New Tactics for Old Problems

2:15PM EST | November 18th, 2020 | 2020 SyS Symposium

Moderators:
Bill Smith, MS – Maricopa County Department of Public Health (Arizona)
Fatema Mamou, MPH – Michigan Department of Health and Human Services

Speakers:
Amy Ising, MSIS – University of North Carolina at Chapel Hill
Sandra Gonzalez, PhD, MPH – Nebraska Department of Health and Human Services
James Muncy, MPH – South Carolina Department of Health and Environmental Control
Dave Atrubin, MPH – Florida Department of Health
Lakshmi Radhakrishnan, MPH – CDC/NSSP
Zach Stein, MPH – ICF Consultant, CDC/NSSP

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Community of Practice
Advancing the Science and Practice of Syndromic Surveillance

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Council of State and Territorial Epidemiologists

Amy Ising, MSIS
University of North Carolina at Chapel Hill

Using Local SyS Data for Timely Chronic Disease Surveillance

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Timely, Granular Data for Chronic Diseases

- Commonly used secondary data sources, e.g., BRFSS & mortality data, can lack timeliness, representativeness and/or granularity
- Local health departments (LHDs) need access to timely subcounty data to inform their decision-making for chronic diseases
- Limited local health department resources require low-cost solutions → evaluate syndromic surveillance data for utility

Prior Uses of SyS ED Data for Chronic Disease

- General descriptive statistics & trends
- Syndrome definition evaluation through retrospective analyses (primarily chief complaint and ICD-9-CM)
- Smoking ban impacts
- Exacerbations from weather events (storms, wildfires, poor air quality days)

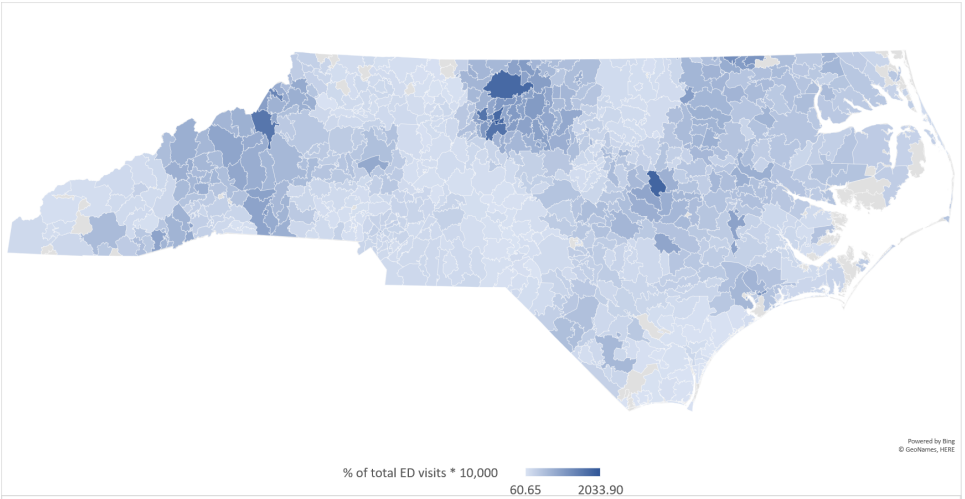
https://cchi.web.unc.edu/using-syndromic-ed-visit-data-for-chronic-disease-surveillance/

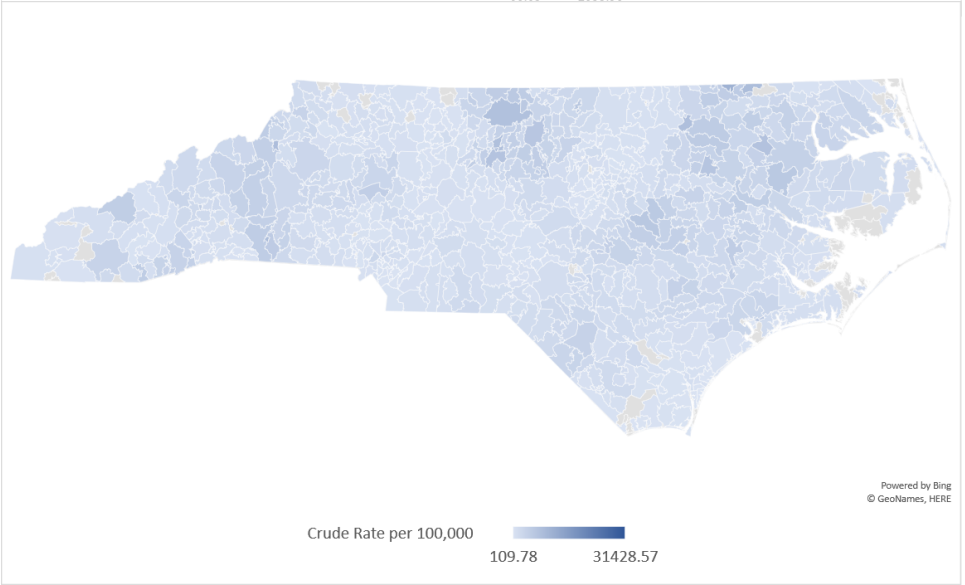
Evaluating NC DETECT for Chronic Diseases

- Calculate rates and trends for asthma, COPD, CKD, CVD, diabetes, stroke/TIA, & oral health
  - ICD-10-CM-based definitions
- Compare to other commonly-used data sources, e.g., BRFSS/County Health Rankings, Mortality, Medicare
- Develop dashboards and evaluate utility based on LHD feedback

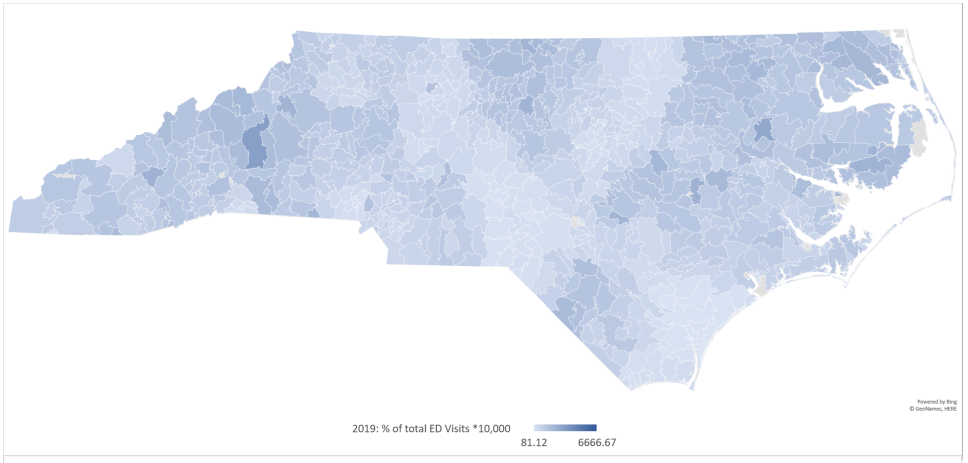
% of Total ED Visits (top) vs. Population (bottom)

