeding
22	Cholelithiasis Gallbladder
23	Urinary Tract Infection
24	Complications of GU Surgery & Other GU Complications Except UTI
25	Head Failure without Output
26*	Renal Failure with Dialysis
27	Diabetic Ketoacidosis & Coma
28	Endocrine & Metabolic Complications except Diabetic Ketoacidosis/Coma
29	Post-Hemorrhagic & Other Acute Anemia without Transfusion
30*	Post-Hemorrhagic & Other Acute Anemia with Transfusion
31	Limb Fracture
32	Paronychia Of Digits & Biological Substances
33	Anesthesia Nausea & Adverse Effects
34	Abnormal Reactions
35*	Debridement
36	Transfusion Incompatibility Reaction
37	Medication Intolerance Complications
38*	Sepsisemia & Sepsis Infection
39	Adverse Effects Of Drugs, Transfusions & Biological Substances
40	Acute Mental State Changes
41	Post-Op Wound Infection & Deep Wound Disruption without Procedure
42*	Post-Op Wound Infection & Deep Wound Disruption with Procedure
43*	Respiratory Or Infection Of Surgical Site
44	Post-Op Hemorrhage & Hematoma without Hemorrhage Control Or MD Procedure
45*	Post-Op Hemorrhage & Hematoma with Hemorrhage Control Or MD Procedure
46	Accidental (Inadvertent) Incision During (S) Procedure
47	Non-(S) Procedure Incision
48	Other Surgical Complication - Mod
49*	Post-Op Foreign Body & Foreign-Body Retention
50	Post-Op Substance Reaction & Non-(S) Procedure for Foreign Body
51*	Other Major Complications Of Medical Care
52	Other Complications Of Medical Care
53	Integumentary Pneumonia
54*	Medication Device, Prosthesis, Graft Or Catheter Complications
55	Infective Inflammation & Other Complication Of Device/Graft or Vascular Infection
56*	Complications Of Peripheral Intravenous Catheters
57	Complications Of Central Venous & Other Vascular Catheters & Devices
58	Ophthalmic Hemorrhage without Infection
59	Ophthalmic Hemorrhage with Infection
60*	Ocular Infection, Inflammation & Other Trauma
61	Chemical, Irritable Eye Lesions & Other Trauma
62	Medical & Anesthesia Ocular Complications
63*	Major Obstetric Complications
64	Other Complications Of Delivery
65	Delivery with Perinatal Complications
66*	Post-Operative Respiratory Failure with Tracheostomy

*Major PPCs
NOTE: The PPC System identifies in-hospital complications among secondary diagnoses not designated as present on admission (POA).
SOURCES: Hughes, J.S., Averil, P.F., Goddard, N.L., Gay, J.C., Malton, J., McGuinness, E., Xiang, J., 2005.

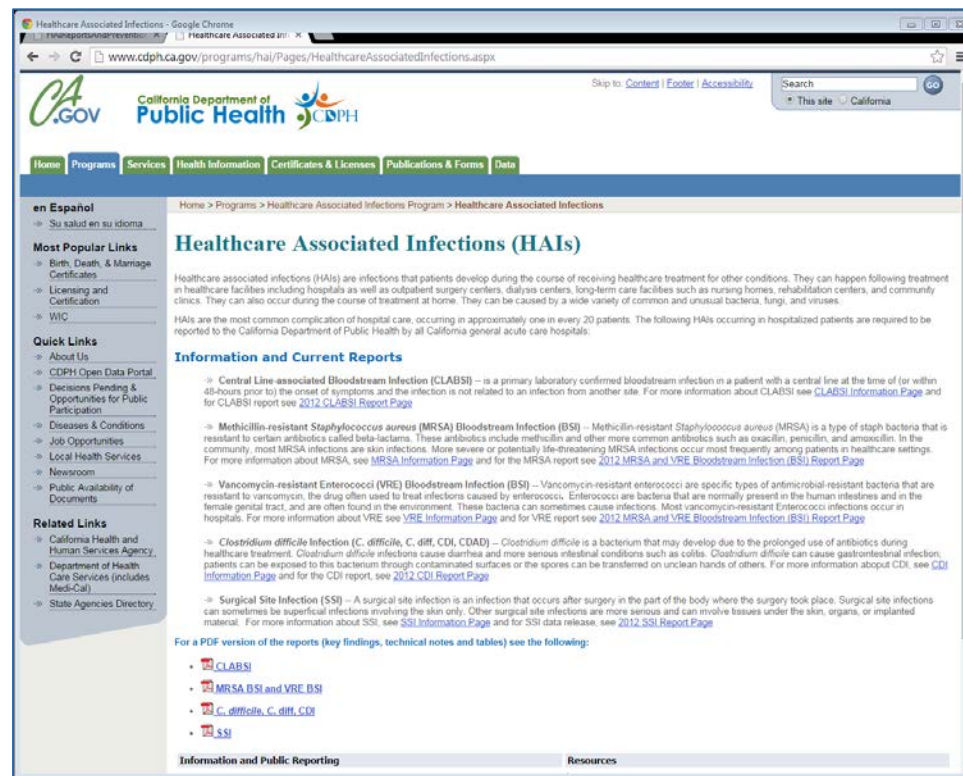
HEALTH CARE FINANCING REVIEW/Spring 2006/Volume 31, Number 1

California Reporting

- ***Clostridium difficile* Infection (CDI):** Bacterial intestinal infection, causing diarrhea and colitis; transmitted through contact with contaminated surfaces or hands.
- **Central Line-associated Bloodstream Infection (CLABSI):** Bloodstream infection (positive blood culture) in a patient with a central line or catheter.
- **Methicillin-resistant *Staphylococcus aureus* (MRSA) Bloodstream Infection (BSI):** Common pathogen in healthcare settings; becomes life-threatening when resistant to common antibiotics, and in the bloodstream.
- **Vancomycin-resistant Enterococci (VRE) Bloodstream Infection (BSI):** Another common pathogen; exhibits resistance to antibiotics and can cause a bloodstream infection.
- **Surgical Site Infections:** Currently 29 surgical procedure categories; CDPH reports on somewhat fewer.

More than you want to know...

<http://cdph.ca.gov/programs/hai/Pages/HealthcareAssociatedInfections.aspx>



The screenshot shows a web browser window displaying the California Department of Public Health (CDPH) website. The page title is "Healthcare Associated Infections (HAIs)". The navigation menu includes Home, Programs, Services, Health Information, Certificates & Licenses, Publications & Forms, and Data. The main content area is titled "Healthcare Associated Infections (HAIs)" and provides a definition: "Healthcare associated infections (HAIs) are infections that patients develop during the course of receiving healthcare treatment for other conditions. They can happen following treatment in healthcare facilities including hospitals as well as outpatient surgery centers, dialysis centers, long-term care facilities such as nursing homes, rehabilitation centers, and community clinics. They can also occur during the course of treatment at home. They can be caused by a wide variety of common and unusual bacteria, fungi, and viruses." Below this, it states "HAIs are the most common complication of hospital care, occurring in approximately one in every 20 patients. The following HAIs occurring in hospitalized patients are required to be reported to the California Department of Public Health by all California general acute care hospitals." The page lists "Information and Current Reports" with links to: "Central Line-associated Bloodstream Infection (CLABSI)", "Methicillin-resistant Staphylococcus aureus (MRSA) Bloodstream Infection (BSI)", "Vancomycin-resistant Enterococci (VRE) Bloodstream Infection (BSI)", and "Clostridium difficile Infection (C. difficile, C. diff, CDI, CDAD)". It also includes a link for "Surgical Site Infection (SSI)". A section titled "For a PDF version of the reports (key findings, technical notes and tables) see the following:" lists links for "CLABSI", "MRSA BSI and VRE BSI", "C. difficile, C. diff, CDI", and "SSI". The page footer includes "Information and Public Reporting" and "Resources".

CDC Information Pages

<http://www.cdc.gov/hai>

The screenshot shows the CDC website for Healthcare-associated Infections (HAI). The page features a navigation bar with the CDC logo and the text "Centers for Disease Control and Prevention" and "CDC 24/7: Saving Lives. Protecting People.™". Below the navigation bar is a search bar and an alphabetical index. The main content area is titled "Healthcare-associated Infections (HAI)" and includes a "What You Can Do" section with links to sign up for email updates, join the conversation at CDC's Safe Healthcare Blog, and spread the word. A prominent banner for "Antibiotic Resistance" features the text "White House Announces the National Strategy for Combating Antibiotic Resistance." and a "Learn More" link. To the right of the banner is a "Print page" link and an email update sign-up form. Below the banner are several content blocks: "Types of Infections", "Data and Statistics" (with the NSHN logo), "Outbreak and patient notifications" (with a 24/7 icon), "Guidelines & Recommendations" (with the HICPAC logo), "Be a Safe Patient", "Prevention Resources by Healthcare Settings" (with sub-sections for Outpatient Settings, Nursing Homes and Assisted Living, Dialysis Facilities, and Dental Resources), "Preventing HAIs", "State-based HAI prevention", "Research", and "Lab Expertise". On the right side, there is a "Contact Us" section with the CDC address and phone numbers, and a "Sepsis" banner with the URL "www.cdc.gov/sepsis". At the bottom of the page, there are social media icons for Facebook, RSS, Twitter, YouTube, and a plus sign, along with the text "CDC @", "Subscribe", "CDC-INFO", "Safe Healthcare blog", and "Emergency.cdc.gov".

