

MICHIGAN DEPARTMENT OF HEALTH & HUMAN SERVICES

# Michigan Syndromic Surveillance System: Heat Syndrome Deployment

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*Putting people first, with the goal of helping all Michiganders lead healthier  
and more productive lives, no matter their stage in life.*

# Presentation Outline

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- Michigan Syndromic Surveillance System Overview
- History of Heat Illness Surveillance in Michigan
- Creation of Heat Syndrome
- Heat Syndrome Alerting Rules
- Results

# Michigan Syndromic Surveillance System (MSSS)

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- The objective of the Michigan Syndromic Surveillance System (MSSS) is to detect bioterrorism, emerging infections, and naturally occurring outbreaks more rapidly than through normal physician detection and reporting
- Based on Real-Time Outbreak Detection System (RODS) developed at the University of Pittsburgh
- Facilities voluntarily participate to send Emergency Department (ED) data to MDHHS
  - 73% of Michigan EDs are voluntarily sending data
  - Represents 83% of ED visits
- Data is exchanged in real-time or near real-time
- Recently introduced enhanced feeds that include more demographic data, disposition, and discharge diagnosis

# Michigan Syndromic Surveillance System (MSSS)

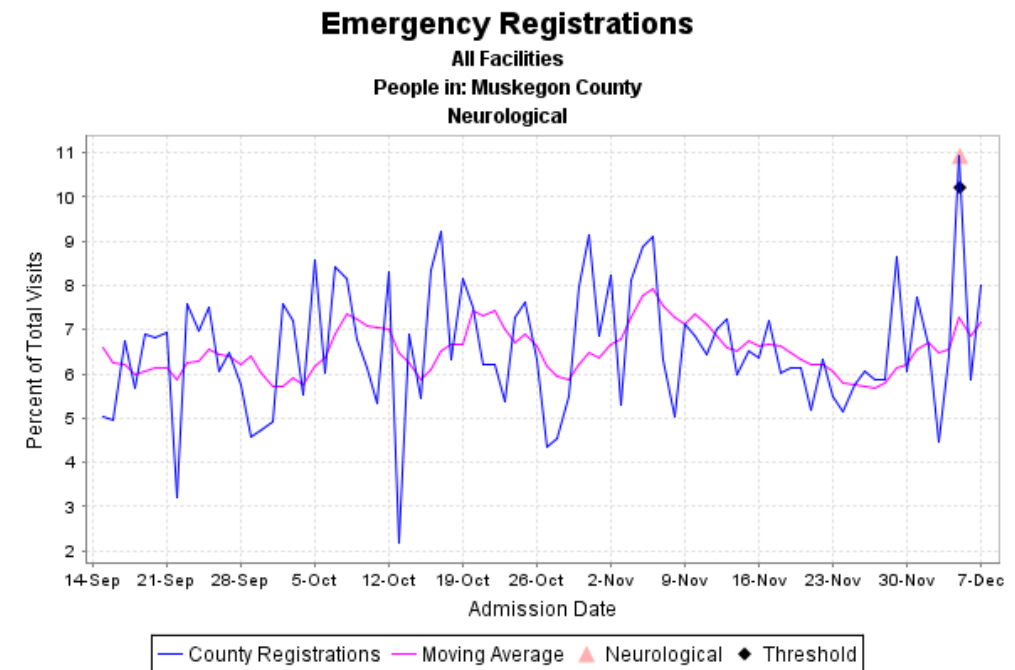
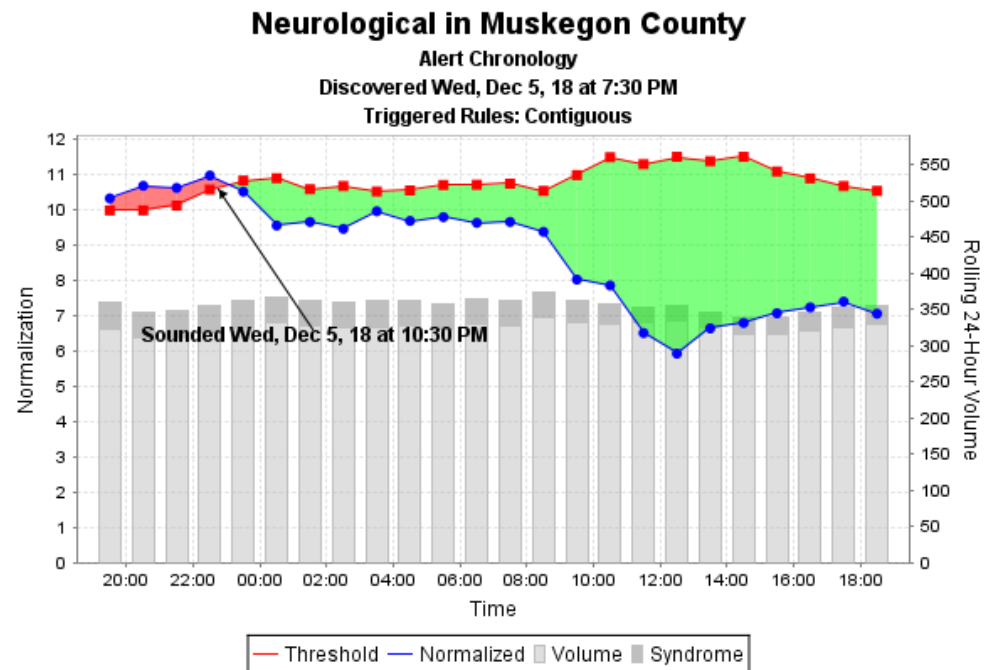
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- Virtual Private Network (VPN) HL7 to exchange data between participants and the MDHHS
- Each legacy message consists of:
  - Patient age, sex, home ZIP code
  - Visit date and time
  - Facility
  - Chief complaint
- Visit is classified into 1 of 10\* syndromic categories
  - Based on the chief complaint
  - Syndromes can be aggregated for review and analysis

