

Outbreak & Case Management: A State Perspective

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Outline

- **Complexity of capturing exposure data during contact investigations for communicable diseases**
- **Tennessee's experience using CDC's Outbreak Management System (OMS)**
- **Summary of CSTE needs assessment for a system such as OMS (March 2007)**
- **Current Gaps/Next Steps for AHIC**

Communicable Disease Contact Investigation

- Agents transmitted via airborne route (droplet nuclei or droplets)
 - SARS (*new communicable disease*)
 - H5N1 influenza (*new communicable disease*)
 - Measles (*vaccine-preventable*)

 - Tuberculosis (TB)

Why Do Contact Investigations for TB?

- **Every Case was once a Contact!**
 - **To stop TB transmission**
 - **To identify additional cases, ensure proper evaluation and treatment to make them non-infectious and cure their TB disease**
 - **To prevent newly infected contacts from developing active disease**
 - **Highest priority: HIV positive, young children (particularly time-sensitive)**

Tennessee's Experience in Using CDC's OMS: Complex TB Contact Investigation

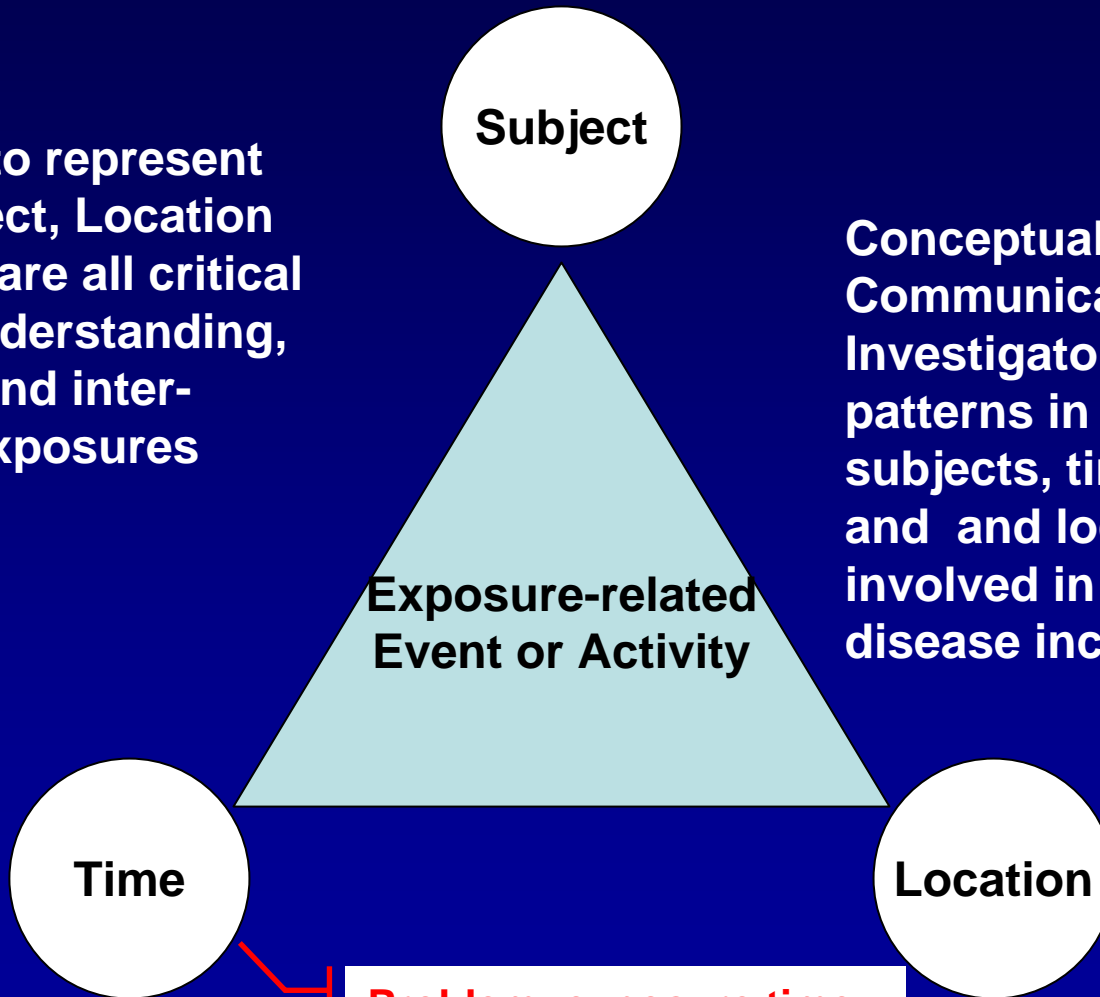
- **Needed a data management tool to track complex follow-up on all cases in this cluster (19) and their contacts**
- **Extensive contact tracing with large numbers of contacts**
 - **One case alone had over 200 contacts identified requiring follow-up including many children, and persons at risk of HIV**