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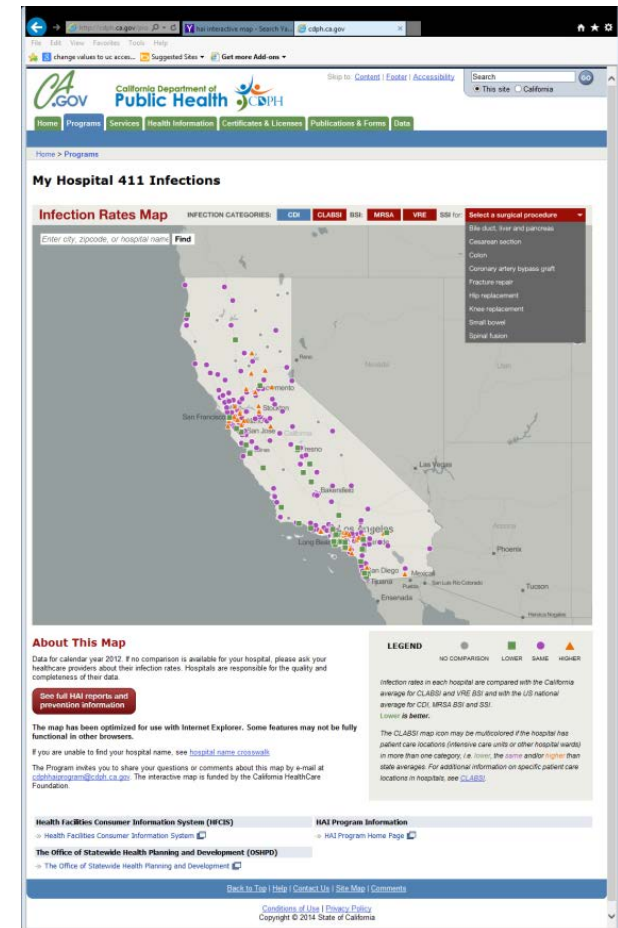
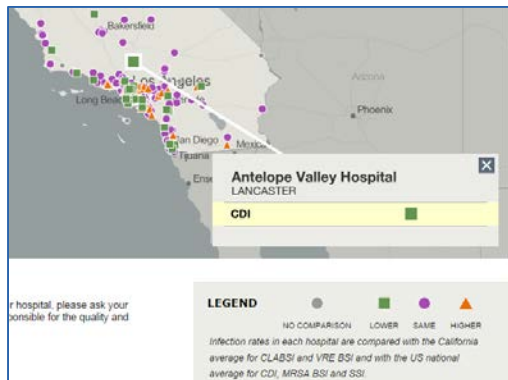
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HAI Program Web Pages, now w/Map

- A valued component of CDPH HAI reporting is an interactive web map
- Initially created as a 2-year sponsored prototype Flash application



Initial Development Coalition



<http://www.chcf.org>

Bay Area foundation supporting projects to improve health care, including most notably promoting greater transparency and accountability in California's health care system.



<http://stamen.com>

Bay Area design firm doing data mapping and visualization of astounding range and sophistication.

Continue with map?

- CDPH HAI reporting pages with map very well received; awarded
- Funding from CHCF for two years (2011 and 2012 data)
- Third year reporting (2013 data) coming up; reduced funding for epidemiology group producing reports, and, sadly,
- No funding for updating Flash application
- Long term goals include
 - internally supportable technology
 - simple annual update process
 - availability of geospatial format to internal users
 - integration with open data and portal visualization platforms
- ITSD GIS able to leverage and offer existing technology (ArcGIS desktop and server, JavaScript, HTML, IIS) as developed for other department programs.

Constraints

- Extensive focus-group driven modifications and development of the initial map; at this point need to honor that work
- Needs to function in an older version of Microsoft SharePoint
- CDPH HAI Group wanted some enhancements
 - additional surgical site reporting
 - different symbolization and popup text for “no data” or joint reporting
 - per facility links to external data and resources
 - different way of reporting and symbolizing CLABSI data
 - bookmarks
 - all-conditions view for each hospital
 - viewable on devices
- Need to integrate with Open Data initiative of our department
- Make data accessible to other GIS applications, users and developers
- Use existing resources and technologies
- No funding; no new or continuing project funds at this point

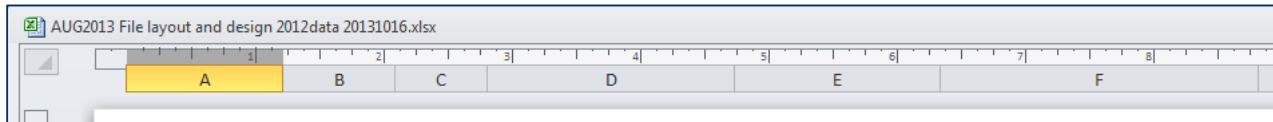
What we received

Multiple Excel tables with data, text, code and instructions which comprised the foundation of the compiled Flash application on our server

Name	Type	Size
assets	File folder	
js	File folder	
cahealth2.html	Chrome HTML Do...	
cahealth2.swf	Shockwave Flash ...	
index.html	Chrome HTML Do...	
noflash.png	Adobe Fireworks ...	
playerProductInstall.swf	Shockwave Flash ...	
swfobject.js	JS File	

Name
AUG2013 File layout and design 2012data...
DRAFT_HAI_2012_ALLNAMES_20130709.x...
HAI_2012_MAP_CDI_2013AUG28.xlsx
HAI_2012_MAP_CLABSI_2013AUG02.xlsx
HAI_2012_MAP_MRSA_2013AUG08.xlsx
HAI_2012_MAP_SENTENCES 20130823.xlsx
HAI_2012_MAP_SSI_20130806.xlsx
HAI_2012_MAP_VRE_2013AUG08.xlsx

File Contents



CLABSI							
HospIndex	NHSN_ID	Type	Sentence_flag	Low_Locations	ND_Locations	High_Locations	NA_Locations
numeric(10)	numeric(8)	alpha(8)	numeric(2)	numeric(8)	numeric(8)	numeric(8)	numeric(8)
		CLABSI	values = (31,36,37,38,39)	Range [0,200] & -9999	Range [0,200] & -9999	Range [0,200] & -9999	Range [0,200] & -9999
Notes:							
A. 4 Locations fields (Low_,ND_,High_,NA_) are the location counts to be displayed WHEN there is data available.							
If Sentence_flag = 31, all 4 locations fields should have data in the (0,200) range to display with associated icon or text.							
If Sentence_flag does not = 31, then all locations fields = -9999. One of the 4 global 'no useful data' sentences should display with no							
EXAMPLES:							
10024000	10024	CLABSI	31	12	33	2	5
10032000	10032	CLABSI	36	-9999	-9999	-9999	-9999
12304000	12304	CLABSI	37	-9999	-9999	-9999	-9999
14587000	14587	CLABSI	38	-9999	-9999	-9999	-9999
20145000	20145	CLABSI	39	-9999	-9999	-9999	-9999
Field definitions: (Note that the texts for referenced sentences are in a separate table.)							
Type:	Single value of 'CLABSI' in all records.						
Sentence_Flag:	Indicates which of 5 standard results to display. Useful data result or one of 4 'no usefule data' sentences.						
31:	Useful data exists for the four types of locations (Low,ND,High,NA). Display will indicate 4 location types with associated counts from the 4 location type fields.						
36:	The hospital affirmed that there were no central line (CL) days. Sentence 36.						
37:	Insufficient data. No evaluation. Sentence 37.						
38:	Incomplete data. No evaluation. Sentence 38.						
39:	No data submitted. Sentence 39.						
Low_Locations:	Count to insert into the first sentence for # of locations below average.						
-9999:	NO DATA for all 4 location types.						
ND_Locations:	Count to insert into the second sentence for # of locations no different than average.						
-9999:	NO DATA for all 4 location types.						
High_Locations:	Count to insert into the third sentence for # of locations above average.						
-9999:	NO DATA for all 4 location types.						