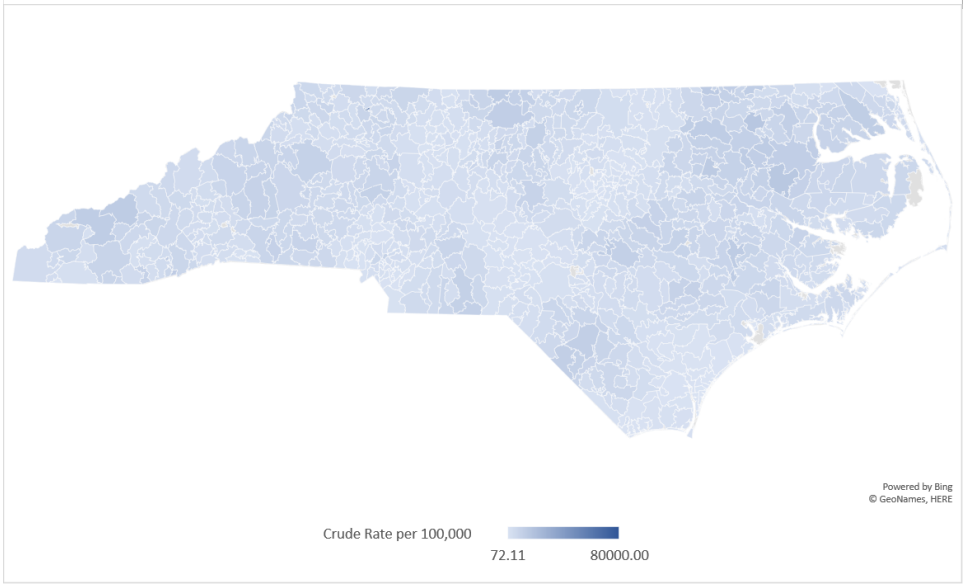
Asthma



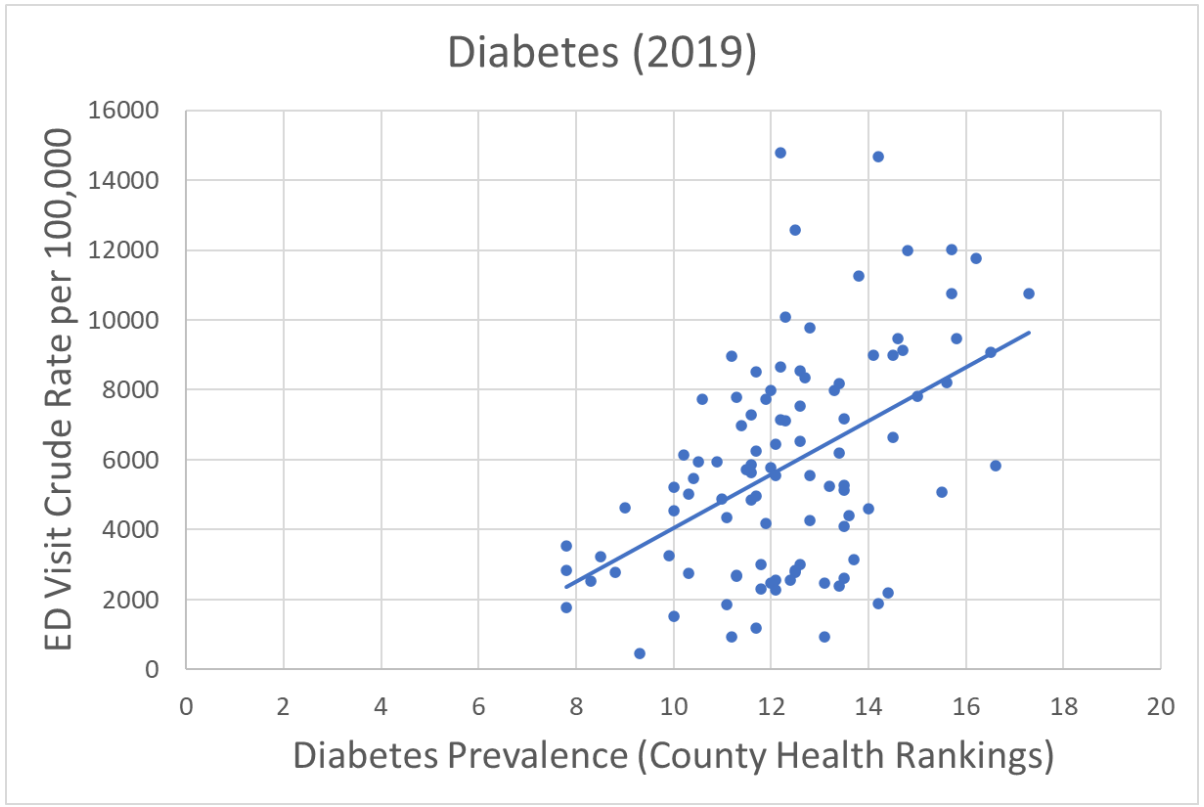


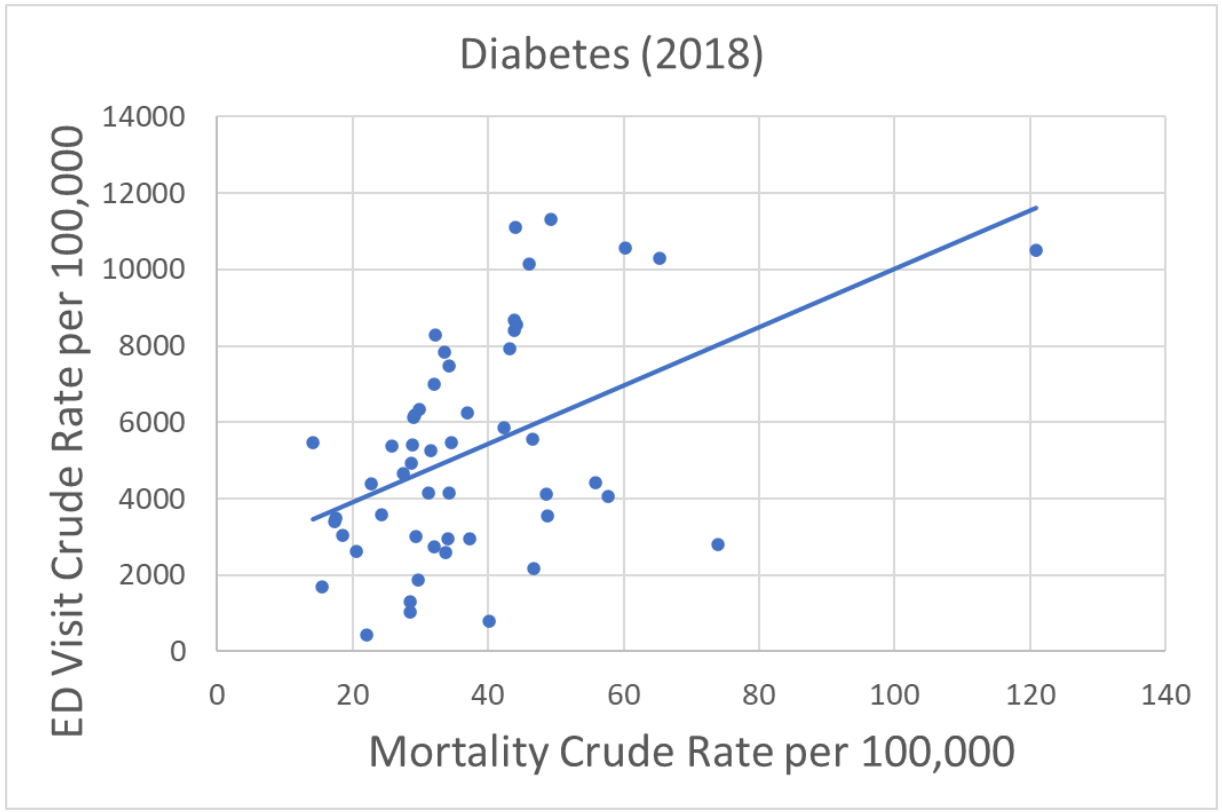
Diabetes





Diabetes Data Source Comparison (Preliminary)





Acknowledgements

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Sandra Gonzalez, PhD, MPH
Nebraska Department of Health and Human Services

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Using SyS to Assess the Impact of Environmental Factors on Asthma- and COPD-Related ED Visits in Douglas County, Nebraska

Sandra Gonzalez [1,2], Anne L. O'Keefe [3], Ming Qu [1], Tricia D. LeVan [4] and Lynette M. Smith [4]

(1) Nebraska Department of Health and Human Services

(2) University of Nebraska-Lincoln

(3) Douglas County Health Department

(4) University of Nebraska Medical Center

University of Nebraska Lincoln

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Background

- Asthma and chronic obstructive pulmonary disease (COPD) are relevant chronic diseases and health disparities in Douglas County, Nebraska.

- Currently there is a lack of information describing the impact of environmental factors in Nebraska on the burden of emergency department (ED) visits or hospitalizations related to these chronic respiratory (CR) diseases.
  - This information could help develop prevention strategies, as well as inform interventions.

Sources: NDHHS, 2016 http://dhhs.ne.gov/Reports/Statewide%20Health%20Needs%20Assessment%20-%202016.pdf

Professional Research Consultants, Inc. , 2015
https://www.douglascountyhealth.com/images/stories/2015%20PRC%20CHNA%20Report%20-%20Omaha%20Metro%20Area%20Douglas%20Sarpy%20Cass%20Pottawattamie%20Counties.pdf