\*This number includes the new Heat Syndrome

# Michigan Syndromic Surveillance System (MSSS)

- A detection algorithm runs every hour and an alert is generated if an aberration in the levels of a syndrome is detected at the state or county level



# MSSS Syndromes (excluding Heat)

Syndrome	% of Visits	Example	Sample Text (not inclusive)
Gastrointestinal	9-13%	“Stomach Pain”	Abdominal, stomach, gastric, enteritis, diarrhea, vomiting, nausea, n, v, abdomen, abd, gastroenteritis, nvd
Respiratory	8-16%	“Difficulty Breathing”	Cough, sore throat, congestion, wheezing, asthma, croup, respiratory, strep, cold, bronchitis, pneumonia, asthma, sob, sinus, uri, dyspnea, dib
Constitutional	7-10%	“General weakness”	Fever, weakness, dizziness, dizzy, temp, temperature, flu, light headed, chills, lethargy, fatigue, sweating, lethargic, febrile
Neurological	6%	“Confusion”	Migraine, headache, disoriented, syncope, fainted, paralysis, tingling, seizure, stroke, cva, convulsion, loc, mental, vertigo, meningitis, numb, confusion, dizzy, unconscious
Hemorrhagic	3%	“Nose bleed”	Epistaxis, bleeding, hemoptysis, hematuria, hematemesis, blood, bleed, hematochesia, hemorrhagic, hemorrhaging
Rash	1.5-2.5%	“Hives and itching”	Rash, hives, bumps, petechiae, purpura, ivy, dermatitis, pox, scabies, spots, shingles
Botulinic	<0.5%	“Slurred Speech”	Slurred, diplopia, dysphagia, photophobia, dysarthria, speaking, swallowing, blurred
Other	12-19%	“Right foot injury”	Laceration, injury, mva, broken, sprain, bite, abrasion, wound, suture, concussion, <b>sunburn</b> , pressure, fall, sugar, gsw, monoxide
Default	40-44%	“Med Refill”	Everything else (default category) – if complaint contains none of the recognized keywords – e.g. “assault/neck”, diabetes, back pain

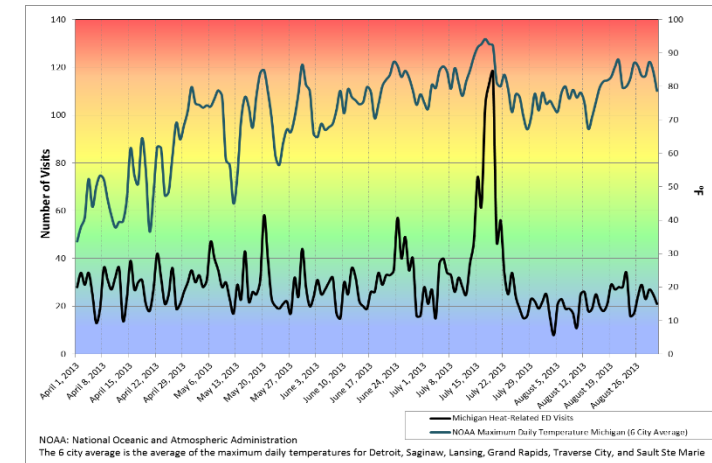
# Syndromic Surveillance: Complaint Coder

