

Automated Monitoring of Injuries Due to Falls Using the BioSense System

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The findings and conclusions in this presentation are those of the authors and do not necessary represent the views of the Centers for Disease Control and Prevention



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BioSense System

- National real-time biosurveillance system to enable public health situational awareness
- Current data sources: 569 hospitals, >1100 ambulatory care Departments of Defense (DoD) and Veterans Affairs (VA) medical facilities, 2 large national laboratories
- Data stored, analyzed, and visualized in a secure web-based application



Background

- Falls are the leading cause of nonfatal medically attended injuries in the U.S.
- Falls accounted for 21% of injury-related visits to U.S. emergency departments (ED) in 2005
- Falls are one of 11 injury-related sub-syndromes currently tracked by BioSense



Objectives

- Identify and characterize clusters of falls in metropolitan areas during the 2007-08 winter season
- Assess association between falls clusters and severe weather



Methods

- Studied chief complaints of fall in 19 metropolitan areas with ≥ 2 participating ED facilities
- Study period October 1, 2007 – March 31, 2008



Methods (cont..)

- Identified clusters of falls based on:
 - Time series analysis: modified EARS C2 algorithm
 - Recurrence interval ≥ 500 days ($p < 0.002$)
 - Observed/expected ≥ 2
 - Observed-expected (excess visits) per day ≥ 10
- Identified falls related to snow or ice by searching chief complaints for “fell on ice,” “fell due to ice,” “trip on ice”
- Identified associated fractures (ICD-9 codes 800-829)



Fall Anomaly Clusters

<u>Cluster #</u>	<u>Metro Area</u>	<u>Region</u>	<u>Anomaly Date(s)</u>
1	A	South-Atlantic	12/6/07
2	A	South-Atlantic	02/12/08 – 2/13/08 ←
3	B	New England	12/10/07
4	B	New England	12/17/07
5	C	East North Central	12/9/07 – 12/10/07 ←
6	C	East North Central	02/9/08
7	D	East North Central	12/6/07
8	E	East North Central	12/9/07 – 12/10/07 ←
9	E	East North Central	02/17/08
10	F	West North Central	12/8/07 – 12/9/07 ←
11	G	East North Central	11/10/07
12	H	West North Central	12/10/07
13	I	South-Atlantic	12/6/07
14	I	South-Atlantic	02/12/08 – 2/13/08 ←



Fall Anomaly Clusters (December 2007)

<u>Cluster #</u>	<u>Metro Area</u>	<u>Region</u>	<u>Anomaly Date(s)</u>
1	A	South-Atlantic	12/6/07 ←
2	A	South-Atlantic	02/12/08 – 2/13/08
3	B	New England	12/10/07 ←
4	B	New England	12/17/07 ←
5	C	East North Central	12/9/07 – 12/10/07 ←
6	C	East North Central	02/9/08
7	D	East North Central	12/6/07 ←
8	E	East North Central	12/9/07 – 12/10/07 ←
9	E	East North Central	02/17/08
10	F	West North Central	12/8/07 – 12/9/07 ←
11	G	East North Central	11/10/07
12	H	West North Central	12/10/07 ←
13	I	South-Atlantic	12/6/07 ←
14	I	South-Atlantic	02/12/08 – 2/13/08

