A Guide for Syndromic Surveillance for **Heat-Related** Health Outcomes in **North America**

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Healthy People, Healthy Places

Agenda

Evolution of the Guide

Overview of the Guide

✓ syndromic surveillance—history, applications

✓ methods to monitor extreme heat

- 1. identify data sources
- 2. design system architecture
- 3. define heat syndrome
- 4. define alerting rules
- 5. integrate health outcomes and weather





Agenda

Case Studies from Pilot Communities



Introduction



Impact of Climate Change on Human Health

Injuries, fatalities, mental health impacts Asthma, cardiovascular disease



The Guide

A Guide for Syndromic Surveillance for Heat-Related Health Outcomes in North America







Health Canada





CENTERS FOR DISEASE CONTROL AND PREVENTION



Comisión Federal para la Protección contra Riesgos Sanitarios

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TASK #	ΑCTIVITY	2016: April	May	June	ĄInf	August	September	October	November	December	2017: January	February	March	April	May
0	0 Project initiation:														
	Travel to Montreal for "kick-off" meeting	\rightarrow	1												
	Provide 1. <u>meeting summary</u> , and 2. <u>final work plan</u>			1											
1	Consultation with local health authoritie	ion with local health authorities to compile data sources and provide guidance for work plan. :													
	Teleconference with Ottawa PH			 ✓ 											
	Teleconference with American city			\rightarrow	\rightarrow	√									
	Teleconference with Mexican city			\rightarrow	\rightarrow	✓									
	Provide summary of data sources							 ✓ 							
1 Review of the literature; Inventory of SS systems:															
	Consultation with in-house library services for literature review		×												
	Compilation of literature				 Image: A second s										
	Provide DRAFT literature review					\rightarrow	 ✓ 								
Inc	Incorporate feedback into FINAL literature review						\rightarrow	 ✓ 							
	Inventory of SS systems in NA			\rightarrow	\rightarrow	•	/								
	Provide DRAFT summary of SS systems					\rightarrow	 ✓ 								
	Provide FINAL summary of SS systems								✓						
2	Support development of database releva	Support development of database relevant to Extreme Heat SS systems:													
	Teleconference with Ottawa PH					✓									
	Teleconference with American city					\rightarrow		×							
	Teleconference with Mexican city					\rightarrow		1							
3	Incorporate findings into Guide:														
	Provide DRAFT Deve								\rightarrow	√					
Т	ravel to Montreal, provide workshop summary							 ✓ 	←	←					
	Incorporate edits into FINAL parte										✓	·			
	Provide FINAL guide for review											1			
	Provide FINAL guide (include edits)												<		
	Provide <u>visual display</u> of Guide, present guide at final meeting.														1

Syndromic Surveillance for Heat-Related Health Outcomes: a Guide for Health Departments in North America

Executive Summary, Table of Contents

Introduction/Conceptual Overview:

(1)project description(2)goals and objectives of guide

- describe SyS, evidence of benefits
- step-by-step guide to SyS methods with *Case Studies* to highlight and give detail

METHODS for SyS for EHE/HRI

Steps to Build:

(1) Data Source Identificationconsider availability and technology

(2) System Architecture

- simple to complex
- including privacy, security

CASE STUDY: use Hermosillo to show database built to accommodate the data that is available

(3) Defining Heat Vulnerable Populations

Glossary:

syndromic surveillance

climate change vulnerability

heat-related illness

aberration detection

BioSense, ESSENCE, RODS

extreme heat event

sensitivity vs selectivity

heat warnings

- heat-related health risk
- (4) Defining a Heat Syndrome
- ad hoc queries
- automated syndromes

CASE STUDY: improving sensitivity of MSSS with refinement of heat syndrome definition (Michigan)

A Primer on Syndromic Surveillance

Brief history, growth in literature • operational definitions • post bioterrorism applications • google scholar analytics

Basic types of SyS systems • active vs passive • defined by data, application • table of data elements to be considered

Inventory of SyS in North America for heat-related health outcomes • summary of results from survey in Canada, US • inset descriptions of Biosense, ACES

Using SyS to target public health response

• defining heat warnings • public health messaging

(5) Heat Warnings

important weather data, defining extreme heat criteria

(6) Integrating Health Outcomes and Weather Informationreal-time relationship between heat and health outcomes

CASE STUDY: enhancing ACES for the City of Ottawa for real-time situational awareness of EHE

(7) Messaging Heat Warnings: Public Health ACTION

resources to improve messaging and impact

CONCLUSIONS

- *SO WHAT*? What information is gained using SyS in real time, and how it can be used to protect population health
- summary of lessons learned
- Iimitations
- resources for more information
 - contacts for organizations, papers & documents

Contact Information

CEC and pilot communities

A Primer on Syndromic Surveillance



Public Health Surveillance

	Traditional Surveillance	Syndromic Surveillance
data sources	diagnostic data from case reports, laboratory reports	pre-diagnostic data (e.g., triage, drug sales, school records)
timing	days to weeks	immediate (real time) to hourly or daily (near-real time)
goal	individual cases or clusters of cases, monitor reportable diseases	excess or unusual case counts; bioterrorism; influenza; asthma
data transfer	telephone/fax transfer of records, paper files	automated electronic data transfer

Timeline of Syndromic Surveillance





Source: KM, 2016

Applications of Syndromic Surveillance

Non-Clinical Data Sources:	Clinical Data Sources:
social media shares (Twitter, Facebook)	nurse advice telephone line
web searches (symptom, topic)	school nurse electronic records
over-the-counter drug sales	poison control telephone calls
sales of health-related items (fans, air conditioners)	primary care electronic medical records
work or school absenteeism	emergency department triage records
ambulance dispatch data	laboratory test requisitions, results
zoonotic disease surveillance data	prescription drug sales
Source: ISDS, 2007	outpatient admissions records