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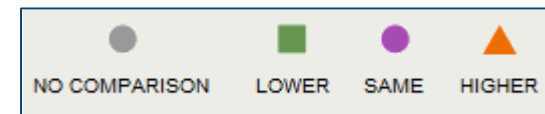
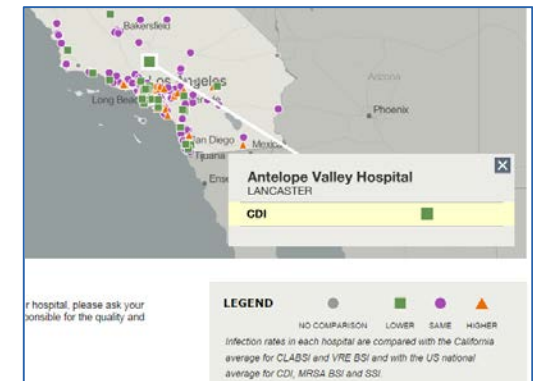
Basic Principle:

Standardized Rate Symbolized

Table 1. NHSN Standardized Infection Ratios (SIR) of Hospital Onset *Clostridium difficile* Infections Reported by California General Acute Care Hospitals* other than Long-term and Rehabilitation Acute Care Hospitals, January through December 2012

Hospital Name	Hospital Onset Cases	Patient Days	SIR*	SIR 95% CI*	Comparison ^c
STATE OF CALIFORNIA POOLED DATA	10667	13929425	1.06**		
+ ADVENTIST HEALTH SYSTEMS	17	44567	0.71	0.41, 1.13	N
ADVENTIST MED CTR, HANFORD					
ADVENTIST MED CTR-SELMA					
ADVENTIST MED CTR, REEDLEY	0	4450	0.00	0.00, 1.90	N
AHMC ANAHEIM REGIONAL MED CTR, ANAHEIM	45	47907	1.33	0.97, 1.78	N
+ ALAMEDA COUNTY MED CTR	23	52086	0.82	0.52, 1.24	N
ALAMEDA COUNTY MED CTR, OAKLAND					
ALAMEDA COUNTY MED CTR-FAIRMONT CAMPUS, SAN LEANDRO					
ALAMEDA HOSP	20	12701	2.69	1.64, 4.15	H
ALHAMBRA HOSP MED CTR	18	17128	1.26	0.75, 1.99	N
+ ALTA LOS ANGELES HOSPS, INC.	18	42654	1.03	0.61, 1.63	N
LOS ANGELES COMMUNITY HOSP					
NORWALK COMMUNITY HOSP					
+ ALVARADO HOSP, LLC	12	30238	0.69	0.36, 1.21	N
ALVARADO HOSP MED CTR, CAMPUS #1, SAN DIEGO					
ALVARADO HOSP MED CTR, CAMPUS #2, SAN DIEGO					
ANAHEIM GENERAL HOSP	0	6589	0.00	0.00, 1.51	N
ANTELOPE VALLEY HOSP, LANCASTER	41	92203	0.71	0.51, 0.97	L
ARROWHEAD RGN MED CTR, COLTON	59	98881	0.88	0.67, 1.13	N
BAKERSFIELD HEART HOSP	11	17135	1.33	0.66, 2.38	N
BAKERSFIELD MEMORIAL HOSP	45	60110	1.00	0.73, 1.34	N
BANNER LASSEN MED CTR, SUSANVILLE	2	5243	0.62	0.07, 2.23	N
BARSTOW COMMUNITY HOSP	0	7311	0.00	0.00, 1.14	N
BARTON MEMORIAL HOSP, SOUTH LAKE TAHOE	0	6926	0.00	0.00, 1.15	N
BEAR VALLEY COMMUNITY HOSP, BIG BEAR LAKE	0	765			
BELLFLOWER MED CTR	0	23242	0.00	0.00, 0.33	L
BEVERLY HOSP, MONTEBELLO	50	39658	1.86	1.38, 2.46	H
BIGGS GRIDLEY MEMORIAL HOSP, GRIDLEY	0	1794			
BROTMAN MED CTR, CULVER CITY	64	66532	2.04	1.57, 2.60	H
CALIFORNIA HOSP MED CTR, LOS ANGELES	15	54452	0.41	0.23, 0.67	L
CALIFORNIA MED FACILITY, VACAVILLE	0	2127			
CALIFORNIA MENS COLONY, SAN LUIS OBISPO	8	10043	1.83	0.79, 3.60	N
CALIFORNIA PACIFIC MED CTR, ST LUKE'S CAMPUS, SAN FRANCISCO	21	16693	1.70	1.05, 2.60	H
CATALINA ISLAND MED CTR, AVALON	0	63			
CEDARS-SINAI MED CTR, LOS ANGELES	347	247068	1.44	1.29, 1.60	H
CENTINELA HOSP MED CTR, INGLEWOOD	55	64895	1.04	0.78, 1.36	N
CENTRAL VALLEY GENERAL HOSP, HANFORD	0	4308	0.00	0.00, 1.79	N
CHAPMAN MED CTR, ORANGE	12	10658	1.65	0.85, 2.89	N
CHILDRENS HOSP AND RESEARCH CTR AT OAKLAND	20	41421	0.68	0.42, 1.05	N
CHILDREN'S HOSP AT MISSION, MISSION VIEJO	1	3906	0.40	0.01, 2.22	N
CHILDREN'S HOSP CENTRAL CA, MADERA	39	57696	0.97	0.69, 1.33	N
CHILDRENS HOSP OF LOS ANGELES	54	85631	1.06	0.79, 1.39	N
CHILDREN'S HOSP OF ORANGE COUNTY, ORANGE	23	43841	0.82	0.52, 1.23	N
CHINESE HOSP, SAN FRANCISCO	5	10424	0.82	0.26, 1.90	N
CHINO VALLEY MED CTR, CHINO	3	15580	0.35	0.07, 1.02	N
+ CITRUS VALLEY MED CTR, IC, COVINA	86	89187	1.26	1.01, 1.56	H
CITRUS VALLEY MED CTR, QV, WEST COVINA					

Report tables, plus information on methodology, data sources, definitions, quality assurance and control, data presentation and statistical analyses



Transformation Workflow

- Data Preparation
 - MS Excel
 - MS Access

- Development of Services
 - Geocoding Service
 - ArcMap
 - ArcGIS Server
 - Adobe Illustrator/Photoshop

- Shared Environment
 - ArcGIS Online

- Test/Production Environment
 - CSS
 - HTML5
 - JavaScript and JQuery Libraries

Data Preparation

We started by combining all data into one huge Excel spreadsheet for analysis

The screenshot shows a Microsoft Excel spreadsheet with a large table of hospital data. The table has columns for Hospital ID, Name, Location, and various metrics. The data is color-coded by status, with green for 'Good' and red for 'Bad'. The table is organized into sections for different metrics, including HOSPITAL, CDR, CLABSI, MRSA, and VRE. The data is sorted by Hospital ID, and the columns are labeled with letters A through Y. The spreadsheet is titled 'HUG_10/10/2010' and is open in Microsoft Excel.