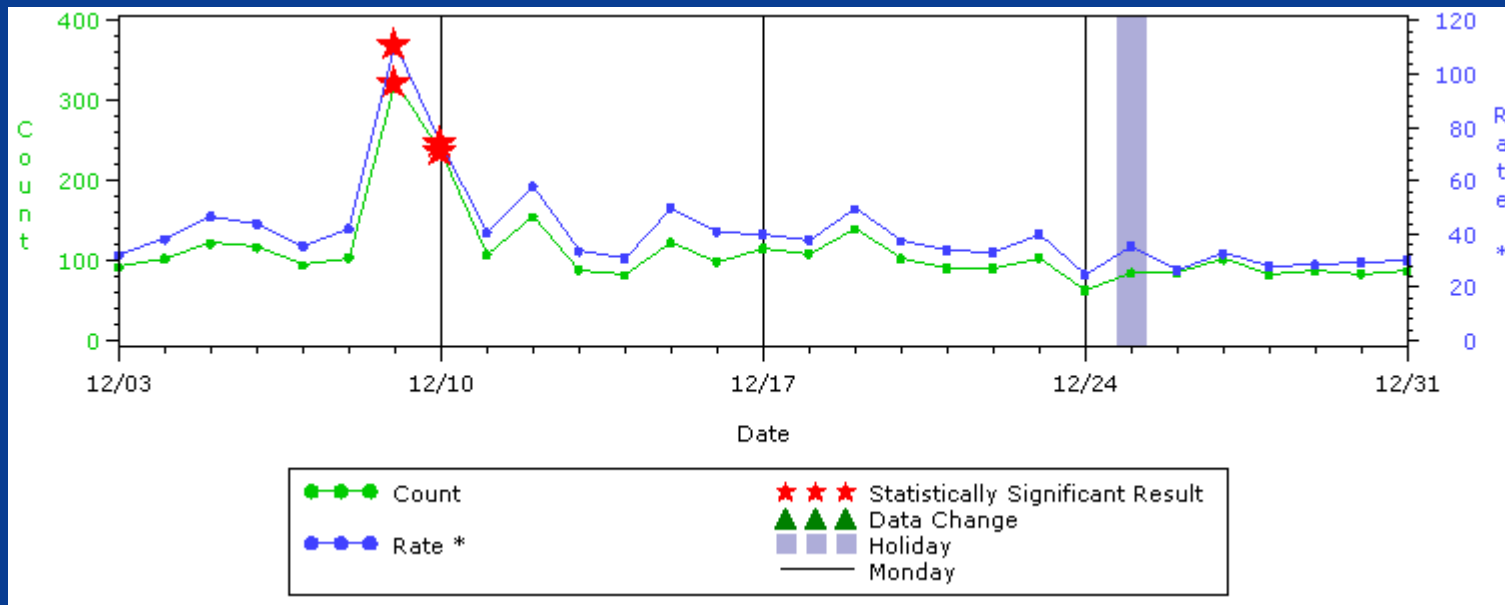


Fall Anomaly Clusters (February 2008)

<u>Cluster #</u>	<u>Metro Area</u>	<u>Region</u>	<u>Anomaly Date(s)</u>
1	A	South-Atlantic	12/6/07
2	A	South-Atlantic	02/12/08 – 2/13/08 ←
3	B	New England	12/10/07
4	B	New England	12/17/07
5	C	East North Central	12/9/07 – 12/10/07
6	C	East North Central	02/9/08 ←
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12	H	West North Central	12/10/07
13	I	South-Atlantic	12/6/07
14	I	South-Atlantic	02/12/08 – 2/13/08 ←