DCHD, 2007 http://www.douglascountyhealth.com/images/stories/living/Asthma_Data_Report_FINAL3.pdf

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Objective

- To assess the association between the number of CR-related weekly ED visits, and weekly seasonal viral respiratory (SVR)- related ED visits, aeroallergen counts, and outdoor air pollutant and temperature levels, in Douglas County, Nebraska.

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Methods

- Time frame: MMWR week 9, 2016 to MMWR week 52, 2018 (February 28, 2016 to December 29, 2018)

- Data sources:

1) Nebraska DHHS SyS ED data from **8 of 9** hospitals in Douglas County, NE
   - A total of **24,485** CR-related ED visits were obtained during the study period.

2) Outdoor air quality and temperature data from the Environmental Protection Agency

3) Pollen and mold data from the National Allergy Bureau (NAB) certified station located in Bellevue, NE

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Methods

- ESSENCE queries containing chief complaint search terms and discharge diagnostic codes (ICD-9-CM and ICD-10-CM) were developed to identify CR (i.e., asthma or COPD) and SVR (i.e., influenza, respiratory syncytial virus, or adenovirus) ED visits.

Generalized linear models (GLMs)

- Negative Binomial models were used to determine association between the number of CR- related weekly ED visits and the environmental factors of interest

- Stratification of the model was used to account for possible cofounding effect of patient age group and interaction with season