Requirements

- Needed to collect detailed information to interrupt transmission
 - ***Relationships (familial and social)***
 - Allows identification of patterns which may contribute to transmission
 - Allows for alternate methods for contacting cases/contacts (through relatives/friends)
 - ***Exposures (to persons and to locations)***
 - In this investigation, involved multiple households and locations where shared activities occurred (baby-sitting, drug use, sex)

Original Exposure Triangle concept

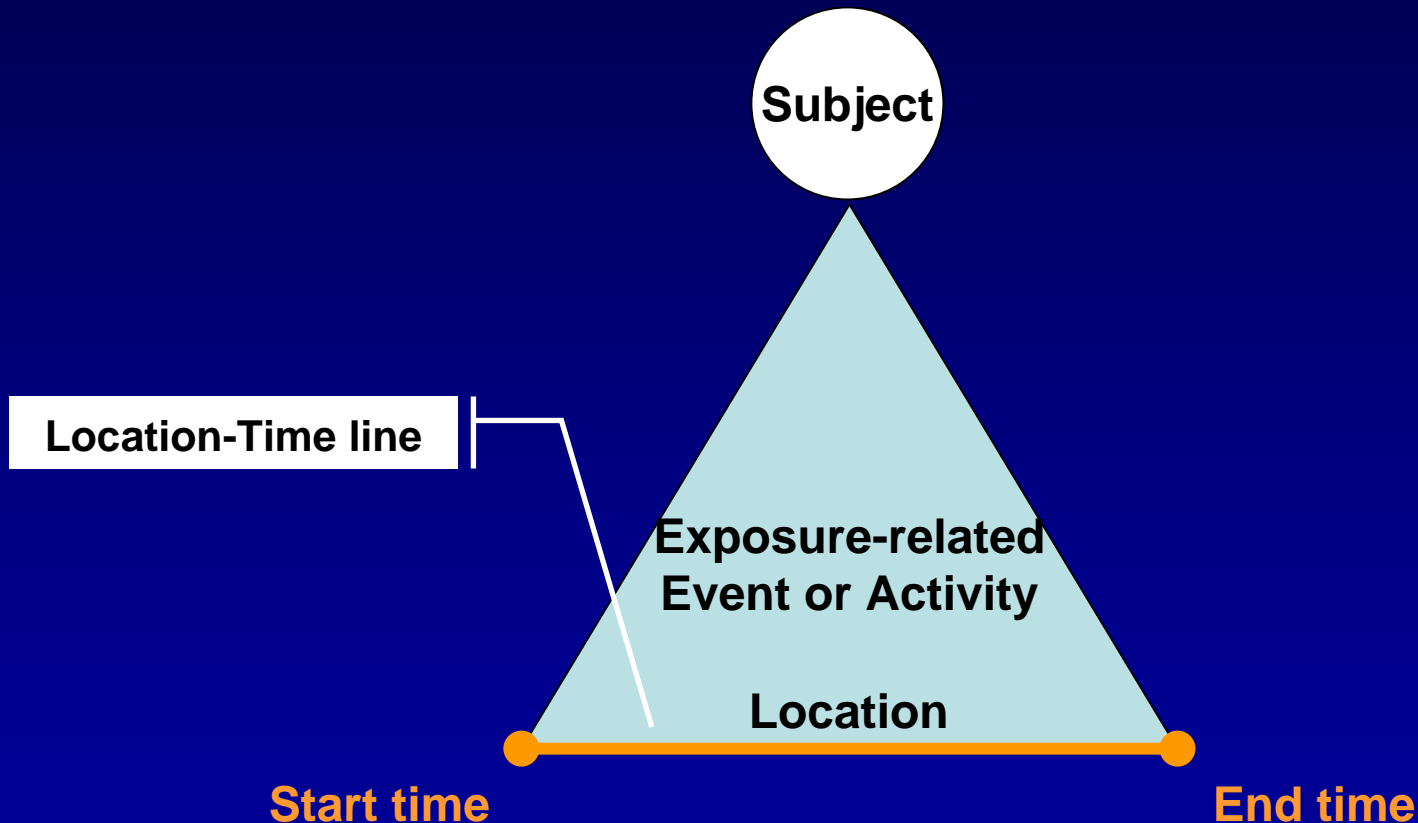
Intended to represent that **Subject, Location and Time** are all critical data in understanding, tracking and inter-relating exposures