HOSPITAL	CDR	CLABSI	MRSA	VRE														
10024000	10024	9 LONG BEACH Long Beach 2001 ATLA LONG BEACH LOS ANGE	90806	71	3	-9999	1	7	1	0	31	61	2	-9999	21	2	46	1
10025200	10022	9 SHARP ME Sharp Mer 7901 PROJ SAN DIEGO SAN DIEGO	92123	71	3	-9999	0	8	0	2	31	61	1	-9999	21	2	46	1
10102001	10102	1 CALIFORN California Calif. Paco 3700 CALIF SAN FRAN SAN FRAN	94118	71	2	-9999	0	10	0	0	31	61	2	-9999	21	3	46	1
10102002	10102	1 CALIFORN California Calif. Paco 2333 BUCH SAN FRAN SAN FRAN	94115	71	2	-9999	0	10	0	0	31	61	2	-9999	21	3	46	1
10116000	10116	9 UNIVERSI UC Davis FUC Davis 7215 STOK SACRAME SACRAME	95817	71	2	-9999	0	18	1	2	31	61	2	-9999	21	2	41	1
10128000	10128	9 CEDARS-S Cedars-Sin Cedars-Sin 8700 BEVE LOS ANGE LOS ANGE	90048	71	3	-9999	2	14	0	2	31	61	1	-9999	21	3	41	1
10156000	10156	9 UNIVERSI UC Irvine UC Irvine 105 CITY D-ORANGE ORANGE	92868	71	2	-9999	0	16	0	0	31	61	2	-9999	21	1	41	1
10208000	10208	9 GROSSMAN Grossman 5555 GROSS MESA SAN DIEGO	91942	71	1	-9999	0	7	0	4	31	61	2	-9999	21	1	46	1
10222000	10222	9 SHARP CH Sharp Chu Sharp Chu 751 MEDI CHULA VIT SAN DIEGO	92010	71	2	-9999	0	6	0	1	31	61	2	-9999	21	2	46	1
10240001	10240	1 HOAG ME Hoag Men Hoag Men ONE HOAG NEWPORT ORANGE	92663	71	3	-9999	0	9	0	1	31	61	2	-9999	21	2	46	1
10240002	10240	1 HOAG HO Hoag Hoag Hoag Hoag 16200 SAN IRVINE ORANGE	92618	71	3	-9999	-0	9	0	1	31	61	2	-9999	21	2	46	1
10312001	10312	1 SUTTER M Sutter Me Sutter Me 5151 F STR SACRAME SACRAME	95819	71	3	-9999	2	12	0	1	31	61	2	-9999	21	2	46	1
10312002	10312	1 SUTTER GE Sutter Gen Sutter Gen 2801 L STR SACRAME SACRAME	95816	71	3	-9999	2	12	0	1	31	61	2	-9999	21	2	46	1
10407000	10407	9 TORRANC Torrance P Torrance P 3130 WEST TORRANC LOS ANGE	95055	71	2	-9999	1	7	0	2	31	61	2	-9999	21	2	46	1
10411000	10411	9 EARL & LO Miller Chi Miller Chi 2801 ATLA LONG BEACH LOS ANGE	90806	71	1	-9999	0	7	0	1	31	61	2	-9999	21	2	41	1
10511001	10511	1 LOMA LIN Loma Lind Loma Lind 25383 BAR LOMA LIN SAN BERN	92354	71	2	-9999	0	15	3	4	31	61	2	-9999	21	2	41	1
10511002	10511	1 LOMA LIN Loma Lind Loma Lind 11234 ANE LOMA LIN SAN BERN	92354	71	2	-9999	0	15	3	4	31	61	2	-9999	21	2	41	1
10511003	10511	1 LOMA LIN Loma Lind Loma Lind 26780 BAR REDLAND SAN BERN	92375	71	2	-9999	-0	15	3	4	31	61	2	-9999	21	2	41	1
10550000	10550	9 JOHN MUI John Muir John Muir 2540 EAST CONCORD CONTRA C	94520	71	3	-9999	0	6	0	0	31	61	2	-9999	21	2	46	1
10606000	10606	9 SHARP M Sharp Mer Sharp Mer 8001 HEAL SAN DIEGO SAN DIEGO	92123	71	1	-9999	-0	6	0	1	31	61	2	-9999	21	2	46	1
10610000	10610	9 JOHN MUI John Muir John Muir 1601 YONV WALNUT C CONTRA C	94598	71	3	-9999	0	12	0	0	31	61	2	-9999	21	1	46	1
11344001	11344	1 SAN RAMO San Ramo San Ramo 6001 NOR SAN RAMO CONTRA C	94583	71	2	-9999	-0	3	0	0	31	61	2	-9999	21	2	46	1
11344002	11344	1 SAN RAMO San Ramo San Ramo 7777 NOR SAN RAMO CONTRA C	94583	71	2	-9999	-0	3	0	0	31	61	2	-9999	21	2	46	1
11519000	11519	9 ST JOSEPH St. Joseph St. Joseph 1800 NO. STOCKTOP SAN JOAC	95204	71	3	-9999	1	4	0	4	31	61	2	-9999	21	2	46	1
11552000	11552	9 SUTTER DE Sutter Del Sutter Del 3901 LONI ANTIPOCH CONTRA C	94509	71	2	-9999	0	4	0	1	31	61	2	-9999	21	2	46	1
11594000	11594	9 KAISER FC Kaiser Fo, Kaiser - FC 9961 SERR FONTANA SAN BERN	92335	71	2	-9999	3	9	0	3	31	61	2	-9999	21	2	46	1
11611000	11611	9 HEALTHSC HealthSci, HealthSci, 5001 COM BAKERSFI KERN	93309	77	-9999	-9999	0	1	0	0	31	67	-9999	-9999	21	2	47	1
11680000	11680	9 TEHACHA Tehachap, Tehachap, 115 WEST TEHACHA KERN	93561	71	2	-9999	0	0	0	1	31	61	2	-9999	21	2	44	1
11741000	11741	9 RIVERSIDE Riverside Riverside 4445 MAG RIVERSIDE RIVERSIDE	92501	71	3	-9999	1	9	0	5	31	61	2	-9999	21	2	46	1
11752000	11752	9 ST MARY S St. Mary & St. Mary 18300 MAG APPLE VAL SAN BERN	92307	71	2	-9999	0	7	0	2	31	61	2	-9999	21	2	46	1
11791000	11791	9 KAISER FC Kaiser Fo, Kaiser - St 25825 S. V HARBOR C LOS ANGE	96710	71	2	-9999	0	5	0	1	31	61	2	-9999	21	2	46	1
11833000	11833	9 DOCTORS Doctors M Doctors M 1441 FLOR MODESTO STANISLA	95350	71	2	-9999	0	10	0	2	31	61	1	-9999	21	2	46	1
11834000	11834	9 FRENCH H French Ho French Ho 3511 JOHN SAN LUIS / SAN LUIS I	93401	71	2	-9999	-0	3	0	0	31	61	2	-9999	21	2	46	1
11841000	11841	9 DOCTORS Doctors H Doctors H 1205 E. NC MANTECA SAN JOAC	95336	71	2	-9999	0	2	0	1	31	61	2	-9999	21	2	46	1
11846000	11846	9 PATIENTS Patients I Patients I 2500 ELRE REDDING SHASTA	96001	77	-9999	-9999	-9999	-9999	-9999	-9999	36	61	2	-9999	21	2	46	1
11850000	11850	9 MARSHAL Marshall P Marshall P 1330 MAR PLACERVIL EL DORAD	95667	71	3	-9999	0	3	0	1	31	61	2	-9999	21	2	46	1
11858000	11858	9 PRESBYTE Presbyter, Presbyter 12401 WA WHITTIER LOS ANGE	96062	71	3	-9999	1	7	0	0	31	61	2	-9999	21	2	46	1
11944001	11944	1 CORONA I Corona Re Corona Re 805 SOUTH CORONA RIVERSIDE	92882	71	2	-9999	0	4	0	1	31	61	2	-9999	21	2	46	1
11944002	11944	1 CORONA I Corona Re Corona Re 730 MESA CORONA RIVERSIDE	92882	71	2	-9999	0	4	0	1	31	61	2	-9999	21	2	46	1
11966001	11966	1 KICK HOS USC - Kick USC Kick 1500 SAN LOS ANGE LOS ANGE	90033	71	2	-9999	0	5	2	1	31	61	2	-9999	21	2	41	1

Data Preparation

Imported into Access:

Hospital table with all names and address

A table for each condition, with all related Excel fields

ID	FACNAME	FACADDRESS	TYPE	Sentence	value	GROUP	Flag	group		
429	CALIFORNIA PACIFIC MEDICAL CENTER - DAVIES CA 43 CASTRO STREET		VRE	Riverside County Regional Medical	21	Compared with other c1 of 7 hospital categories desig	1	below	41	major teaching
430	MISSION HOSPITAL REGIONAL MEDICAL CENTER - 27700 MEDICAL CENTER RD		VRE	Glendale Valley Medical Center	21	Compared with other c1 of 7 hospital categories desig	3	above	46	community
431	MISSION HOSPITAL LAGUNA BEACH - 31812 COAST HIGHWAY		VRE	Glendale Adventist Medical Center	21	Compared with other c1 of 7 hospital categories desig	3	above	41	major teaching
26	HEALTHCARE SERVICES - 5001 COMMERCE DRIVE		VRE	Stanford Hospital and Clinics	21	Compared with other c1 of 7 hospital categories desig	3	above	46	community
34	PATIENTS HOSP OF REDDING - 2001 EUREKA WAY		VRE	Memorial Medical Center - Modes	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
53	MODOC MED CTR - ALTURA - 228 W MC DONNELL AVE		VRE	Mercy Medical Center 34C Mt. Sh	21	Compared with other c1 of 7 hospital categories desig	2	no different	44	critical access
77	TRINITY HOSP - WEAVERVILLE - 60 EASTER AVENUE - P O B		VRE	Modoc Medical Center	21	Compared with other c1 of 7 hospital categories desig	2	no different	44	critical access
100	GLENN MED CTR - WILLOWS - 1131 W Sycamore St		VRE	Sequoia Hospital	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
141	SANTA VNEZ VALLEY COTTAGE HOSP - SOLVANG - 3050 WISCONSIN RD		VRE	White Memorial Medical Center	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
162	PORTERVALE DEVELOPMENTAL CTR - 29021 AVENUE 140		VRE	Ukiah Valley Medical Center/Hosp	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
173	BEAT VALLEY COMMUNITY HOSP - BIG BEAR LAKE - 4100 GASTON DRIVE		VRE	Queen of the Valley Medical Cent	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
181	SUBURSE VALLEY COMMUNITY HOSP - CEDARVALE - 701 NORTH MAIN STREET		VRE	Menifee Valley Medical Center	21	Compared with other c1 of 7 hospital categories desig	2	no different	43	pediatric
190	MAMMOTH HOSP - 85 SEBERA BLVD - P O B		VRE	Children's Hospital of Los Angeles	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
198	JEROLD PHELPS COMMUNITY HOSP - BARBERVILLE - 733 CEDAR ST		VRE	Emanuel Medical Center Inc.	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
213	BARLOW RESPIRATORY HOSP - LOS ANGELES - 2000 STADIUM WAY		VRE	Community Hospital of Long Beach	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
215	LANTERMAN DEVELOPMENTAL CTR - POMONA - 3530 POMONA BLVD		VRE	Glendale Memorial Hospital and H	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
217	STANISLAUS SURGICAL HOSP - MODOCISTO - 1421 CADELA ROAD		VRE	Kaiser Foundation Hospital - Redw	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
218	KINDRED HOSP - WESTMINSTER - 300 HOSPITAL CIRCLE		VRE	Citrus Valley Medical Center 34C G	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
222	FAIRVIEW DEVELOPMENTAL CTR - COSTA MESA - 2201 ALBION BLVD		VRE	Sharp Memorial Hospital	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
247	KINDRED HOSP - SAN DIEGO - 1940 EL CAJON BLVD		VRE	Whittier Hospital Medical Center	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
258	THE GENERAL HOSP - ELREKA - 2202 HARRISON AVE		VRE	St. John's Regional Medical Center	21	Compared with other c1 of 7 hospital categories desig	3	above	46	community
259	NORTHERN CA RENAISSANCE HOSP - REDDING - 2802 EUREKA WAY		VRE	Sierra Valley District Hospital	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
265	KINDRED HOSP RIVERSIDE - PERES - 2224 MEDICAL CENTER DRWY		VRE	St. Elizabeth Community Hospital	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
274	VIEVA HOSP OF SAN DIEGO - SAN DIEGO - 503 WASHINGTON STREET		VRE	Long Beach Memorial Medical Cen	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
280	MENLO PARK SURGICAL HOSP - 500 WILLOW ROAD		VRE	Grossmont Hospital	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
289	KINDRED HOSP SOLIVIA BEY - GARDENA - 120 N 155TH ST		VRE	California Pacific Medical Center	21	Compared with other c1 of 7 hospital categories desig	3	above	46	community
306	NEWPORT SPECIALTY HOSP - TUSTIN - 1842 NEWPORT AVENUE		VRE	California Pacific Medical Center	21	Compared with other c1 of 7 hospital categories desig	3	above	46	community
307	KINDRED HOSP - ONTARIO - 530 NORTH MONTEREY AVE		VRE	UC Davis Medical Center	21	Compared with other c1 of 7 hospital categories desig	2	no different	41	major teaching
311	SAN JOAQUIN VALLEY RENAISSANCE HOSP - FRESNO - 7575 N SHARON AVE		VRE	Cedars-Sinai Medical Center	21	Compared with other c1 of 7 hospital categories desig	3	above	41	major teaching
316	PROMISE HOSP OF EAST LA-EAST LA CAMPUS - LOS 441 SOUTH 50TH ST		VRE	UC Irvine Medical Center	21	Compared with other c1 of 7 hospital categories desig	1	below	46	community
319	BALLARD RENAISSANCE HOSP - SAN BERNARDINO - 1700 WEST 10TH STREET		VRE	Sharp Chula Vista Medical Center	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
320	KINDRED HOSP SACRAMENTO - FOLSOM - 220 FARGO WAY		VRE	Hoag Memorial Hospital - Newport	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
328	LAS DEL MONTE HOSP & RENAISSANCE CTR - SAN FRANCISCO - 135 LAQUINA WOODA BOULE		VRE	Hoag Memorial Hospital - Irvine	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
332	PULMANS DISTRICT HOSP - QUINCY - 1300 ROCKS LANE ROAD		VRE	Sutter Memorial Hospital	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
349	PROMISE HOSP OF EAST LA-SUB-RBAN CAMPUS - P 1305 S COLORADO AVE		VRE	Sutter General Hospital	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
353	KINDRED HOSP FANCHO-RANCHO OXINGAMUNO - 13845 WHITE OAK AVENUE		VRE	Torance Memorial Medical Cente	21	Compared with other c1 of 7 hospital categories desig	2	no different	46	community
365	HEALTHBRIDGE CHILDREN'S HOSP - ORANGE - 3915 TUSTIN STREET		VRE	Miller Children's Hospital	21	Compared with other c1 of 7 hospital categories desig	2	no different	43	pediatric
389	KINDRED HOSP-SAN FRANCISCO BAY AREA - SAN LE 3800 BENTON DRIVE		VRE	Loma Linda University Medical Ce	21	Compared with other c1 of 7 hospital categories desig	2	no different	41	major teaching

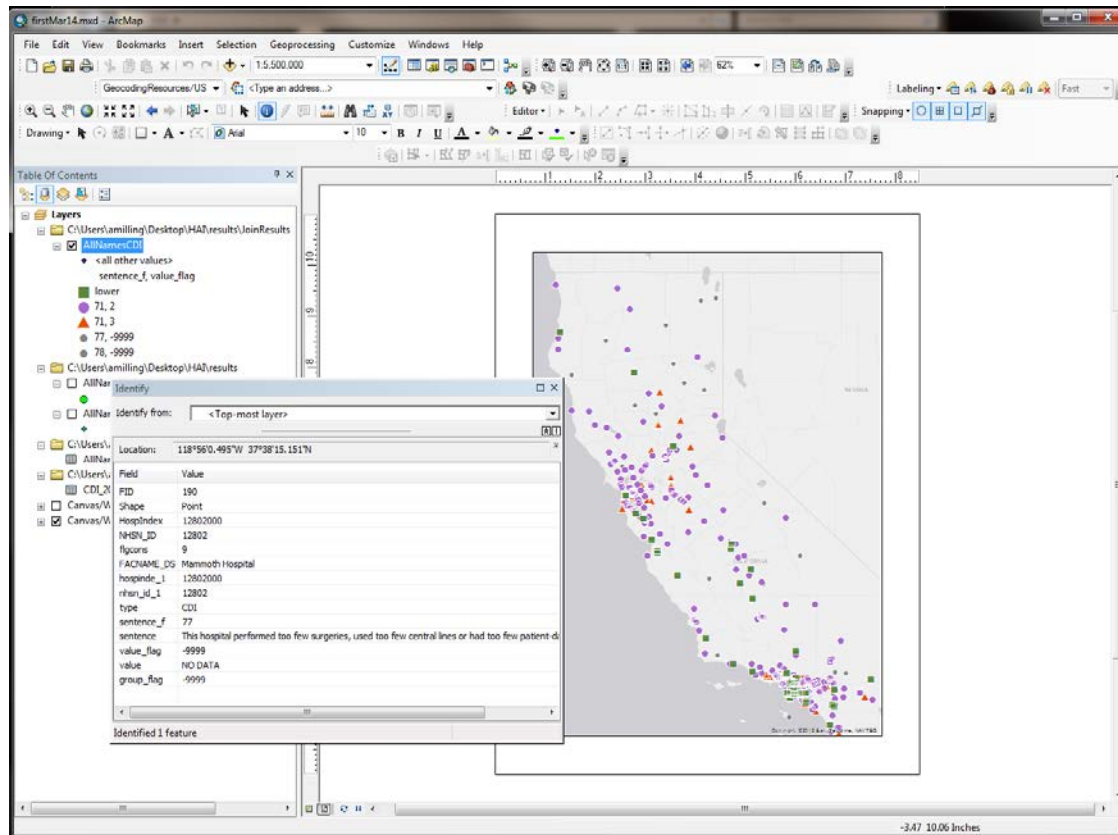
Development of Services

We geocoded the hospital addresses, brought into ArcMap.