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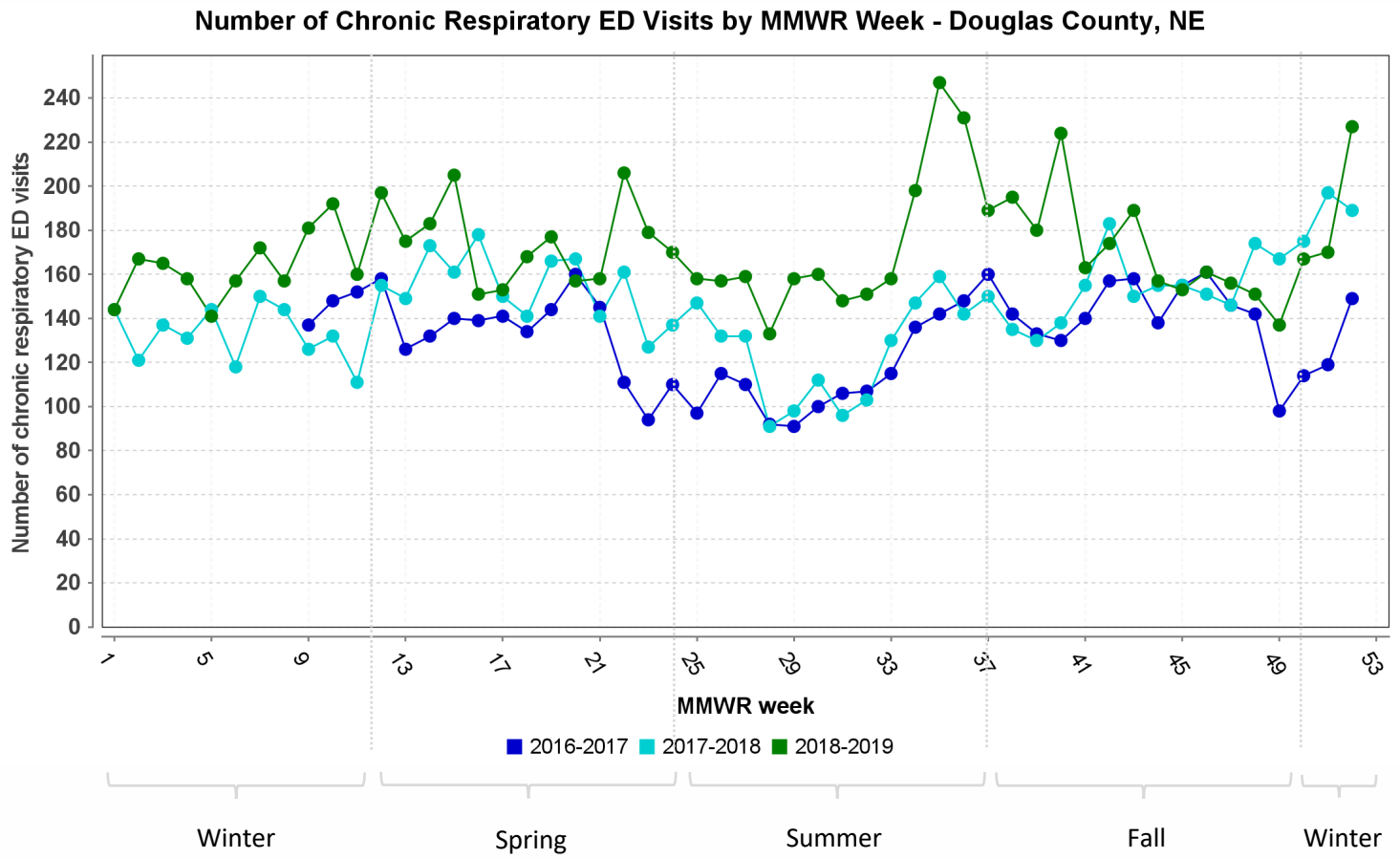
Outcome Variable: Number of Chronic Respiratory ED visits by MMWR week



Seasons by MMWR week:

Winter = wks. 51-11

Spring = wks. 12-24

Summer = wks. 25-37

Fall = wks. 38-50

Chronic respiratory (CR) ED visits descriptive statistics						
	N	Mean	Std. Dev.	Minimum	Maximum	Median
CR ED visits by MMWR week - All	148	165	38	94	258	159
CR ED visits by MMWR week - Winter	31	178	44	115	258	161
CR ED visits by MMWR week - Spring	39	172	38	94	254	160
CR ED visits by MMWR week - Summer	39	150	37	95	248	148
CR ED visits by MMWR week - Fall	39	165	28	103	226	161

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Significant univariate parameter estimates adjusted by season for chronic respiratory related ED visits in Douglas County, NE during MMWR weeks 9-2016 to 52-2018

	Log-link Negative Binomial		
Variable	**β**	**95% C.I.**	**p-value**
Spring			
Outdoor Air Pollutants			
$PM_{2.5}$ ($\mu g/m^3$ per hour)	0.0238	(0.0076, 0.0399)	0.0039
Temperature			
Minimum Temperature (°F, 24 hours)	-0.0046	(-0.0084, -0.0009)	0.0155
Summer			
Seasonal viral respiratory related ED visits (per MMWR week)	0.0045	(0.0030, 0.0059)	< 0.0001
Aeroallergens			
Weed pollen (counts per m^3 air/ day)	0.0008	(0.0002, 0.0014)	0.0083
Mold spores (counts per m^3 air/ day), 1000 unit increase	0.0038	(0.0014, 0.0061)	0.0018
Outdoor Air Pollutants			
Ozone (ppm/ hour)	-14.0118	(-26.2940, -1.7297)	0.0254
SO_2 (ppb/ hour)	-0.2245	(-0.4338, -0.0151)	0.0356
Fall			
Seasonal viral respiratory -related ED visits (per MMWR week)	0.0010	(0.0002, 0.0019)	0.0175
Outdoor Air Pollutants			
CO (ppm/hour)	-0.8388	(-1.3913, -0.2862)	0.0029
$PM_{2.5}$ ($\mu g/m^3$ per hour)	-0.0185	(-0.0306, -0.0064)	0.0028
Winter			
Seasonal viral respiratory related ED visits (per MMWR week)	0.0007	(0.0004, 0.0009)	< 0.0001
Temperature			
Minimum Temperature (°F, 24 hours)	-0.0062	(-0.0111, -0.0013)	0.0126

- **Significant univariate parameter estimates were selected to be included in the multivariable negative binomial models.**

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Multivariable analysis by season for CR- related ED visits in Douglas County, NE during MMWR weeks 9-2016 to 52-2018

	Log-link Negative Binomial						
Variable	***β***	**95% C.I.**		**p-value**	**R.R.**	**95% C.I.**	
Spring							
Aeroallergens							
Mold spores (counts per m^3 air/ day), 1000 unit increase	0.0064	0.0034	0.0095	< 0.0001	1.0064	1.0034	1.0095
Outdoor Air Pollutants							
$PM_{2.5}$ (µg/m^3 per hour)	0.0232	0.0078	0.0386	0.0031	1.0235	1.0078	1.0394
Temperature							
Minimum Temperature (°F, 24 hours)	-0.0102	-0.0152	-0.0052	< 0.0001	0.9899	0.9849	0.9948
Summer							
Seasonal viral respiratory related ED visits (per MMWR week)	0.0045	0.0030	0.0059	< 0.0001	1.0045	1.0030	1.0059
Fall							
Seasonal viral respiratory related ED visits (per MMWR week)	0.0010	0.0002	0.0017	0.0117	1.0010	1.0002	1.0017
Outdoor Air Pollutants							
CO (ppm/hour)	-0.8107	-1.3240	-0.2974	0.0020	0.4445	0.2661	0.7427
Winter							
Seasonal viral respiratory related ED visits (per MMWR week)	0.0007	0.0004	0.0009	< 0.0001	1.0007	1.0004	1.0009

- **Interactions**
  - Models were stratified by season since significant interactions were observed between season and most of the explanatory variables.

