PROFILES OF SELECTED HEALTH EVENTS DETECTED IN EPICENTER

Syndromic surveillance is the classification of healthcare visits into syndrome or symptom categories to identify and characterize events of public health importance. In partnership with local health departments, the Ohio Department of Health has been analyzing chief complaint data from over 6 million annual healthcare visits transmitted by emergency departments and urgent care centers from around the state for over a decade. In most cases, data is also captured when an Ohio resident visits an emergency department in a neighboring state. Some examples of past health events where syndromic surveillance was used for situation awareness include infectious disease outbreaks, injuries when hurricane Ike (2008) passed through the state, seasonal and pandemic influenza surveillance and heat-related illness. Previous cluster detections include scabies, occupational exposures and carbon monoxide poisonings. The data is made available to over 500 authorized users at Ohio's local health departments and hospitals. State and local health departments investigate identified anomalies in the syndromic surveillance data and actively seek information for situational awareness during a health event.

Healthcare visit information is received in real-time or near real-time and includes chief complaint, basic de-identified demographic information and sometimes diagnosis and discharge disposition. The data is accessible in a web application called EpiCenter. EpiCenter automatically alerts system users to unusual trends and patterns in the data that may indicate a potential health event. The system also manages the syndrome classifications, anomaly records, investigation information and displays anomaly analytics, maps and subscription of automated alerting for users.

Classification of chief complaint data occurs by both syndrome and symptom category. These classifications have been developed to detect acute health events. State and local health departments review the syndrome and symptom anomalies, and if appropriate, investigate with the submitting facilities. The anomaly is then categorized into one of ten final dispositions to indicate whether it is related to a health event or a random occurrence. Anomalies that were determined to be duplicates or an incomplete assessment were excluded (see Technical Notes). Table 1 illustrates the final distribution of syndromic surveillance anomalies for 2013. A new disposition, "severe weather event," was added as an option for 2013. Comparisons of anomaly counts and percentages between years should not be made due to high variability of the data, classifier definition changes, circulating viruses, man-made and natural outbreaks and methods of analysis.

Table 1: Distribution of EpiCenter Anomalies, Ohio, 2013

Anomaly Disposition*	# of Events	% of Events
Environmental health event	10	0.4
Naturally occurring disease outbreak	22	0.9
Seasonal illness health event	795	34.5
Severe weather event	2	0.1
Other health event	125	5.4
Not a health event	325	14.1
Data error (facility or EpiCenter)	14	0.6
Unknown health event	78	3.4
Indeterminate	936	40.6
Total	**2,307**	**100.0**

Source of data: Ohio Department of Health Public Health Informatics & Vaccine-Preventable Disease Epidemiology Unit.
* Please see Technical Notes.

Multiple algorithms for syndromes and symptoms creates potential overlaps for the detection of health events. This overlap increases the odds of detecting a health event, but also creates duplicates (same or similar patient lists over the same or similar time period). Grouped anomalies were reclassified to provide a greater consistency of the reported events (see Technical Notes). Forty percent of the 2013 anomalies were classified as indeterminate in assessing if there was a health event (Table 1). Of the other dispositions, “Seasonal illness health event” then “Not a health event” had the second and third highest frequencies, respectively. The distribution across county and state geopolitical boundaries are highlighted in Table 2. The number of facilities, algorithm requirements and population size in some counties are certainly factors in the number and distribution of anomalies generated (Table 2). Some health events are seasonal in nature, like influenza in December and first quarter of the calendar year and respiratory illnesses associated with the start of grade-school (Table 3).