Current Environmental Applications



Source: Matt Roach, 2016

Assessing Heat Vulnerable Populations

1. define areas and timelines of interest, gather data for climate exposure (temperature, humidity, precipitation) and health outcomes (HRI, injuries, chronic diseases)



2. identify risk factors for health outcomes (demographic, environmental factors)



Heat Vulnerable Populations

- geographically-isolated
- infants, young children
- newcomers and transients
- older adults
- outdoor labourers (farmers, construction workers)
- people accustomed to normally cool climates
- people taking medications
- people who are physically active (athletes)

- people with chronic health conditions
- physically disabled people
- socially-disadvantaged
 people (homeless, living alone)
- materially-disadvantaged people (low income, low quality housing)
- urban residents (urban heat island effect)







Assessing Heat Vulnerable Populations

- 3. collate health outcomes, risk factors to smallest possible geographical unit
- assess population's adaptive capacity (system's ability to cope with and/or reduce the health risk)—financial resources, health infrastructure, adaptive policy
- 5. assess vulnerability using both quantitative (spatial regression analysis) and qualitative (analysis of the quality of resources available)



What can Syndromic Surveillance do?

- ✓ evidence of health impacts (real time)
- vidence of health impacts for vulnerable populations (real time)
- ✓ data to determine local heat thresholds
- ✓ data to validate local heat thresholds
- ✓ assist in the allocation of public health resources (real time)
- ✓ evaluate communication methods



Methods for Syndromic Surveillance



1. Data Source Identification





2. System Architecture





CASE STUDY

🔡 PROYECTO DE VIGILANCIA SINDROMICA POR EVENTOS DE CALOR EXTREMO										
Secretaría de Salud Pública COESPRISSON Comisión Estatal de Protección Contra Riesgos Sanitarios del Estado de Sonora COESPRISSON: LIC. PASCUAL AXEL SOTO ESPINOZA										
Efecto de la lesión Caso	Evento	Calor	Causa básica de	e la lesión o defunciór	[Seleccione una Opción]					
Nombre Apellido Paterno		Apellido Materno		Edad 0 😂	Sexo	\sim				
RESIDENCIA HABITUAL	LUGAR DE OCURRENCIA FECHA									
Entidad Sonora 🖂	Entidad Sonora 🗸 Ocurrencia 16/12/2016 🗸									
Municipio [Seleccione una Opción]	Municipio [Seleccione una Opción] 🔽 Localidad [Seleccione una Opción] 😒 Notificacion 16/12/2016 😒									
Lugar de atención [Seleccione una Opción] Persona que notifico el caso o defunción [Seleccione una Opción]										
Sitio [Seleccione una Opción]	Temperatura ambiental									
Ocupacion										
Comentarios						>				
Usuario ADMIN			Fecha Captura 16/1	2/2016 🖂 Hora	a de Captura 01:58 p.m	* *				
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3. Heat Syndrome Definition

- pre-diagnostic data is processed and classified into medically-relevant syndromes
- records are analyzed and classified using a statistical syndrome classifier, natural language processing
- classifier depends on data:
 - ✓ free-text chief complaints vs. pre-diagnostic codes
- classifier is "trained" with large datasets to determine accuracy



CASE STUDY



Michigan Department of Health and Human Services

Michigan Syndromic Surveillance System (MSSS)

dehydration, dehydrated, dehydrate, dehydrat, dehydraton, 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



How to identify unusual clusters?

- basic "eyeball" of data (must be very familiar with data)
- ✓ statistical deviation from baselines (for example, 120 days)
- ✓ statistical deviation from baselines (same timeframes in previous years or from previous events—historical baseline)
- ✓ algorithms based on (for example) cumulative sum (CuSum)













An alert and/or severity can:

- ✓ identify vulnerable populations or areas
- ✓ locate vulnerable populations (resources)
- evaluate effectiveness of risk communication strategies
- evaluate severity of health response to heat event

Absence of an alert during an extreme heat event can:

- evaluate the sensitivity of warning protocols
- evaluate thresholds, education, and communication strategies



5. Integrating Health Outcomes & Weather Info

Ideal Syndromic Surveillance to Monitor Extreme Heat:

- map-based representation of meteorological conditions, including real-time measures, alerts, and forecasts
- ✓ geospatial description of heat-vulnerable populations
- map-based population health status indicators, such as air quality parameters, forecasts for extreme heat events
- map-based health outcome indicators to:

- 1. support situational awareness for launching public health action
- 2. retrospective evaluation of health impacts of extreme heat







Lessons Learned

- identification of data sources, and careful collection of data sources are key first step
- working systems can be built *without* electronic medical records with active surveillance techniques
- collected data can be used identify vulnerable populations and/or vulnerable geographic regions





Lessons Learned



- occupational exposure → develop messaging strategies in coordination with employers, workers and occupational health authorities
- alert fatigue should be considered, especially in hot climates
- messaging coordinated with aberration
 detection to improve uptake and reduce risks



Lessons Learned



- RODS-based systems with fixed methods for syndrome definitions can be modified to accommodate greater numbers of syndromes
- use creative statistical methods to establish baselines for sporadic seasonal events (extreme heat in northern climates)



Next Steps

- education and training are key to technology uptake and adoption of syndromic surveillance tool
- methods to determine health,
 weather indicators (or a combined metric)



 statistical relationships between heat and health to improve heat response plans and emergency protocols



Contact Information



МОН













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