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Relative risks by season and age group for chronic respiratory related ED visits in Douglas County, NE during MMWR weeks 9-2016 to 52-2018

Variable	< 18yrs.			18 to 39 yrs.			≥ 40 yrs.			
	R.R.	95% C.I.	p-value	*R.R.*	95% C.I.	p-value	*R.R.*	95% C.I.	p-value	
Spring										
Aeroallergens										
Mold spores (counts per m^3 air/ day), 1000 unit increase	1.0066	1.0007	0.9876	0.0280	1.0103	1.0057	1.0148	< 0.0001	1.0035	1.0002	1.0068	0.0374
Outdoor Air Pollutants										
$PM_{2.5}$ (µg/m^3 per hour)					1.0381	1.0150	1.0617	0.0011	1.0244	1.0074	1.0416	0.0047
Temperature										
Minimum Temperature (°F, 24 hours)	0.9811	0.9716	0.9907	0.0001	0.9889	0.9815	0.9963	0.0035	0.9946	0.9894	1.0000	0.0484
Summer										
Seasonal viral respiratory related ED visits (per MMWR week)	1.0044	1.0011	1.0077	0.0093	1.0205	1.0072	1.0340	0.0025				
Aeroallergens										
Weed pollen (counts per m^3 air/ day)	1.0025	1.0016	1.0034	< 0.0001								
Mold spores (counts per m^3 air/ day), 1000 unit increase									1.0030	1.0002	1.0058	0.0345
Fall										
Seasonal viral respiratory related ED visits (per MMWR week)									1.0073	1.0011	1.0135	0.0208
Aeroallergens										
Mold spores (counts per m^3 air/ day), 1000 unit increase	0.9952	0.9913	0.9991	0.0170	0.9955	0.9916	0.9994	0.0226				
Outdoor Air Pollutants										
CO (ppm/hour)					0.1645	0.0599	0.4517	0.0005				
$PM_{2.5}$ (µg/m^3 per hour)	1.0318	1.0090	1.0551	0.0059					0.9778	0.9630	0.9927	0.0038
Temperature										
Minimum Temperature (°F, 24 hours)	1.0144	1.0051	1.0239	0.0023	1.0098	1.0009	1.0190	0.0309				
Winter										
Seasonal viral respiratory related ED visits (per MMWR week)					1.0033	1.0012	1.0054	0.0020	1.0027	1.0017	1.0037	< 0.0001

- **Significant associations:**
  - **weekly # of SVR ED visits**
  - **mean weed pollen counts**
  - **mean mold spore counts**
  - **mean minimum temperature**
  - **mean CO levels**
  - **mean $PM_{2.5}$ levels**
- **Discrepancies in significant associations between the CR- related weekly ED visits and environmental variables observed after stratifying the model by season and age groups.**

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Conclusions

- Results suggest the association between environmental factors and CR- related ED visits in Douglas County, Nebraska could be affected not only by SVR disease cycles, temperature, and other environmental factors, but also by differences in exposure by age group.

- Results also indicate that SyS can be used for the timely assessment of CR-related ED visit trends and its association with environmental factors.

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National Allergy Bureau certified pollen count station in Bellevue, NE

- The Asthma and Allergy Center, PC
  - Linda B. Ford, MD FAAAAI, Pollen Station Head
  - Michelle Kelly, CMA

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James Muncy, MPH

South Carolina Department of Health and Environmental Control

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South Carolina Department of Health and Environmental Control

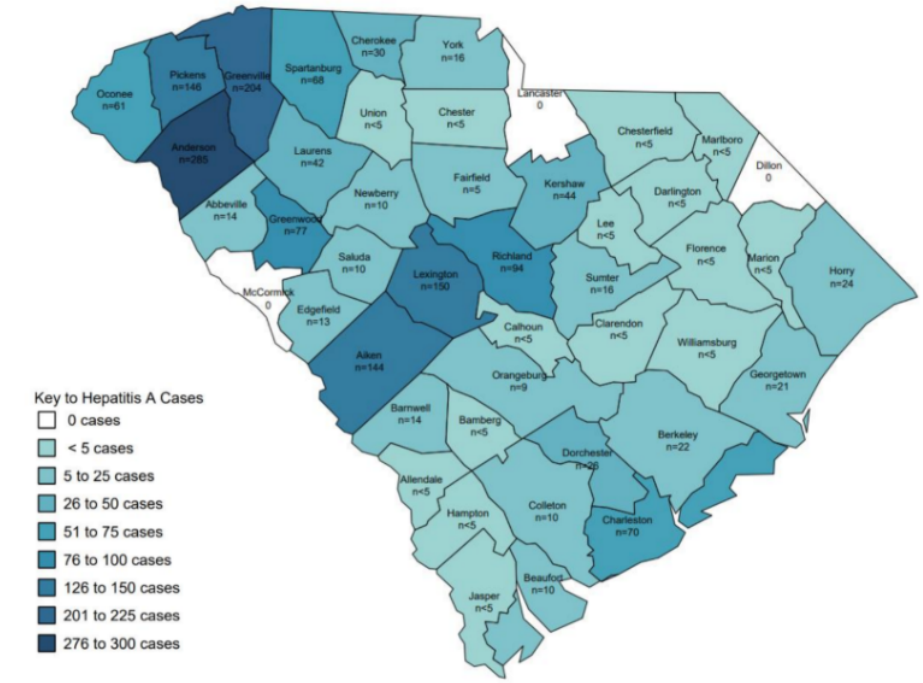
Utilization of Syndromic Surveillance during a Statewide Outbreak of Hepatitis A in South Carolina