ED Chief Complaint of Fall, 26 Facilities, Cluster 5, Metro Area: C

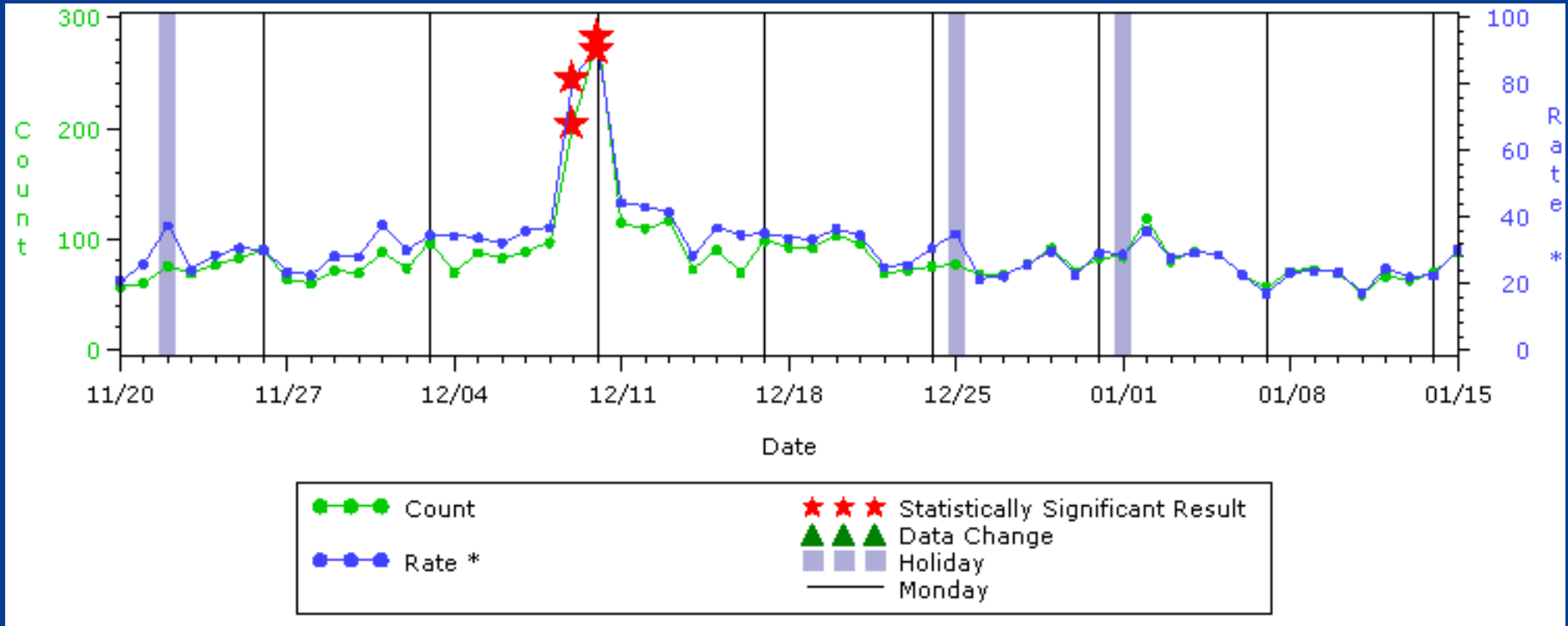


Source: BioSense Application

Excess visits for falls 233, 136



ED Chief Complaints of Fall, 17 Facilities, Cluster 8, Metro Area: E



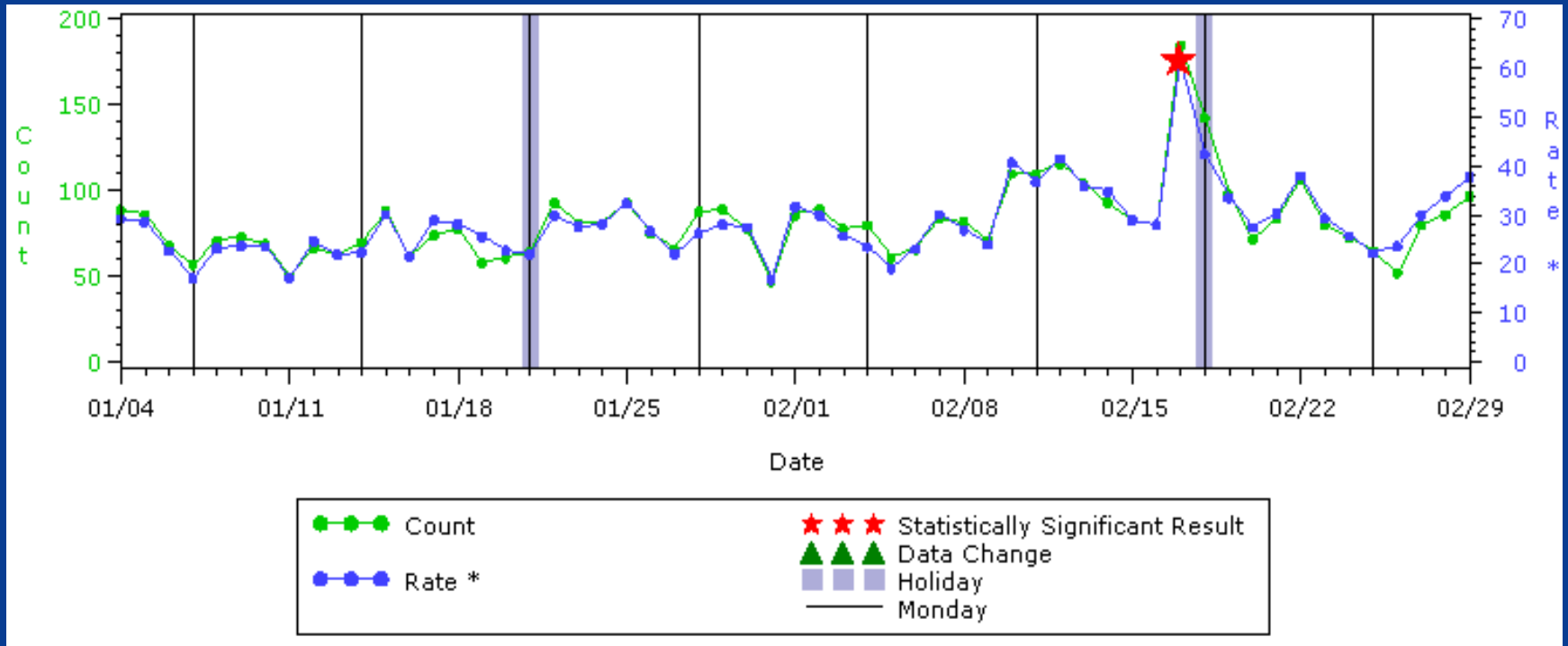
Excess visits for falls: 137, 197



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ED Chief Complaints of Fall, 17 Facilities, Cluster 9, Metro Area: E