Conceptually, **Communicable Disease Investigators** are seeking patterns in the overlap of subjects, time-periods and and locations involved in **communicable disease incidents**

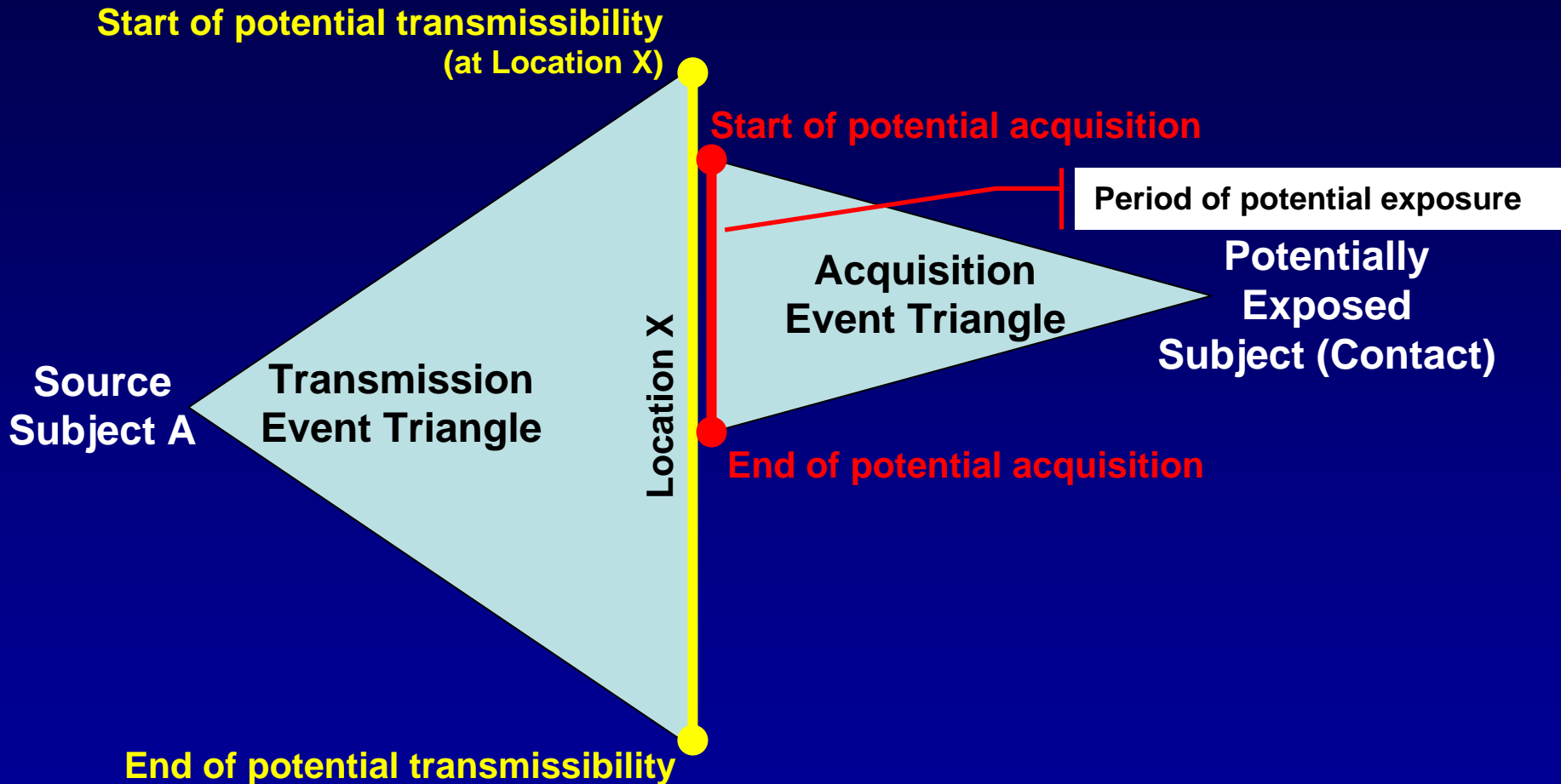
Modified Exposure Triangle

(Location is the base of each triangle and its end-points are Start and End times)