James Muncy, MPH

Background

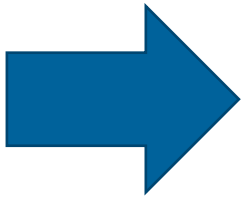
- Hepatitis A is an acute liver infection caused by the hepatitis A virus and is typically transmitted via the fecal-oral route or through consumption of contaminated food or water
- In May 2019, SC DHEC declared a statewide outbreak of hepatitis A after a large increase in cases

Map 1: Confirmed HAV cases by county, November 1, 2018 – October 9, 2020 (n = 1,660)

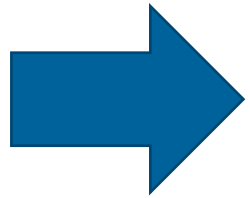


Methods

Utilized the myAlert function in ESSENCE to send automated email alerts when a record met the CDC Hepatitis A v1 syndrome definition



ESSENCE records matched to the SC electronic disease surveillance system (SCION) on age, DOB, sex, case ZIP code, and treating facility



Cases not in SCION were referred to regional epidemiology staff for follow up with hospitals

Results

803 confirmed hepatitis A cases → **185** potential cases in ESSENCE → **10** cases (4.2%) not previously reported

Conclusions

- Syndromic surveillance can be used to supplement traditional surveillance during outbreaks to identify cases in a timely manner
- The myAlert feature reduces manual work of staff by automating queries
- These alerts can be used for other public health events such as the opioid epidemic

South Carolina Department of Health and Environmental Control

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NOVEL USE OF SYNDROMIC SURVEILLANCE TO IDENTIFY VACCINE-ASSOCIATED ADVERSE EVENTS

Zach Stein and Lakshmi Radhakrishnan

Centers for Disease Control and Prevention

Division of Health Informatics and Surveillance (DHIS)

Vaccine-Associated Adverse Events Syndrome Definition

- **Goal**: To assist public health partners in capturing vaccine adverse events through syndromic surveillance data by developing a sensitive query in anticipation of a mass-vaccination event

Discharge Diagnosis Query

Hierarchy of Inclusion Factors

1. Discharge diagnosis codes

2. Highly-relevant terms (vaccine reaction, vaccine side effect)

3. Time + Vaccine + Effect

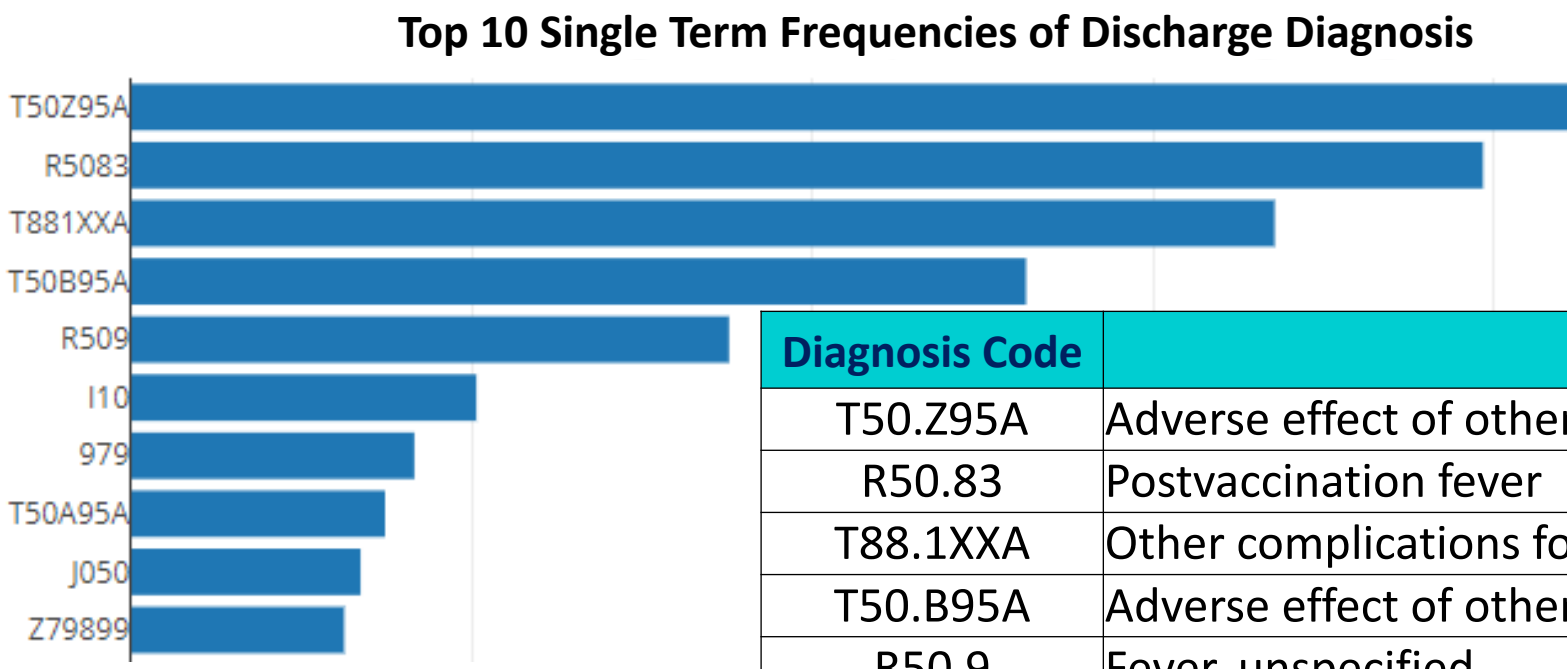
3a. Time + Vaccine (regardless of effect)

3b. Vaccine + Effect

Notes on Discharge Diagnosis Data

Notes	ICD-10	ICD-9	SNOMED
Adverse effect of, poisoning by, and underdosing of bacterial, viral and other vaccines, and biological substances	T50.A, T50.B, T50.Z	978, 979, 964.6	420113004, 408672009, 293125008, 293120003, 293118001, 293109003, 293116002, 293117006, 219075006, 219084006, 219088009, 293104008
Anaphylactic reaction and other serum reaction due to vaccination.	T80.52, T80.62	999.42, 999.52	1592012100011910 3
Infection and other complications (not elsewhere classified), following immunization	T88.0, T88.1	999.0, 999.39	47988006, 31935007
Postvaccination fever	R50.83	780.63	123471000119103
Postimmunization acute encephalopathy, encephalitis, myelitis, and encephalomyelitis	G04.32, G04.02	323.5	