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- CoCo correctly classified 98% of chief complaints
  - CoCo originally designed by the RODS team
  - MDHHS version “trained” using MI ED chief complaints
- System is trained to recognize terms and categorize based on significance
  - Each syndrome classification is given a weighting
  - Chief complaint terms are given a weight
  - An algorithm is applied that categorizes the chief complaint into one (and only one) of the syndromes
    - “vomiting and fever” could be Gastrointestinal, but “fever” is more significant; categorized as Constitutional
    - “bleeding lacerations” could be Hemorrhagic, but “lacerations” is more significant; categorized as Other

# Heat-Related Illness Surveillance in Michigan

- Passive surveillance
- Ad Hoc Search
  - OR: dehyd sun prostration heat hyperthermia
  - NOT: Sunday heater heatrate cheat heatlh wheat flower beat
- Data is downloaded weekly during the summer months (June – September)
  - Data was reviewed and cleaned
  - An excel spreadsheet was created to manage the data
  - County, region, and syndrome was added to each ED registration
  - Custom charts were created
- A report is disseminated weekly to state officials, public health partners, and local health departments



V3319													
1	Admitted	Gender	Age	Syndrome	Complaint	County	Region	Date	Dehydration	HEAT	SUN		
3283	7/17/2013 21:19	M	23	Default	dehydration	Wayne	2S	17-Jul	YES	NO	NO		
3284	7/17/2013 21:24	F	30	Default	poss heat exhaustion	Delta	8	17-Jul	NO	YES	NO		
3285	7/17/2013 21:34	M	26	Default	heat exhaustion	Wayne	2S	17-Jul	NO	YES	NO		
3286	7/17/2013 21:35	M	47	Other	heat related injury leg cramp	Kent	6	17-Jul	NO	YES	NO		
3287	7/17/2013 21:48	F	21	Other	sunburn	Calhoun	5	17-Jul	NO	NO	YES		
3288	7/17/2013 21:53	M	23	Default	sun burns	Wayne	2S	17-Jul	NO	NO	YES		
3289	7/17/2013 21:58	F	3	Default	dehydration	Wayne	2S	17-Jul	YES	NO	NO		



# Creation of Heat Syndrome

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- List of “inclusion” terms includes one-word and two-word keywords
  - Includes misspellings and derivatives
  - The finalized Heat syndrome was implemented with 36 keyword terms
    - Dehydration, dehydrated, dehydrate, dehydrat, dehydration, heat, heatstroke, overheating, overheated, heating, heated, sun, sunburn, sunburnt, sunburned, hyperthermia, sunstroke, heat rash, heat exhaustion, heat stroke, over heated, heat exposure, heat related, heat exhaust, over heating, heat cramps, heat illness, heat issues, heat bumps, sun burn, sun poisoning, sun burned, sun blisters, sun reaction, heat syncope, heat fatigue
- Heat syndrome keywords are weighted so that inclusion terms that are detected add to the Heat classification total
- Weightings were revised during testing to fine-tune the classifications
  - Weighting for dehydration-related keywords was reduced
  - Weighting for the terms that may be classified in other syndromes
    - Examples: Heat stroke, Heat rash, Sun poisoning

# Creation of Heat Syndrome

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- Original intent was to add “exclusion terms” to assist the algorithm in classifying chief complaints into another, more appropriate syndrome
  - When this proved problematic, the exclusion terms were instead added as keywords to the Other syndrome
  - During the course of testing the Heat syndrome and reviewing results, the exclusion terms expanded to include the following
    - Attack, beat, flash, palpitations, rate, racing, flashes, pad, pack, vent
    - A higher weight was given to these terms