Acquisition and Transmission Triangles

(related by common location)



TB Contact Investigation in TN

**Subject A
(Potential Source)**

Exposures

**Exchange of Sex
for Drugs, Drug Use**

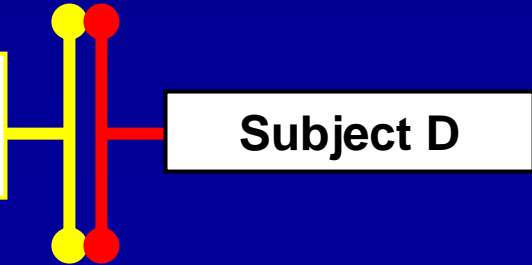
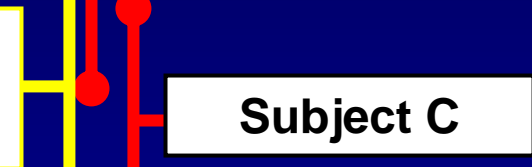
Subject B

Subject C

Subject B (again)

**Household N (very small,
crowded, poor ventilation)**

Subject D



Requirements

– *Shared activities*

- In this particular investigation: drug use, exchange of sex for money/drugs

– *Follow-up Information*

- TB skin testing (infected with TB)
- Chest X-rays (active TB disease)
- Treatment



CDC's OMS 1.1.53 beta

- **Demographic and investigation-specific information**
- **Exposure-contact relationships for many entity types:**
 - **Persons, animals, objects, organizations, events, travel events, vehicles (conveyances), and locations**
- **Create relationships between any entity**
 - **Household, social, occupational, etc...**



Core Tab: Demographics

Name: John Doe [INV47497] **Date of Birth:** Jan 1, 1950
Reported Age: 56 Years **Gender:** Male
Case Status: LTBI

* Required fields are denoted by an asterisk

New Save Revert Supplemental Data

Characteristics Investigation Exposure Contacts Relationships

*Subject ID: INV47497 Generate ID

Name: Legal: John Doe
Nickname:

Address: Primary H...: 1234 Main Street
Memphis, Tennessee 38105
 This is the mailing address.

Telephone: Home: (901) 406-6506

Email: Personal:
Primary Employer: Add
Occupation:

Date of Birth: 01/01/1950
Is the patient deceased? No
Race: African American
 American Indian, Alaskan
 Asian
 Pacific Island, Hawaiian

Reported Age: 56 Years **Gender:** Male
If yes, date of death: 03/15/2006 If yes, reason for death:

Ethnicity:
Marital Status:
Social Security No.: 555-55-5555
Issuing State:
Country of Citizenship:
Issuing Country:
Country of Birth:
Primary Language:
Hair Color:
Complexion:
If female, pregnant?

Driver's License No.:
Passport No.:
Speaks English?
Height:
Size/Build:



OMS

- Flexibility to include any additional data specific to the investigation
 - Use of supplemental data tables – can be anything
 - Examples may include risk factors, clinical information, laboratory testing, treatment, study questionnaires, isolation/quarantine, vaccinations, etc.
 - *[Note: OMS 1.2 has laboratory & countermeasures module (treatment, vaccinations & isolation/quarantine)]*



Supplemental Data

Supplemental Data

Save New Record Delete Record Remove Flag Expand All Collapse All First Previous Next Last Close Form Help

Record 1 of 1

Set MSR TB Investigation Version <Default> MSR TB Investigation : Testing a View Records Refresh

Show unavailable (skipped) questions. Required fields Questions marked with require review and validation before removing the flag

Was a chest x-ray taken?
Yes

Date chest x-ray was taken:
09/14/2005

Results of chest x-ray
An equivocal calcified granuloma over right lateral rib but nothing to suggest to active TB

Was contact started on treatment?
Yes

If yes, was this window treatment?
 No (1)
 Yes (2)
 Unknown (9)

Date treatment started:

Did treatment end?