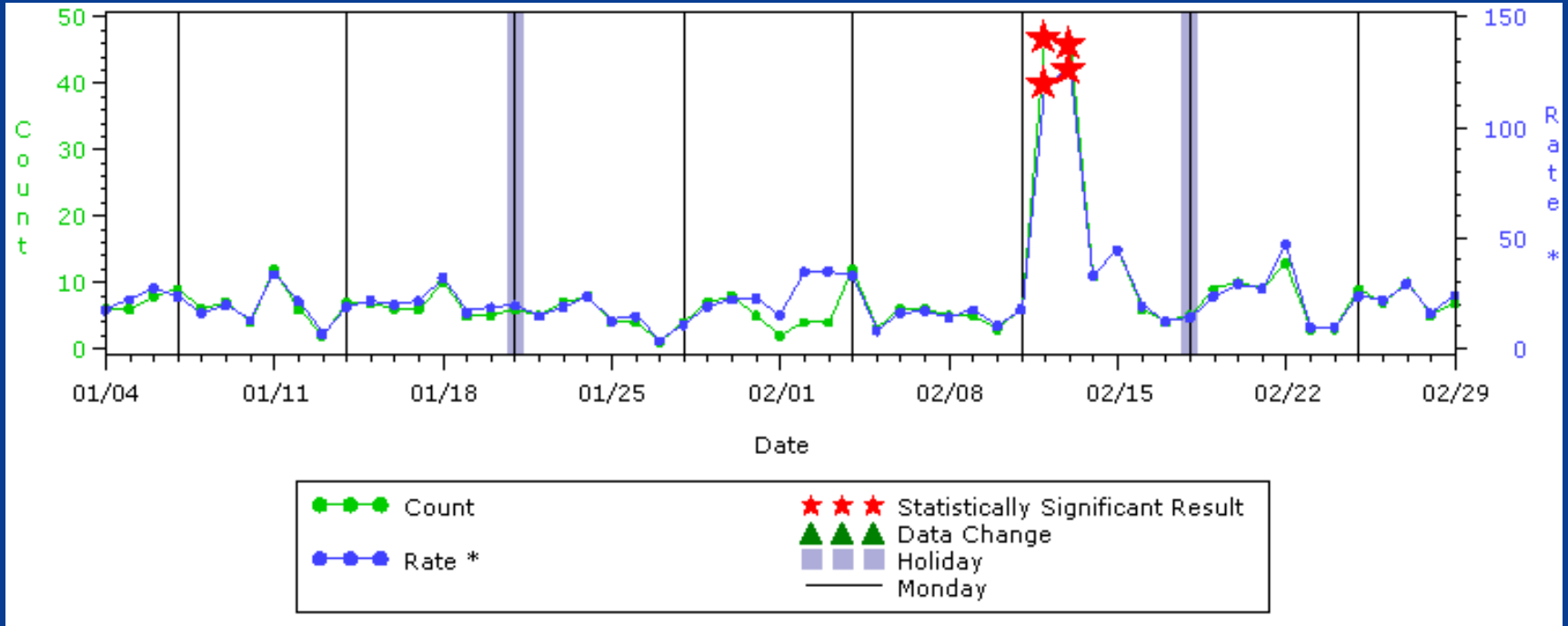
Excess visits for falls: 100



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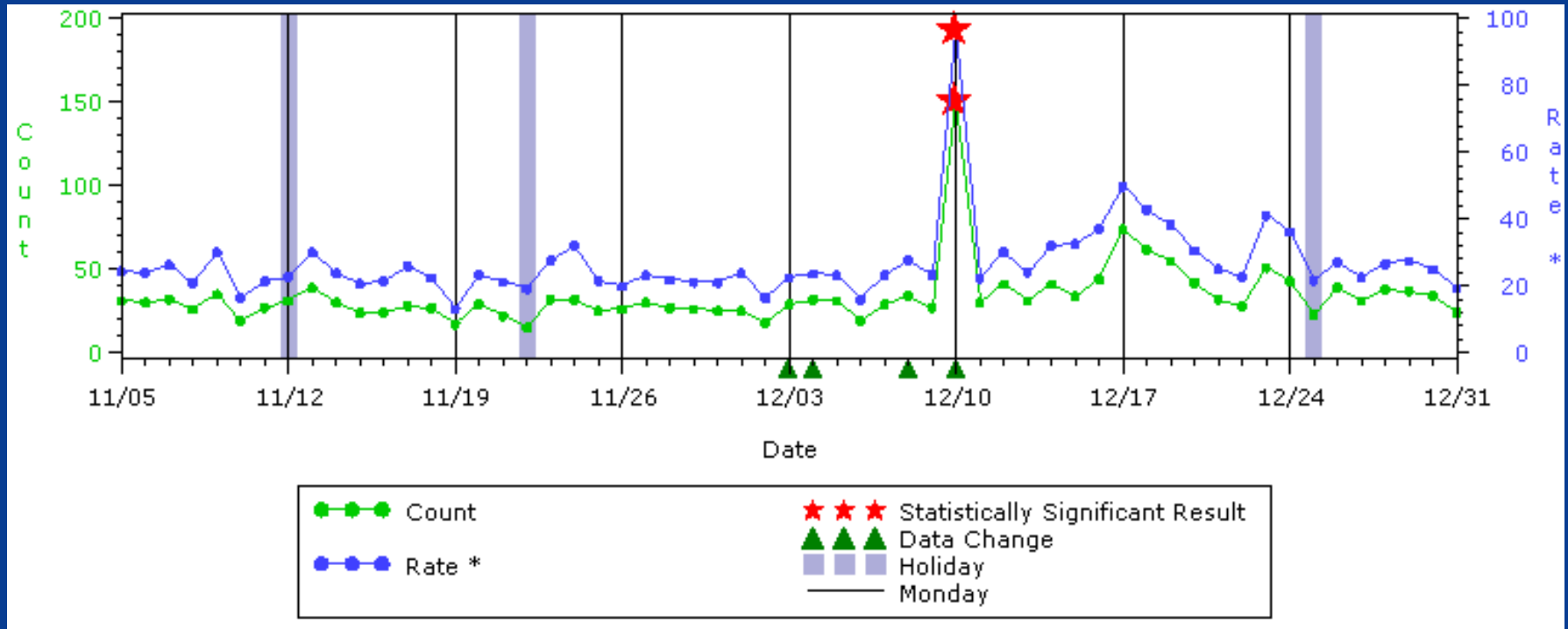
ED Chief Complaint of Fall, 2 Facilities, Cluster 14, Metro Area: I



Excess visits for falls 40, 39



ED Chief Complaint of Fall, 24 Facilities, Cluster 12, Metro Area: H