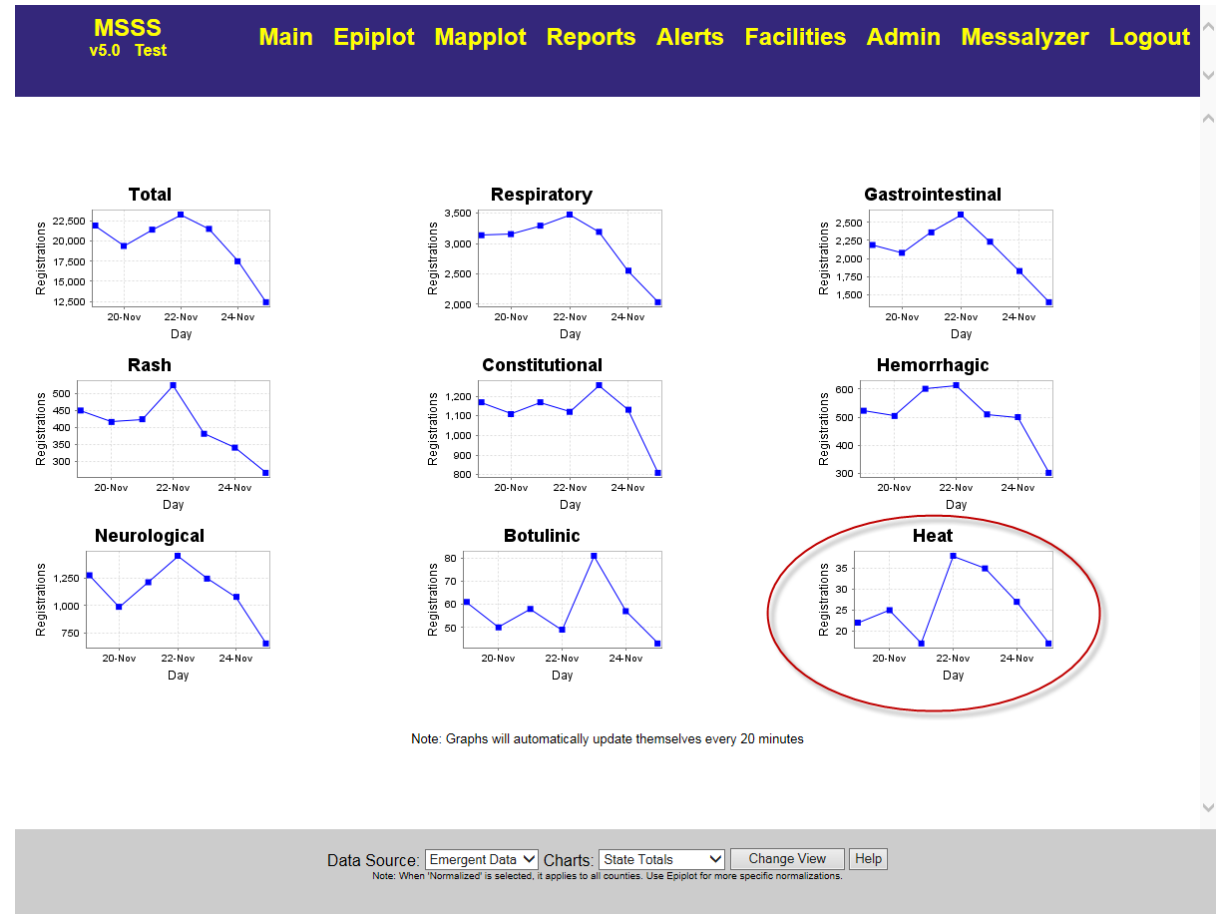
# Heat Syndrome Alerting Rules

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- Existing RODS-based “previous 120 days” baseline not effective for Heat
- A custom baseline was developed for the Heat syndrome
  - Used historical data from multiple years to develop a year-round baseline ratio (per 100 visits) of Heat syndrome classifications for State and each Michigan county
  - Also applied a minimum threshold of 5 classifications per county
- To signal alert, Heat classifications must exceed the minimum and the historical baseline ratio
  - The historical visit baseline was calculated per day, per county, and with a two-week averaging of these values around a given day when calculations are performed
- When alerts are generated the existing MSSS alerting structure notifies the appropriate people