FID	Shape	HospIndex	HSN_ID	Hgcons	FACNAME_DS	hospindex_t	nhsn_at_t	type	ssn	sentence	value_flag
20	Point	11611000	11611	9	HealthSouth Behavioral Rehabilitation Hosp	11611000	11611	CDI	77	This hospital performed too few surgeries, used too	-9999
24	Point	11846000	11846	9	Palmetto Hospital of Rocking	11846000	11846	CDI	77	This hospital performed too few surgeries, used too	-9999
53	Point	12033000	12033	9	Modoc Medical Center	12033000	12033	CDI	77	This hospital performed too few surgeries, used too	-9999
77	Point	12229000	12229	9	Trinity Hospital	12229000	12229	CDI	77	This hospital performed too few surgeries, used too	-9999
100	Point	12326000	12326	9	Glenn Medical Center	12326000	12326	CDI	77	This hospital performed too few surgeries, used too	-9999
141	Point	12522000	12522	9	Santa Ynez Valley Cottage Hospital	12522000	12522	CDI	77	This hospital performed too few surgeries, used too	-9999
162	Point	12614000	12614	9	Porterville Developmental Center	12614000	12614	CDI	77	This hospital performed too few surgeries, used too	-9999
173	Point	12704000	12704	9	Bear Valley Community Hospital	12704000	12704	CDI	77	This hospital performed too few surgeries, used too	-9999
181	Point	12764000	12764	9	Surprise Valley Community Hospital	12764000	12764	CDI	77	This hospital performed too few surgeries, used too	-9999
190	Point	12802000	12802	9	Mammoth Hospital	12802000	12802	CDI	77	This hospital performed too few surgeries, used too	-9999
196	Point	12847000	12847	9	Jerod Phelps Community Hospital	12847000	12847	CDI	77	This hospital performed too few surgeries, used too	-9999
213	Point	12881000	12881	9	Barlow Respiratory Hospital	12881000	12881	CDI	77	This hospital performed too few surgeries, used too	-9999
215	Point	12887000	12887	9	Lanterman Developmental Center	12887000	12887	CDI	77	This hospital performed too few surgeries, used too	-9999
217	Point	12914000	12914	9	Stankaus Surgical Hospital	12914000	12914	CDI	77	This hospital performed too few surgeries, used too	-9999
218	Point	12915000	12915	9	Kindred Hospital - Visalia/Reader	12915000	12915	CDI	77	This hospital performed too few surgeries, used too	-9999
222	Point	12926000	12926	9	Fairview Developmental Center	12926000	12926	CDI	77	This hospital performed too few surgeries, used too	-9999
247	Point	13043000	13043	9	Kindred Hospital - San Diego	13043000	13043	CDI	77	This hospital performed too few surgeries, used too	-9999
256	Point	13062000	13062	9	St. Joseph - General Hospital Campus	13062000	13062	CDI	77	This hospital performed too few surgeries, used too	-9999
259	Point	13092000	13093	9	Northern California Rehabilitation Hospital	13092000	13093	CDI	77	This hospital performed too few surgeries, used too	-9999
265	Point	13131000	13131	9	Kindred Hospital - Riverside	13131000	13131	CDI	77	This hospital performed too few surgeries, used too	-9999
274	Point	13162000	13162	9	Vibra Hospital of San Diego	13162000	13162	CDI	77	This hospital performed too few surgeries, used too	-9999
280	Point	13163000	13163	9	Menlo Park Surgical Hospital	13163000	13163	CDI	77	This hospital performed too few surgeries, used too	-9999
299	Point	13287000	13287	9	Kindred Hospital, South Bay	13287000	13287	CDI	77	This hospital performed too few surgeries, used too	-9999
306	Point	13311000	13311	8	Newport Specialty Hospital	13311000	13311	CDI	76	This hospital did not provide data for at 12 months o	-9999
307	Point	13316000	13316	9	Kindred Hospital - Ontario	13316000	13316	CDI	77	This hospital performed too few surgeries, used too	-9999
311	Point	13341000	13341	9	San Joaquin Valley Rehabilitation	13341000	13341	CDI	77	This hospital performed too few surgeries, used too	-9999
316	Point	13399000	13399	9	Promise Hosp of East Los Angeles - South S	13399000	13399	CDI	77	This hospital performed too few surgeries, used too	-9999
319	Point	13429000	13429	9	Ballard Rehabilitation Hospital	13429000	13429	CDI	77	This hospital performed too few surgeries, used too	-9999

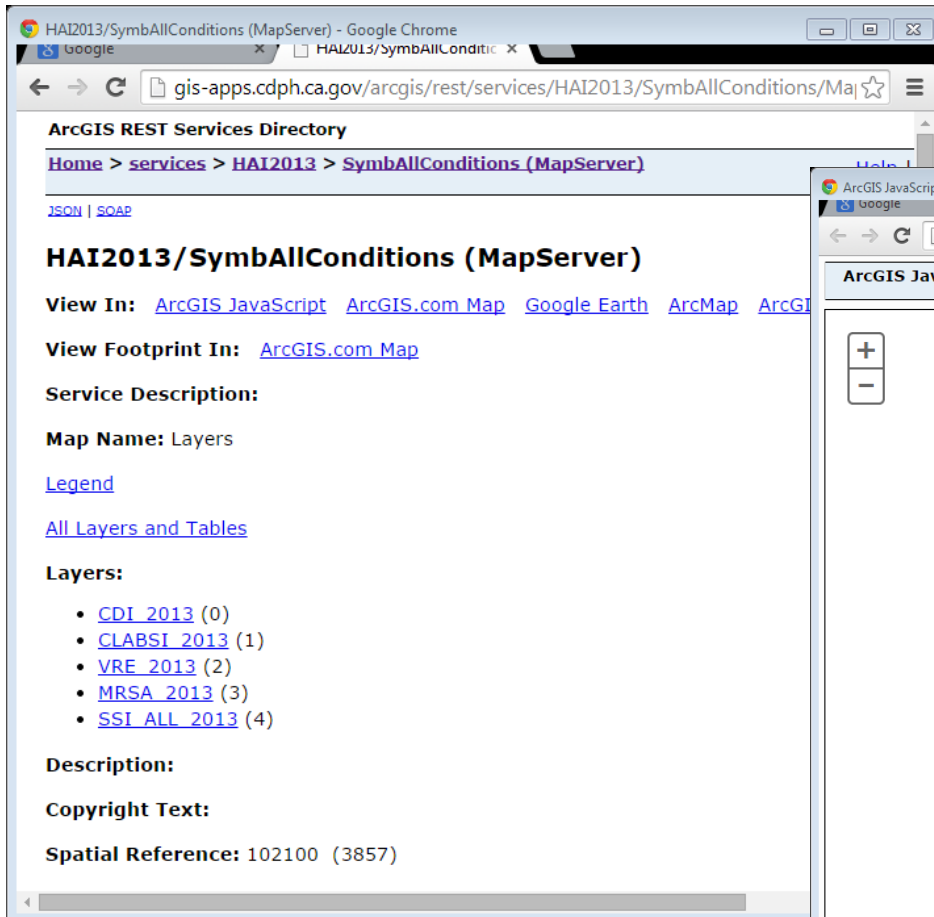
Development of Services

We began to experiment with images for symbolization, coding schemes and the presentation of attributes (field name vs field alias).



Development of Services

Basic ArcGIS for Server services using file gdb as data source



A screenshot of a web browser showing the ArcGIS REST Services Directory for the service 'HAI2013/SymbAllConditions (MapServer)'. The page includes navigation links for JSON and SOAP, a breadcrumb trail, and a list of layers: CDI_2013 (0), CLABSI_2013 (1), VRE_2013 (2), MRSA_2013 (3), and SSI_ALL_2013 (4). It also provides a description, copyright text, and spatial reference (102100 3857).

HAI2013/SymbAllConditions (MapServer) - Google Chrome
gis-apps.cdph.ca.gov/arcgis/rest/services/HAI2013/SymbAllConditions/Maj

ArcGIS REST Services Directory
Home > services > HAI2013 > SymbAllConditions (MapServer)

JSON | SOAP

HAI2013/SymbAllConditions (MapServer)

View In: [ArcGIS JavaScript](#) [ArcGIS.com Map](#) [Google Earth](#) [ArcMap](#) [ArcGI](#)

View Footprint In: [ArcGIS.com Map](#)

Service Description:

Map Name: Layers

[Legend](#)

[All Layers and Tables](#)

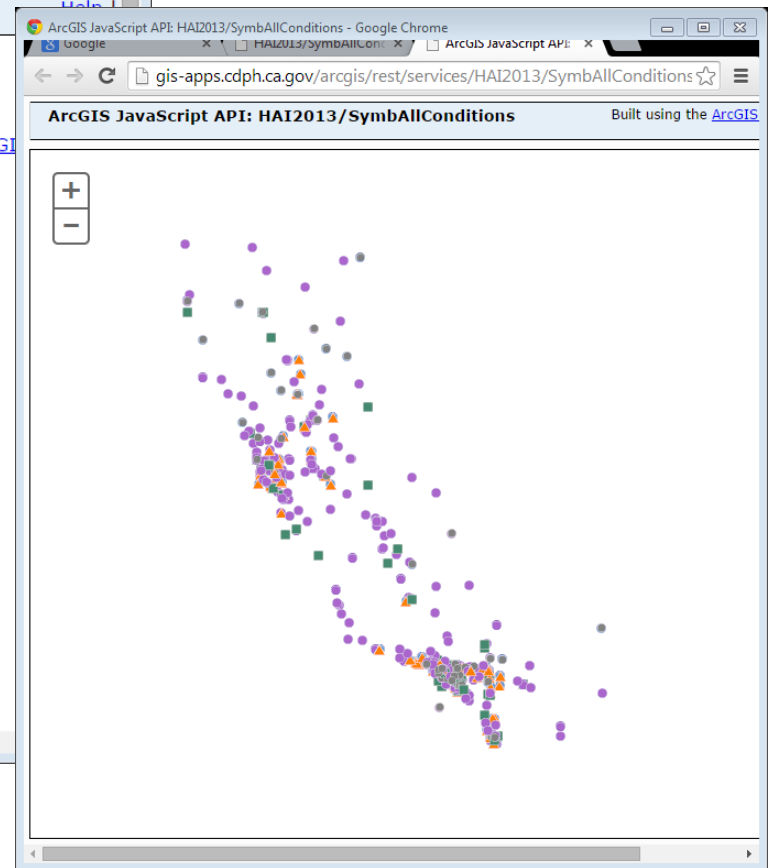
Layers:

- [CDI_2013](#) (0)
- [CLABSI_2013](#) (1)
- [VRE_2013](#) (2)
- [MRSA_2013](#) (3)
- [SSI_ALL_2013](#) (4)

Description:

Copyright Text:

Spatial Reference: 102100 (3857)



A screenshot of a web browser showing the ArcGIS JavaScript API for the service 'HAI2013/SymbAllConditions'. The map displays a geographic area with various colored markers (purple circles, green squares, orange triangles, and grey dots) representing different data points. The interface includes zoom controls (plus and minus signs) and a scale bar.

ArcGIS JavaScript API: HAI2013/SymbAllConditions - Google Chrome
gis-apps.cdph.ca.gov/arcgis/rest/services/HAI2013/SymbAllConditions

ArcGIS JavaScript API: HAI2013/SymbAllConditions Built using the ArcGIS

Map showing data points (purple circles, green squares, orange triangles, grey dots) on a geographic area.

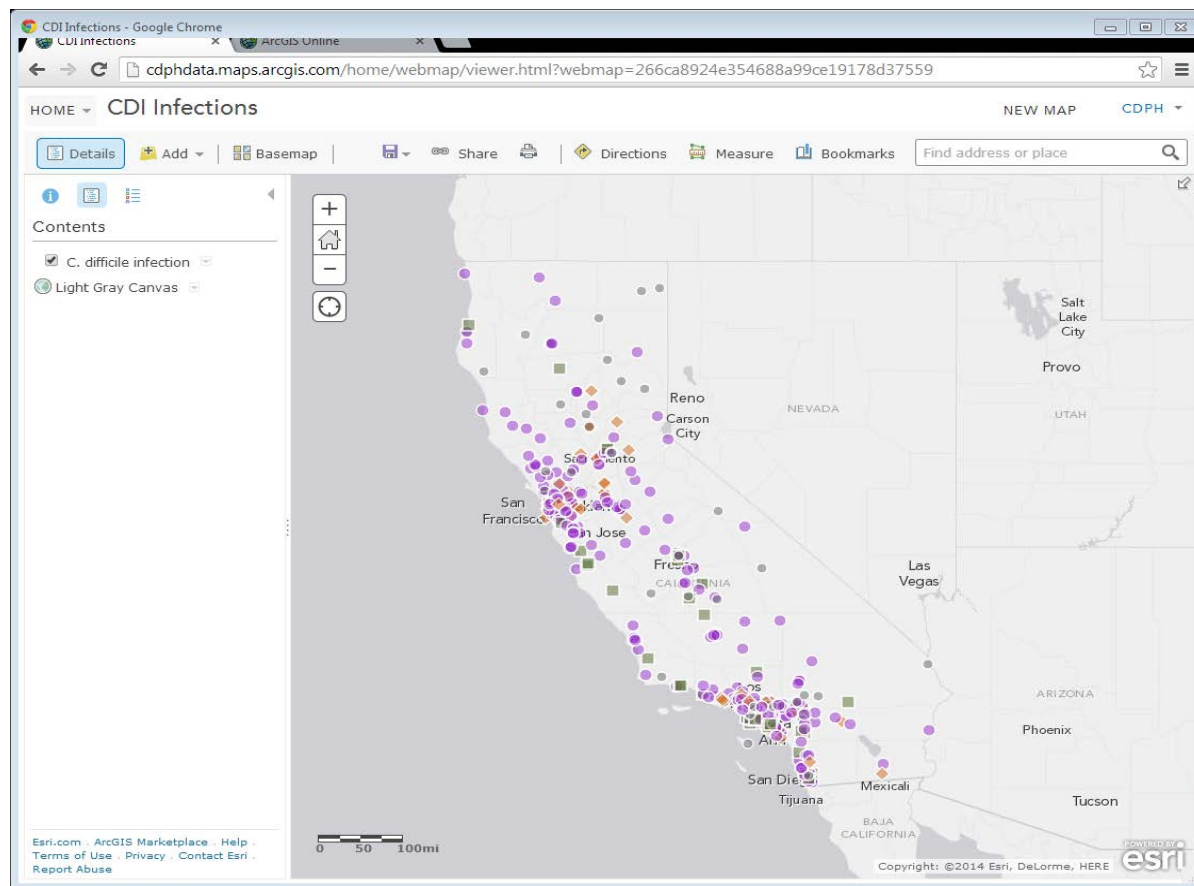
Shared Environment

Used ArcGIS Online; viewable by the external Epidemiology Unit staff and other participants



Shared Environment

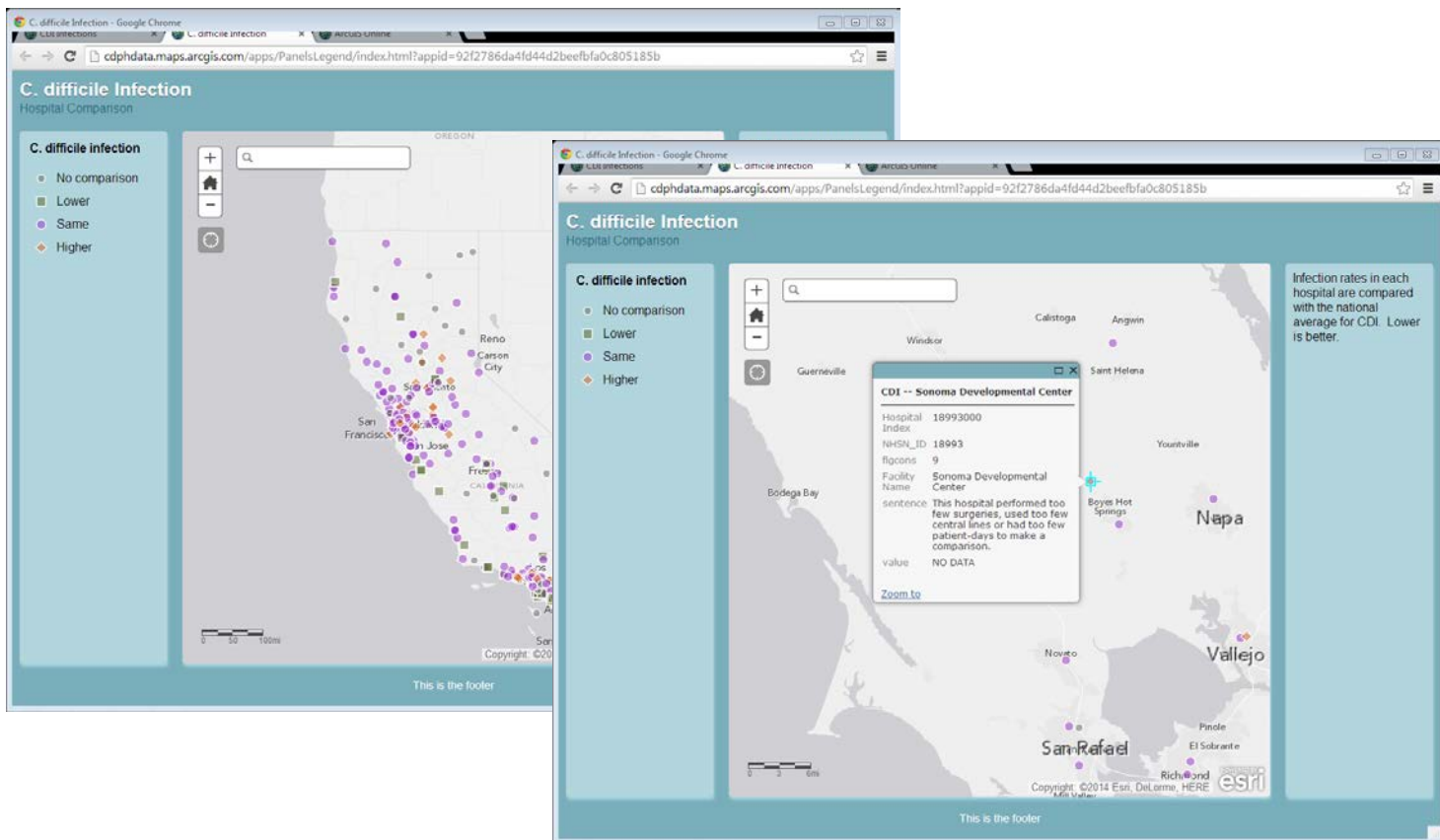
We created a web map online, showing each reported condition and some map options to consider