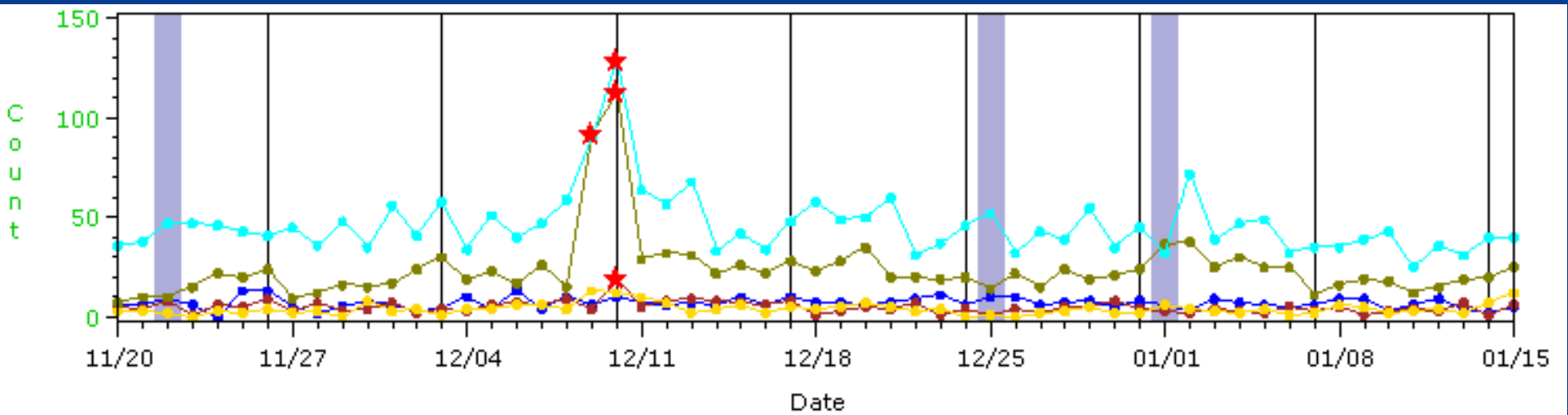
Excess visits for falls: 117



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Metro Area: E, Cluster 7, by Age Group



Source: BioSense Application



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Patient List, BioSense Application