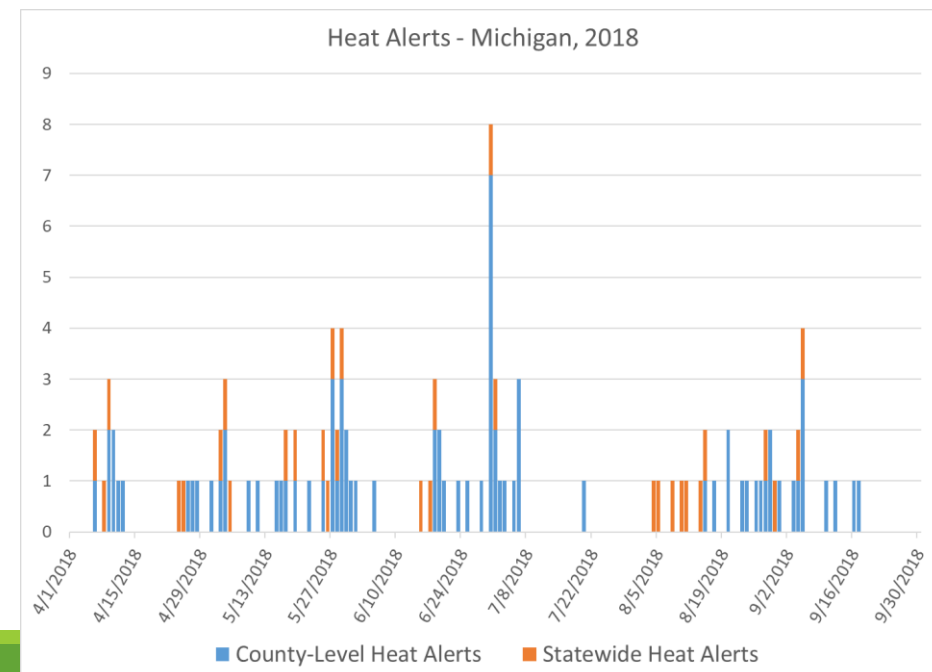
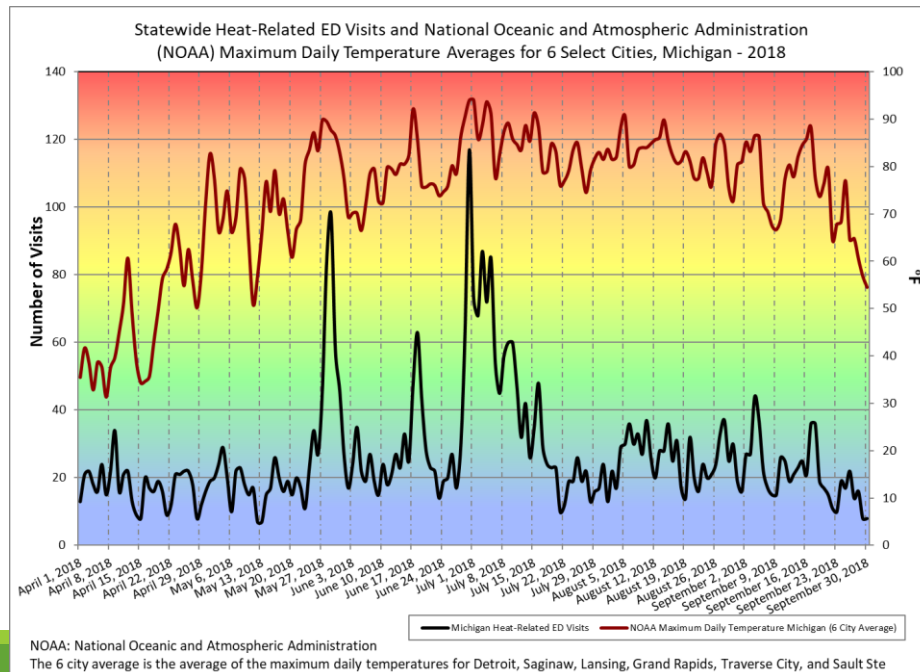
# Results

- Heat Syndrome was deployed in November 2016
- ED visits categorized as heat-related constitute a small proportion (0.1%-0.3%) of all ED visits reported into MSSS
- Majority are dehydration complaints which occur year round
- Significant increases in heat-related illnesses are observed during periods of extreme heat
- MSSS Main Page includes past week data for Heat syndrome



# Results

- Each heat alert was investigated by an epidemiologist
- State-level and county-level Heat alerts correlated with extreme heat events
- During the summer of 2018 a chart of Heat alerts was added to Michigan's weekly Heat-Related Illness Surveillance Report



# Conclusions

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- Results from participation in the project
  - Heat syndrome alerts prompted an earlier start of routine reporting on heat-related illness
  - Heat syndrome alerts led to earlier identification of increasing morbidity due to extreme heat events
  - Initiation of statewide press releases to educate the public on the health effects of extreme heat events
  - Increased jurisdiction-level notifications of potential health effects due to extreme heat events
  - Easier access to jurisdiction level heat-related illness data
  - Assistance with heat response planning at the jurisdictional level
- Lessons learned
  - Exclusion terms were assigned to the Other syndrome so that their presence would decrease the likelihood of a classification in the Heat syndrome
  - The Heat syndrome needs a tailored alerting baseline in RODS-based systems

# Acknowledgements

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