Table 2: Distribution of EpiCenter Anomalies by Jurisdiction, Ohio, 2013*

Jurisdiction	Environmental Health Event N (%)	Naturally Occurring Disease Outbreak N (%)	Seasonal Illness Health Event N (%)	Severe Weather Event N (%)	Other Health Event N (%)	Not a Health Event N (%)	Data Error (Facility or EpiCenter) N (%)	Unknown Health Event N (%)	Indeterminate N (%)	Total N (%)
Allen	0 (0)	0 (0)	18 (46)	0 (0)	0 (0)	11 (28)	0 (0)	0 (0)	10 (26)	39 (100)
Ashtabula	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	43 (100)	43 (100)
Athens	0 (0)	0 (0)	5 (21)	0 (0)	0 (0)	1 (4)	0 (0)	0 (0)	18 (75)	24 (100)
Auglaize	0 (0)	0 (0)	3 (20)	0 (0)	0 (0)	12 (80)	0 (0)	0 (0)	0 (0)	15 (100)
Belmont	0 (0)	0 (0)	4 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (100)
Brown	0 (0)	0 (0)	2 (25)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6 (75)	8 (100)
Butler	0 (0)	0 (0)	24 (35)	0 (0)	0 (0)	4 (6)	1 (1)	0 (0)	39 (57)	68 (100)
Carroll	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	12 (100)	12 (100)
Champaign	0 (0)	3 (17)	3 (17)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	12 (67)	18 (100)
Clark	0 (0)	1 (2)	4 (7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	51 (91)	56 (100)
Clermont	0 (0)	0 (0)	25 (60)	0 (0)	1 (2)	1 (2)	0 (0)	0 (0)	15 (36)	42 (100)
Clinton	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)
Columbiana	0 (0)	0 (0)	6 (16)	0 (0)	0 (0)	0 (0)	0 (0)	31 (84)	0 (0)	37 (100)
Coshocton	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)
Crawford	0 (0)	0 (0)	3 (33)	0 (0)	0 (0)	6 (67)	0 (0)	0 (0)	0 (0)	9 (100)
Cuyahoga	0 (0)	5 (5)	37 (37)	0 (0)	52 (51)	4 (4)	3 (3)	0 (0)	0 (0)	101 (100)
Defiance	0 (0)	0 (0)	9 (50)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9 (50)	18 (100)
Delaware	0 (0)	0 (0)	21 (62)	0 (0)	0 (0)	0 (0)	1 (3)	12 (35)	0 (0)	34 (100)
Erie	0 (0)	3 (6)	10 (19)	0 (0)	0 (0)	5 (10)	0 (0)	0 (0)	34 (65)	52 (100)
Fairfield	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	28 (100)	28 (100)
Franklin	0 (0)	0 (0)	26 (32)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	55 (67)	82 (100)
Fulton	0 (0)	0 (0)	4 (36)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (64)	11 (100)
Geauga	0 (0)	0 (0)	1 (13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (88)	8 (100)
Greene	5 (14)	3 (8)	10 (28)	0 (0)	2 (6)	2 (6)	2 (6)	0 (0)	12 (33)	36 (100)