Date treatment ended:

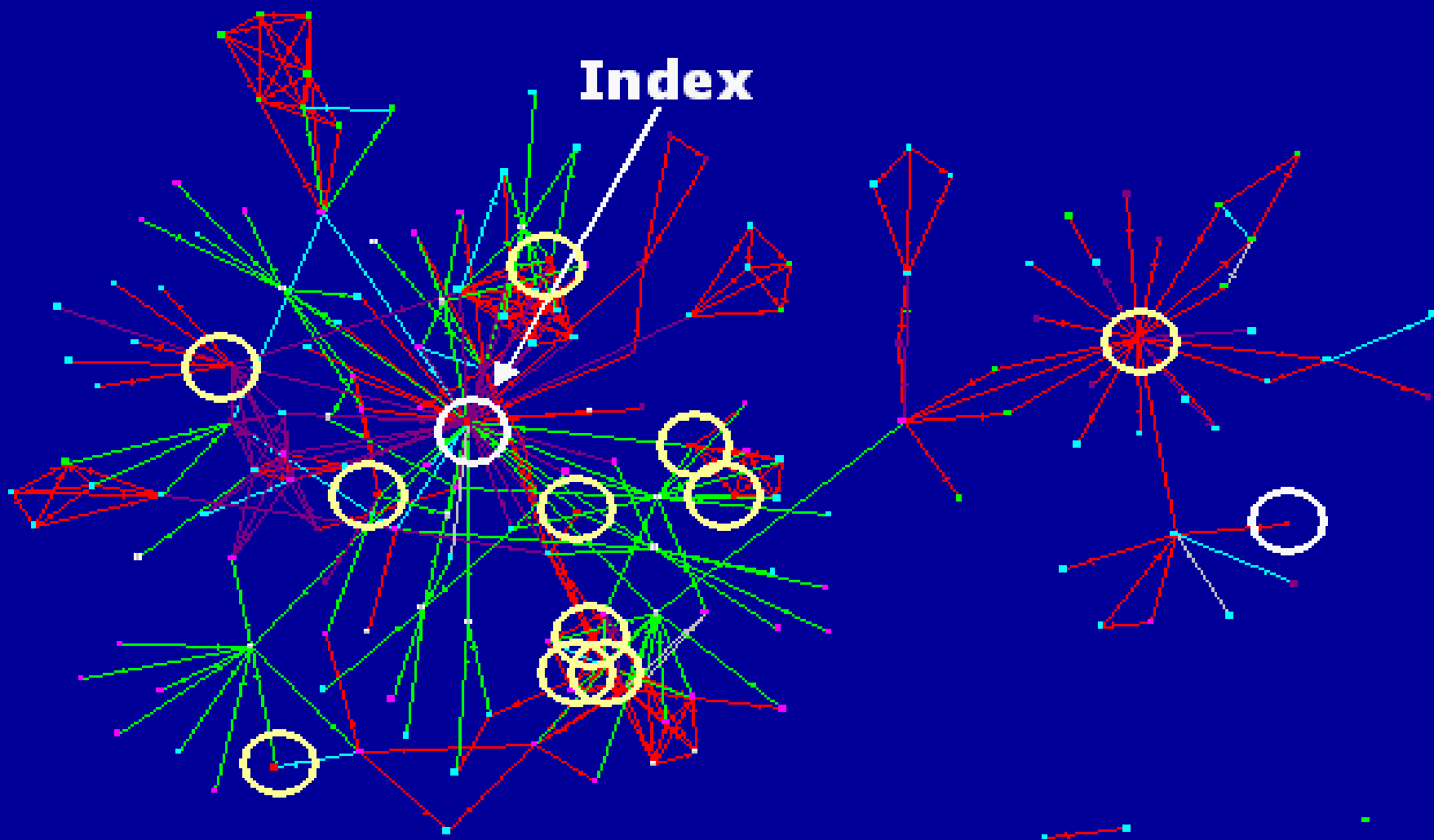
Why did treatment stop?

Edit Saved Record 1 of 1

Daily Reports to Drive Investigation

- **Reports created in Microsoft Access to allow for ease of use by investigators**
 - **Line listings**
 - **Missing data reports to identify communication gaps and needed activities for each case/contact**
 - **Daily Activity Report**
 - **Printed on a daily basis for field investigators and clinic staff**
 - **Made managing multiple large contact investigations possible, decreasing the chance of patients being missed**

Social Network Analysis



Data entered into OMS were able to be extracted and imported into social networking software using SAS. Because OMS captures relationship and exposure information, the strength of relationships and associations between persons and places, for example, can be easily described.