Top 10 Discharge Diagnosis Frequencies, Sep 1-Dec 29, 2019



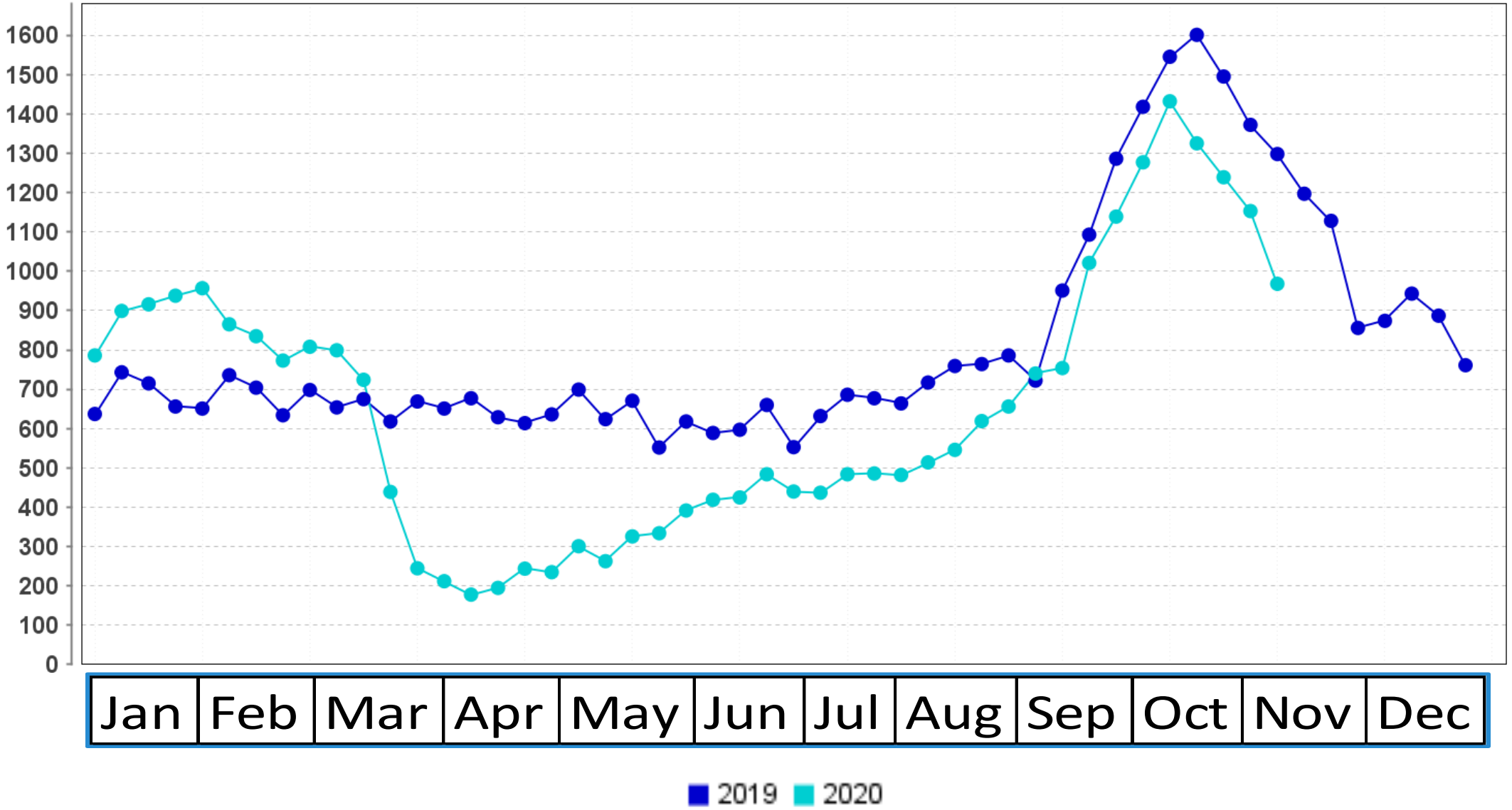
Diagnosis Code	Description
T50.Z95A	Adverse effect of other vaccines and biological substances
R50.83	Postvaccination fever
T88.1XXA	Other complications following immunization
T50.B95A	Adverse effect of other viral vaccines
R50.9	Fever, unspecified
I10	Essential (primary) hypertension
979	Poisoning by other vaccines and biological substances (Suspect improper code usage)
T50.A95A	Adverse effect of other bacterial vaccines
J05.0	Acute obstructive laryngitis (croup)
Z79.899	Other long term (current) drug therapy

Chief Complaint Query

Chief Complaint Terms

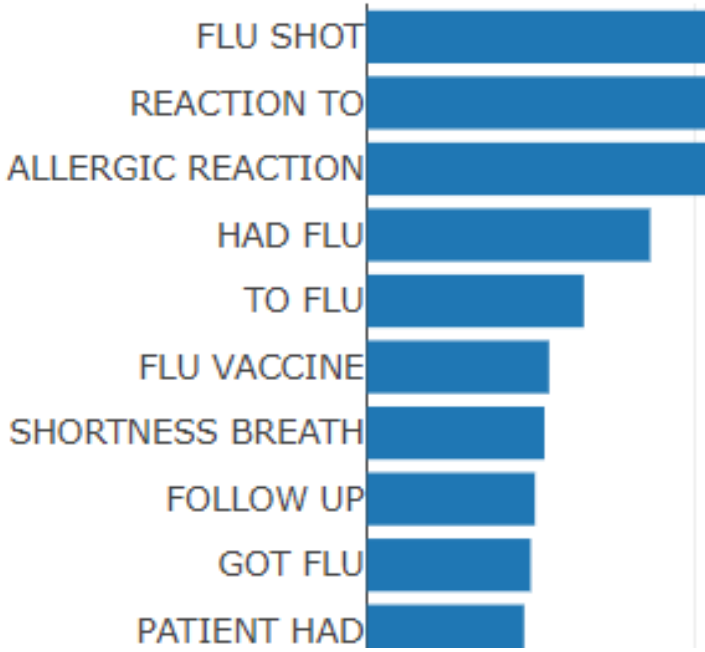
(,(,^vaccin^,or,^immuniz^,or,(,^shot^,and,(,^flu^,or,Flu^,or,^influenza^,or,^shingles^,or,^pne^,or,^pna^,or,^tetn^,or,^tetanu^,or,^tdap^,or,^booster^,or,^td^,or,^hpv^,or,^mmr^,or,^covid^,or,^corona^,),),),and,(,^reaction^,or,^allerg^,or,^adverse^,or,^side effect^,or,^had^,or,^received^,or,^got^,or,^was given^,or,^after^,or,^post^,or,^last time^,or,^recent^,or,^since getting^,or,^since receiving^,or,^since yesterday^,),or,^shot^,AND,(,^Reaction^,or,^Allergic^,or,^Adverse^,),),andnot,(,^no vaccine^,or,^no immuniz^,or,^immunization not carried^,or,^[;/]Z28.21^,or,^[;/]Z2821^,or,^[;/]P55.1^,or,^[;/]P551^,or,^has received first dose^,or,^has received second dose^,or,^has received third dose^,or,^dog^,or,^cat^,or,^wound^,or,^up to date^,or,^ABO isoimmunization of newborn^,or,^well child^,or,^well visit^,or,^encounter for immunization^,or,^loss of consciousness^,or,^aftercare^,or,^UTD^,or,^up to date^,or,^wound^,or,^bite^,or,^air vac^,or,^Denies any previous adverse reaction^,or,^did not receive^,)