Jurisdiction	Environmental Health Event N (%)	Naturally Occurring Disease Outbreak N (%)	Seasonal Illness Health Event N (%)	Severe Weather Event N (%)	Other Health Event N (%)	Not a Health Event N (%)	Data Error (Facility or EpiCenter) N (%)	Unknown Health Event N (%)	Indeterminate N (%)	Total N (%)
Guernsey	0 (0)	0 (0)	13 (38)	0 (0)	0 (0)	2 (6)	0 (0)	0 (0)	19 (56)	34 (100)
Hamilton	0 (0)	0 (0)	26 (39)	0 (0)	0 (0)	3 (5)	0 (0)	0 (0)	37 (56)	66 (100)
Hancock	0 (0)	0 (0)	5 (19)	0 (0)	2 (7)	18 (67)	0 (0)	0 (0)	2 (7)	27 (100)
Hardin	0 (0)	0 (0)	3 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (100)
Henry	0 (0)	0 (0)	1 (13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (88)	8 (100)
Highland	0 (0)	0 (0)	2 (50)	0 (0)	0 (0)	0 (0)	1 (25)	0 (0)	1 (25)	4 (100)
Hocking	0 (0)	0 (0)	11 (28)	0 (0)	4 (10)	3 (8)	0 (0)	0 (0)	21 (54)	39 (100)
Holmes	0 (0)	0 (0)	1 (33)	0 (0)	0 (0)	1 (33)	0 (0)	0 (0)	1 (33)	3 (100)
Huron	0 (0)	0 (0)	4 (16)	0 (0)	0 (0)	10 (40)	1 (4)	0 (0)	10 (40)	25 (100)
Jefferson	0 (0)	0 (0)	44 (81)	0 (0)	0 (0)	9 (17)	0 (0)	0 (0)	1 (2)	54 (100)
Lake	0 (0)	0 (0)	33 (52)	0 (0)	3 (5)	7 (11)	0 (0)	0 (0)	20 (32)	63 (100)
Licking	0 (0)	0 (0)	3 (21)	0 (0)	0 (0)	7 (50)	0 (0)	0 (0)	4 (29)	14 (100)
Logan	0 (0)	0 (0)	16 (73)	0 (0)	0 (0)	0 (0)	1 (5)	5 (23)	0 (0)	22 (100)
Lorain	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	13 (81)	0 (0)	0 (0)	3 (19)	16 (100)
Lucas	0 (0)	2 (2)	32 (38)	0 (0)	34 (40)	0 (0)	0 (0)	0 (0)	16 (19)	84 (100)
Madison	0 (0)	0 (0)	9 (82)	1 (9)	0 (0)	0 (0)	0 (0)	0 (0)	1 (9)	11 (100)
Mahoning	0 (0)	0 (0)	19 (21)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	70 (79)	89 (100)
Marion	0 (0)	0 (0)	26 (49)	0 (0)	1 (2)	26 (49)	0 (0)	0 (0)	0 (0)	53 (100)
Medina	0 (0)	0 (0)	8 (22)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	29 (78)	37 (100)
Mercer	0 (0)	0 (0)	3 (43)	0 (0)	0 (0)	4 (57)	0 (0)	0 (0)	0 (0)	7 (100)
Miami	0 (0)	0 (0)	7 (18)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	32 (82)	39 (100)
Montgomery	5 (7)	0 (0)	14 (19)	0 (0)	0 (0)	24 (33)	0 (0)	29 (40)	1 (1)	73 (100)
Morrow	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1 (100)
Muskingum	0 (0)	0 (0)	40 (74)	0 (0)	0 (0)	14 (26)	0 (0)	0 (0)	0 (0)	54 (100)
Ottawa	0 (0)	0 (0)	4 (25)	0 (0)	0 (0)	6 (38)	1 (6)	0 (0)	5 (31)	16 (100)
Perry	0 (0)	0 (0)	2 (50)	0 (0)	0 (0)	2 (50)	0 (0)	0 (0)	0 (0)	4 (100)

Jurisdiction	Environmental Health Event N (%)	Naturally Occurring Disease Outbreak N (%)	Seasonal Illness Health Event N (%)	Severe Weather Event N (%)	Other Health Event N (%)	Not a Health Event N (%)	Data Error (Facility or EpiCenter) N (%)	Unknown Health Event N (%)	Indeterminate N (%)	Total N (%)
Pickaway	0 (0)	0 (0)	2 (6)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	29 (91)	32 (100)
Portage	0 (0)	1 (4)	9 (33)	0 (0)	0 (0)	1 (4)	0 (0)	0 (0)	16 (59)	27 (100)
Putnam	0 (0)	0 (0)	2 (13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	13 (87)	15 (100)
Richland	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (60)	0 (0)	0 (0)	2 (40)	5 (100)
Ross	0 (0)	0 (0)	9 (21)	0 (0)	0 (0)	10 (24)	0 (0)	0 (0)	23 (55)	42 (100)
Sandusky	0 (0)	0 (0)	2 (5)	0 (0)	0 (0)	30 (79)	1 (3)	0 (0)	5 (13)	38 (100)
Scioto	0 (0)	0 (0)	5 (18)	0 (0)	0 (0)	1 (4)	0 (0)	0 (0)	22 (79)	28 (100)
Seneca	0 (0)	0 (0)	10 (36)	0 (0)	2 (7)	5 (18)	0 (0)	0 (0)	11 (39)	28 (100)
Shelby	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	1 (100)
Stark	0 (0)	0 (0)	20 (22)	1 (1)	0 (0)	2 (2)	1 (1)	0 (0)	68 (74)	92 (100)
Summit	0 (0)	1 (2)	24 (42)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	32 (56)	57 (100)
Trumbull	0 (0)	0 (0)	38 (58)	0 (0)	12 (18)	16 (24)	0 (0)	0 (0)	0 (0)	66 (100)
Tuscarawas	0 (0)	0 (0)	4 (11)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	33 (89)	37 (100)
Union	0 (0)	0 (0)	15 (54)	0 (0)	0 (0)	11 (39)	0 (0)	0 (0)	2 (7)	28 (100)
Van Wert	0 (0)	0 (0)	12 (43)	0 (0)	0 (0)	16 (57)	0 (0)	0 (0)	0 (0)	28 (100)
Vinton	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)
Warren	0 (0)	0 (0)	16 (48)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	17 (52)	33 (100)
Washington	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	1 (100)
Wayne	0 (0)	1 (3)	11 (30)	0 (0)	12 (32)	10 (27)	0 (0)	0 (0)	3 (8)	37 (100)
Wood	0 (0)	0 (0)	27 (63)	0 (0)	0 (0)	16 (37)	0 (0)	0 (0)	0 (0)	43 (100)
Wyandot	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)
State of Ohio	0 (0)	1 (1)	45 (61)	0 (0)	0 (0)	7 (9)	1 (1)	0 (0)	20 (27)	74 (100)
Total	**10 (0)**	**22 (1)**	**795 (34)**	**2 (0)**	**125 (5)**	**325 (14)**	**14 (1)**	**78 (3)**	**936 (41)**	**2,307 (100)**