Patient Zip	Patient State	Facility	Patient ID	Age	Gender	Patient Class	VISIT (Outpatient), Chief Complaint (ED)/ Reason for Admit (Inpatient)	Physician Working Diagnosis	Final Diagnosis
		Hospital Center		58 Y	M	E	Fell chest pain		
		Hospital	Click to go to Patient Detail.	59 Y	M	E	L Shoulder Pain S/p Fallll shoulder pain s/p fall	Priority 1: 719.4 (Joint Pain-shoulder)	Priority 1: 812.01 (Cl Fx Surg Neck Humerus) Priority 2: 403.91 (Htn Ckd Nos V-esrd) Priority 3: 585.6 (Esrd) Priority 4: V45.1 (Renal Dialysis Status) Priority 5: 428.0 (Chf Nos) Priority 6: 250.00 (Dm2/nos Uncomp Nsu)
		Hospital		45 Y	M	I/E	Fall Rt Ankle Painrt tib-fib fxRt Tib-fib Fx	Priority 1: 959.7 (Lower Leg Injury Nec)	Priority 1: 824.8 (Clsd Fx Ankle Nos) Priority 2: 305.1 (Tobacco Use Disorder) Priority 5: V14.0 (Hx Penicillin Allergy)
		Hospital Center		50 Y	F	E	fell injured leg foot pain		
		Hospital Center		48 Y	M	E	fell injured rt wrist hand		
		Hospital Center		62 Y	M	E	s/p fall		
		Hospital Center		41 Y	M	E	s/p fall		
		University Hospital		30 Y	F	E	Pregnant And Fellpregnant and fell	Priority 1: 724.5 (Backache Nos)	Priority 1: 648.93 (Oth Cce Comp Preg-ap) Priority 2: 847.9 (Back Sprain Nos) Priority 3: 246.8 (Thyroid Disorder Nec) Priority 4: V14.2 (Hx Sulfonamides Allergy)
							Fall. Ini L Side Of	Priority 1:	Priority 1: 840.9 (Shoulder/arm Nos

		Hospital Center		25 Y	F	E	fall rt shoulder pain		Reg) Priority 2: 847.0 (Neck Sprain) Priority 3: E885.9 (Fall From Tripping Nec)
		University Hospital		42 Y	M	E	Broken Arm/compoundbroken arm/compound fell on ice	Priority 1: 729.5 (Pain In Limb)	Priority 1: 813.0 (Cl Fx Olecran Pro Ulna) Priority 2: 833.01 (Clsd Disl Dist Raduln) Priority 3: 401.9 (Hypertension No) Priority 4: E885.9 (Fall From Tripping Nec)
		Hospital Center		38 Y	F	E	lt arm pain from fall		
		Hospital Center		91 Y	M	E	s/p fall head laceration		
		University Hospital		40 Y	F	E	back pain/fell on iceBack Pain/fell On Ice	Priority 1: 724.5 (Backache Nos)	Priority 1: 848.8 (Other Sprains an Strains) Priority 2: E885.9 (Fall From Tripping Nec)
		Hospital Center		74 Y	F	E	r ankle inj s/p fall		
		Hospital Center		27 Y	F	E	fall rt knee pain		
		Hospital Center		26 Y	F	E	s/p fall head inj l elbow pain		
		Hospital Center		45 Y	M	E	s/p fall facial laceration		
									Priority 1: 824.6 (Clsd Fx Trimalleolar) Priority 2: V14.0 (Hx Penicillin Allergy) Priority 3: E883

Summary of Falls Clusters, 2007-2008

- 14 clusters of falls in 9 metro areas
- Total ED visits for falls: 2,394
- Excess ED visits for falls: 1,593
- Time period
 - Dec 6-18, 2007, 9 clusters (winter storm)
 - February 9-17, 2008, 4 clusters (freezing rain)