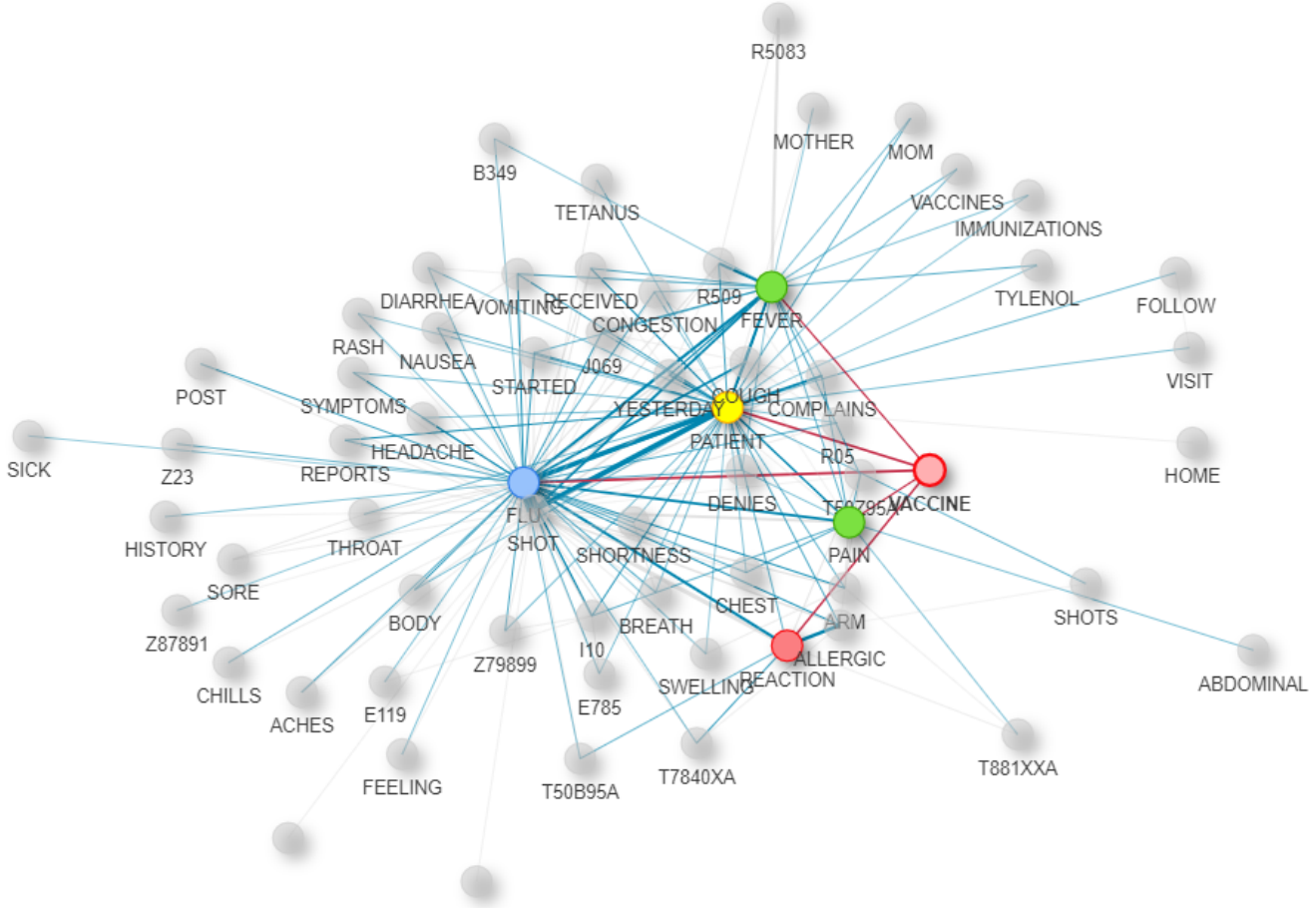
Vaccine Associated Adverse Events Syndrome Definition, 2019-2020



Top 10 Bi-gram Frequencies and Word Association Cloud, Sep 1-Dec 29, 2019

Top 10 Bigram Frequencies of Chief Complaint Parsed





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National Syndromic Surveillance Program

Community of Practice

Advancing the Science and Practice of Syndromic Surveillance

Block Schedule

	Training	Methods	Innovation
1-1:15PM EST	Daily Opening, Logistics, Overview		
1:15-2PM EST	Training: Call Up Your Data Using APIs	Breakout: Querying from Scratch - Cooking Up New Syndromes	Training: Data Sharing Step-by-Step Using the AMC
	...BREAK...		
2:15-3PM EST	Training: Telling Your Story - Insights and Tips to Promote Syndromic Surveillance	Breakout: The Art of Surveillance - Data Visualizations	Lightning: New Tactics for Old Problems
	...BREAK...		
3:15-4PM EST	Training: Dashboard Creation in NSSP ESSENCE	Breakout: Making the Best of a SyS Situation - Data Quality for SyS	Roundtable: COVID, Current Events, and More - Discussing Syndromic Surveillance Practices in 2020
	...BREAK...		
4:15-5PM EST	Virtual Happy Hour		

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