Source of data: Ohio Department of Health Public Health Informatics and Vaccine-Preventable Disease Epidemiology Unit.
* Please see Technical Notes.

Table 3: Distribution of EpiCenter Anomalies by Month, Ohio, 2013

Anomaly Disposition*	Jan N (%)	Feb N (%)	Mar N (5)	Apr N (%)	May N (%)	Jun N (%)	Jul N (%)	Aug N (%)	Sep N (%)	Oct N (%)	Nov N (%)	Dec N (%)	Total N (%)
Environmental health event	1 (10)	0 (0)	2 (20)	1 (10)	0 (0)	3 (30)	0 (0)	0 (0)	3 (30)	0 (0)	0 (0)	0 (0)	10 (100)
Naturally occurring disease outbreak	3 (14)	4 (18)	0 (0)	0 (0)	3 (14)	0 (0)	0 (0)	0 (0)	4 (18)	0 (0)	6 (27)	2 (9)	22 (100)
Seasonal illness health event	69 (9)	54 (7)	42 (5)	29 (4)	63 (8)	17 (2)	29 (4)	29 (4)	97 (12)	43 (5)	49 (6)	274 (34)	795 (100)
Severe weather event	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (100)
Other health event	7 (6)	4 (3)	9 (7)	5 (4)	8 (6)	12 (10)	22 (18)	16 (13)	14 (11)	8 (6)	8 (6)	12 (10)	125 (100)
Not a health event	25 (8)	18 (6)	28 (9)	19 (6)	32 (10)	20 (6)	23 (7)	43 (13)	37 (11)	23 (7)	36 (11)	21 (6)	325 (100)
Data error (facility or EpiCenter)	2 (14)	4 (29)	2 (14)	2 (14)	2 (14)	1 (7)	0 (0)	0 (0)	0 (0)	0 (0)	1 (7)	0 (0)	14 (100)
Unknown health event	5 (6)	3 (4)	7 (9)	7 (9)	8 (10)	10 (13)	4 (5)	11 (14)	13 (17)	6 (8)	2 (3)	2 (3)	78 (100)
Indeterminate	41 (4)	49 (5)	65 (7)	35 (4)	92 (10)	84 (9)	79 (8)	87 (9)	132 (14)	100 (11)	77 (8)	95 (10)	936 (100)
Total	**153 (7)**	**136 (6)**	**155 (7)**	**98 (4)**	**208 (9)**	**147 (6)**	**159 (7)**	**186 (8)**	**300 (13)**	**180 (8)**	**179 (8)**	**406 (18)**	**2,307 (100)**

Source of data: Ohio Department of Health Public Health Informatics and Vaccine-Preventable Disease Epidemiology Unit.
* Please see Technical Notes.