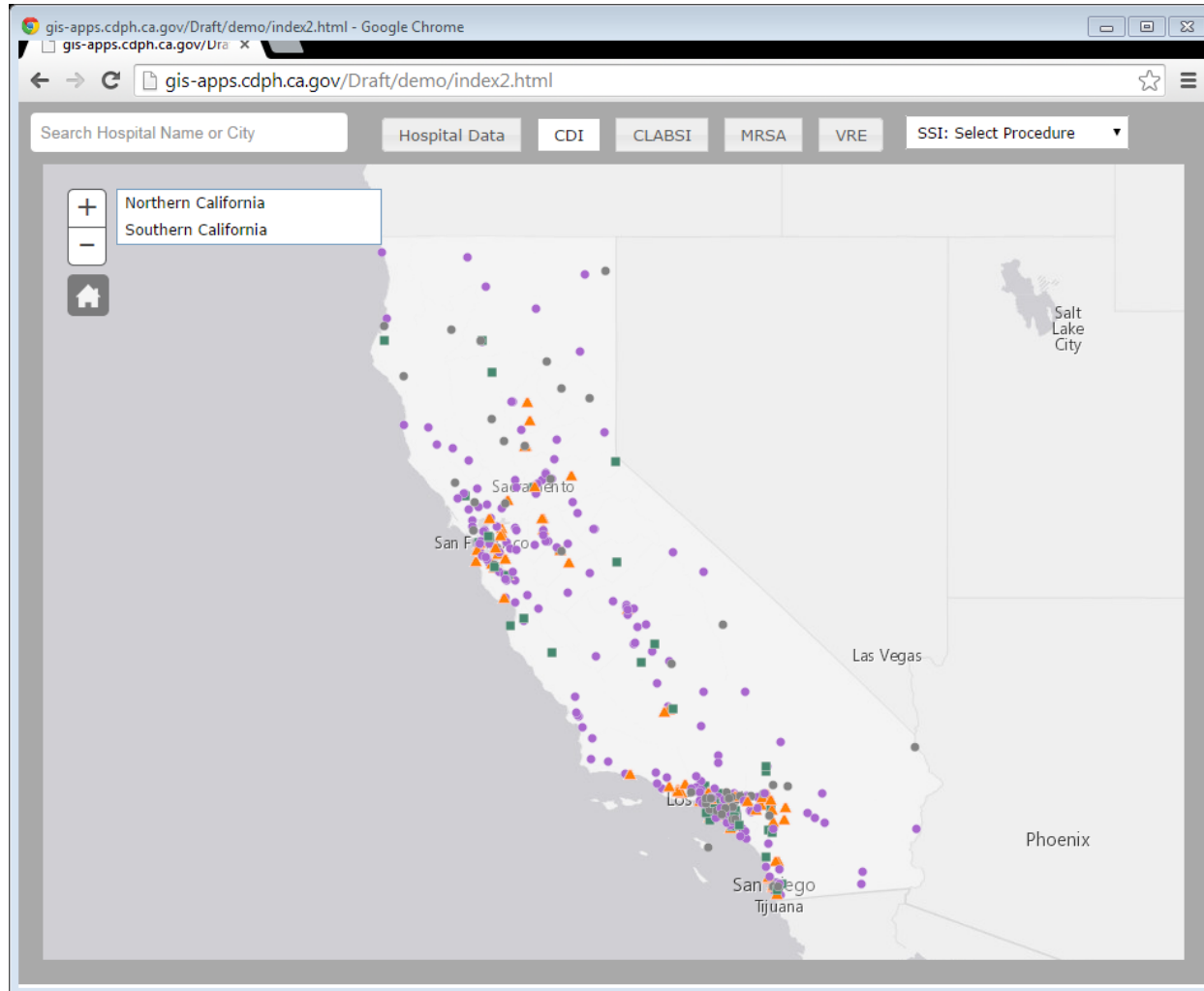
Shared Environment

We created a related Web Map Application, demonstrating out of the box capability and popup customization.

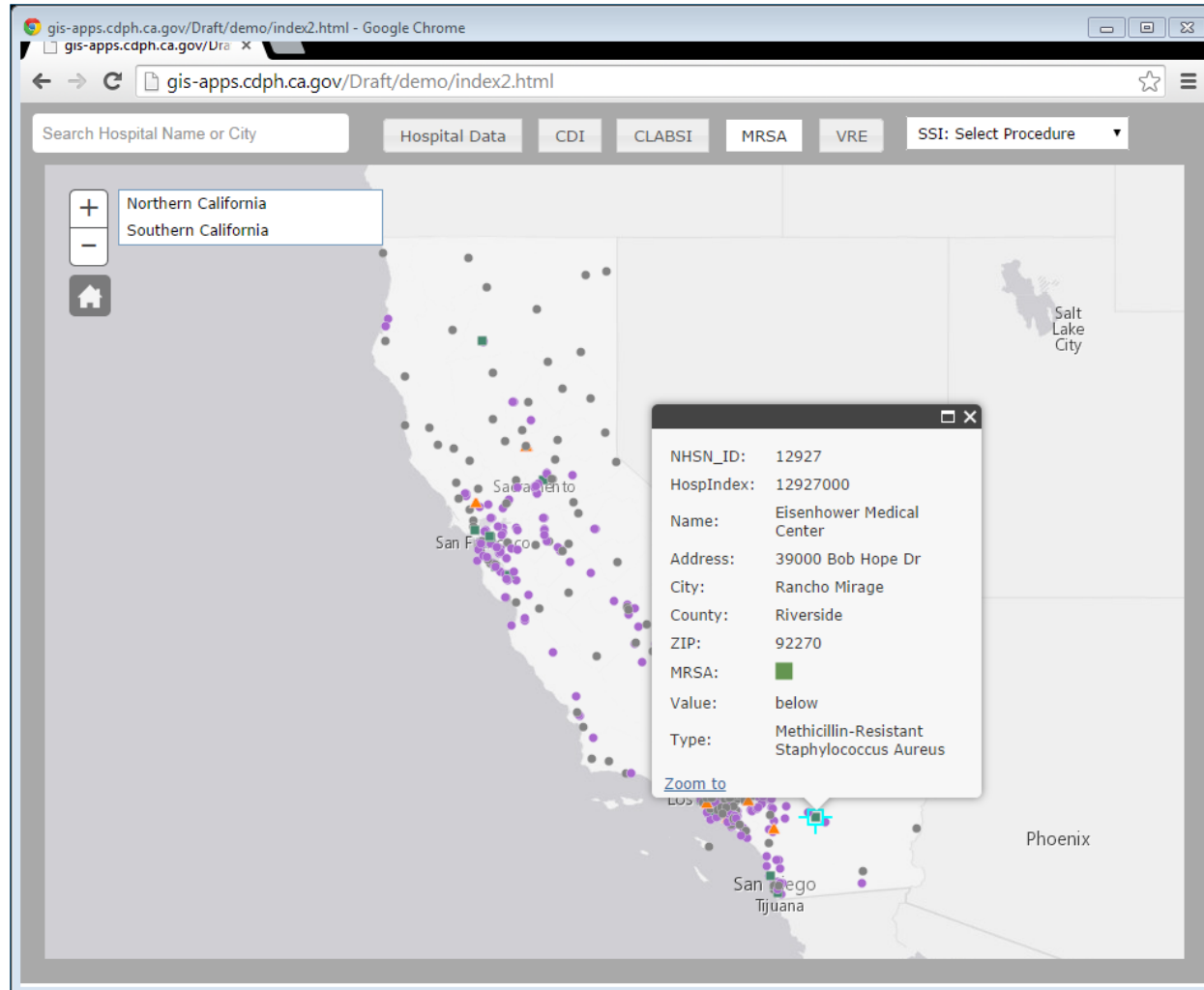
We also created a version using the template for mobile devices.



Test & Production



Test & Production





Future Work Plans

Near Term

- Continue to work with attributes and popup information
- Still getting base data corrections; will help refine process for next update
- Will require some effort to get into SharePoint; also upgrading to SP 2013 in future
- Integration with Open Data Initiative

Next Phase

- Funding for Future Development
- Hospital compare, other external linkings
- Development for Mobile Devices
- Only-to-be-Imagined Applications

Comments? Questions?
anne.millington@cdph.ca.gov