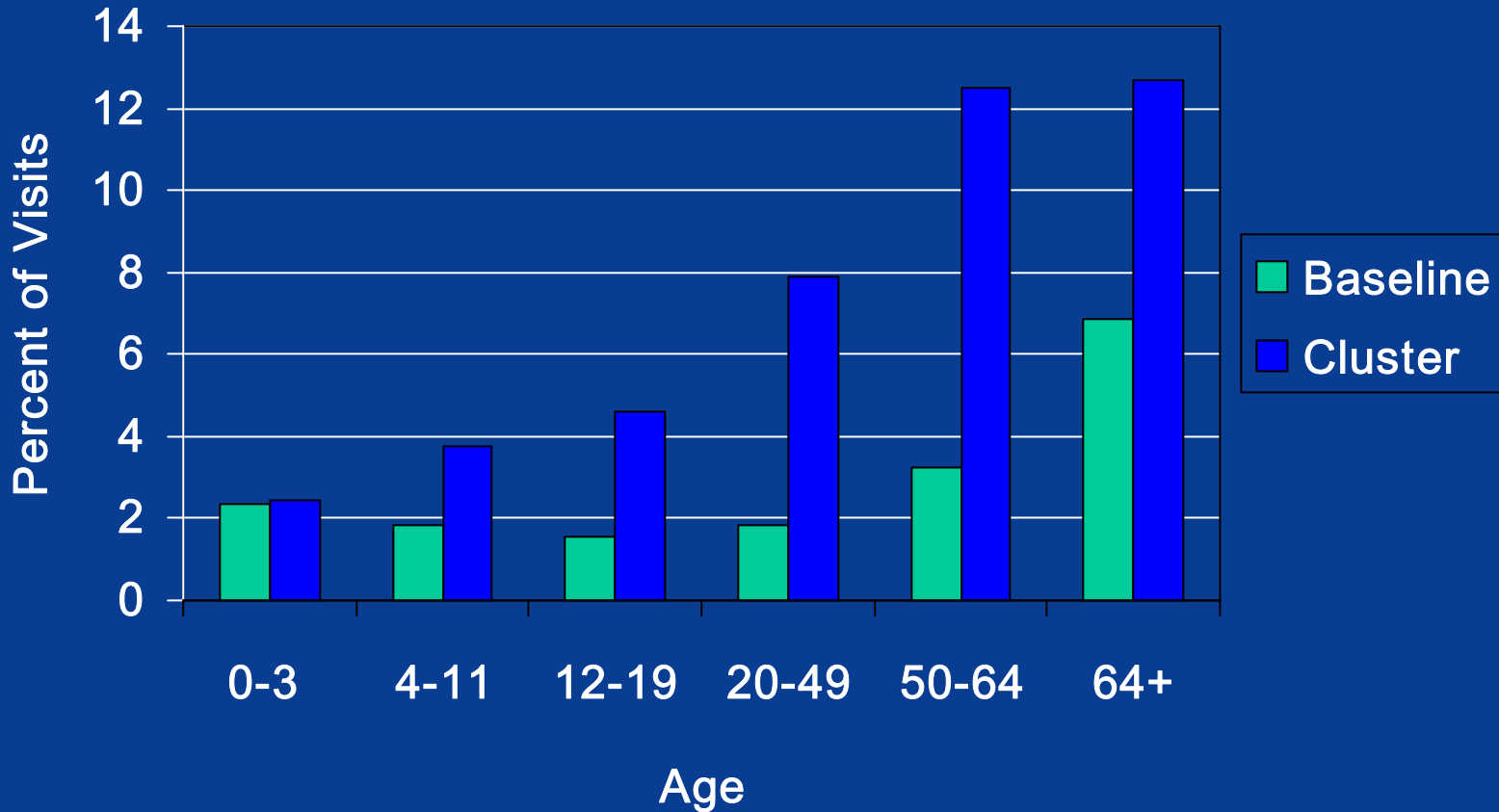


Characteristics of ED Visits for Falls

- Demographics
 - Mean age: 47 years
 - 57% were women
- Mention of “ice” or “snow” in chief complaint: 9%
- Associated fracture
 - 33% had a final ICD-9 coded diagnosis
 - 15% of these had an ICD-9 code for fracture



Percentage of Visits for Falls, by Age and Time Period

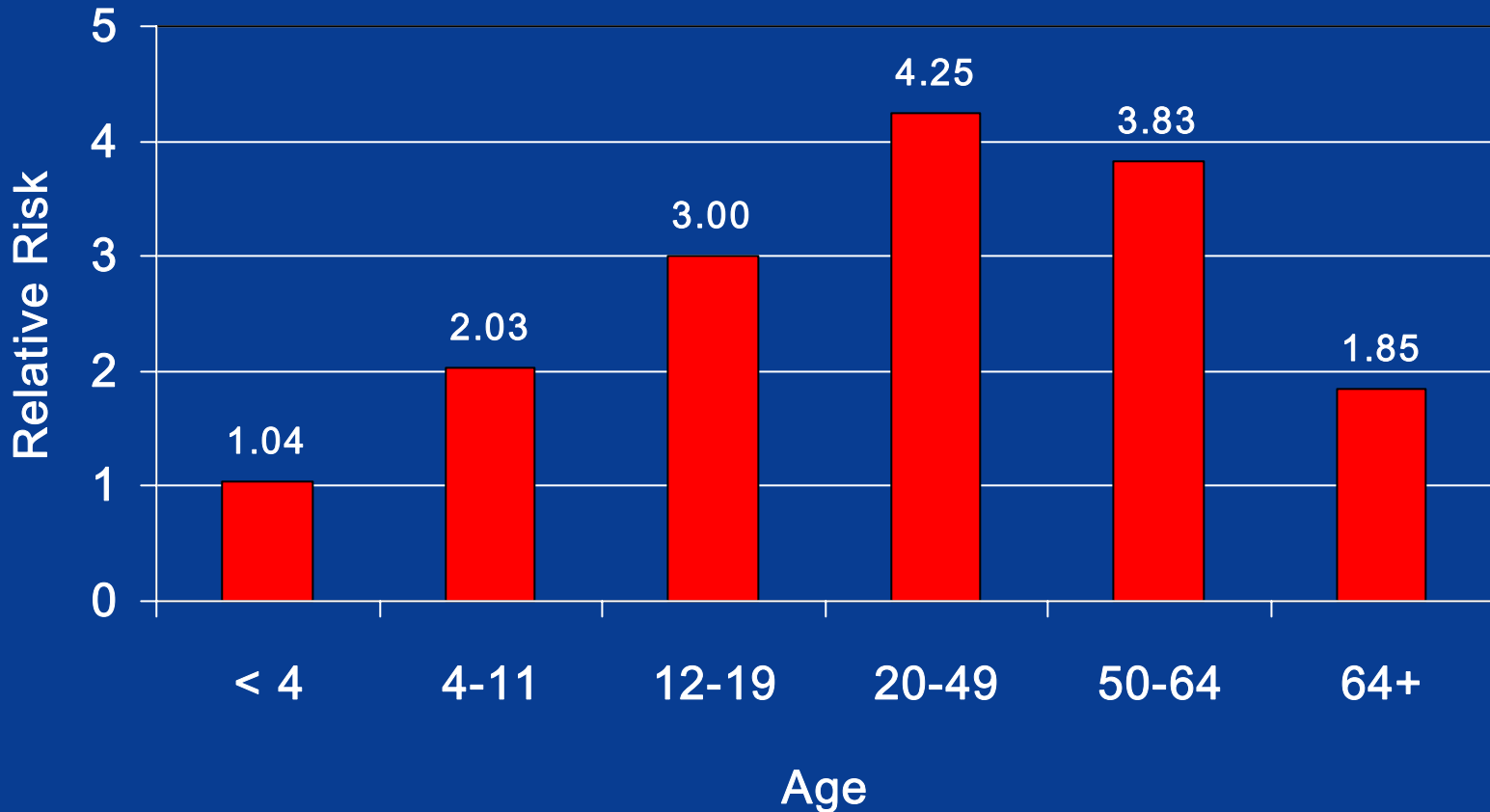


Baseline=28 days before clusters

Cluster=Day of falls clusters



Relative Risk* of Falls by Age Group



*Percent of visits with fall on cluster days/baseline days

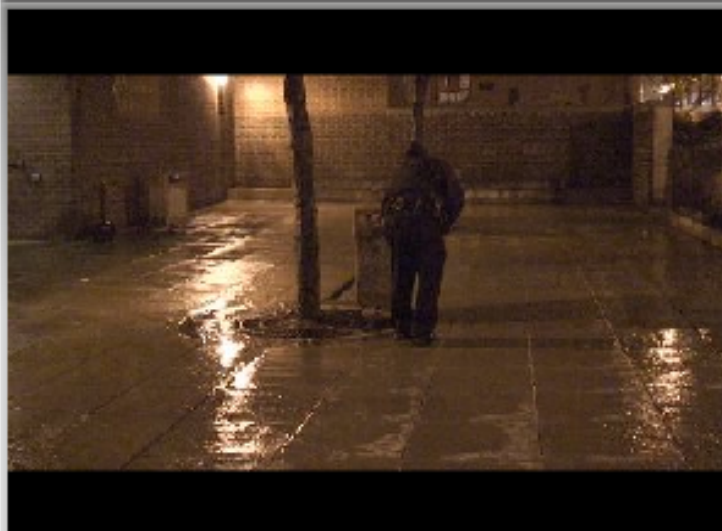


Traffic slides across Md.

Ice storm causes many accidents, tie-ups

Ice hits city on primary day

01:24



MARYLAND NEWS

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Tall order: Zoo patrons feed giraffes

02:28



3 children injured in Baltimore school bus collision

00:46



Baltimore artist Tom Lipka carries on screen painting tradition

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Rickrolling at the Inner Harbor

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By Richard Irwin and Brent Jones | Sun reporters

February 13, 2008

A late-afternoon ice storm yesterday left dozens of wrecked cars littered along major roads and brought traffic on the highways to a standstill, leaving commuters bumper-to-bumper for hours.

Article tools

✉ E-mail



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Discussion

- Limitations of geographic coverage and data availability
- Identified several large clusters of ED visits due to falls associated with severe weather
- Increase in falls visits highest for 20-49 years
- Several earlier studies have shown similar results



Discussion, Utility

- Surveillance for falls
 - Data available in near-real time
 - Permits rapid detection of increases in falls injuries
 - May be helpful in determining the effectiveness of public health campaigns
 - May be helpful in prevention programs
- Surveillance for injuries due to natural disasters such as hurricanes in real time
 - Provide descriptive data
 - Track geographically



Thank You

BioSenseHelp@cdc.gov