Tennessee's Experience in Using CDC's OMS: Results (cont'd)

- **Overall Reports and Data Analysis**
 - Able to easily harvest data for analysis in statistical package and social networking software through the use of SAS and ODBC (Open Database Connectivity)

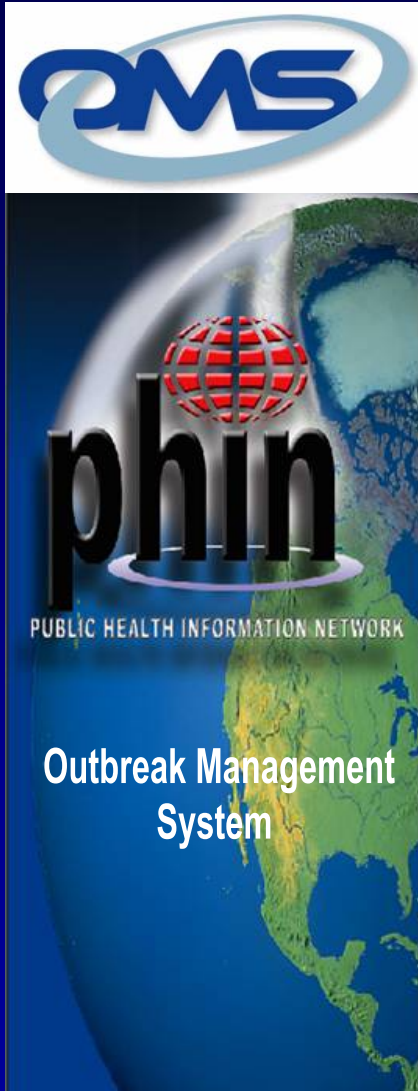
“The power of OMS is intoxicating”

Jennifer Ward, Epidemiologist
Memphis- Shelby County Health Dept.

Tennessee's Experience in Using CDC's OMS: Conclusions

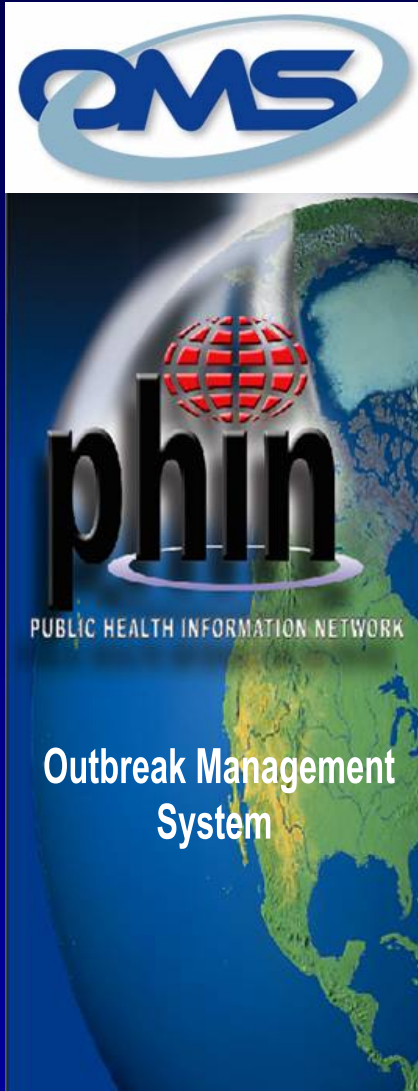
- **OMS is a powerful tool for managing contact investigations**
- **In conjunction with SAS, MS Access, social networking software, and GIS, use of OMS greatly improves epidemiologic response**
- **Sustainable tool for managing multiple and/or large contact investigations**
 - **Ease of data entry**
 - **Standardized vocabulary**
 - **Dynamic, versioned supplemental question sets**
 - **Ease of data extraction and analysis**

CSTE Assessment



- Conducted in February 2007
- 50 States and 11 large city public health jurisdictions
- Assess need for an OMS
- Gathered data on which features were considered most important.

CSTE Assessment



- **Response Rate:**
 - **50/50 (100%) States**
 - **6/11 (55%) Large cities/urban areas**

Summary of CSTE Assessment

- States and local public health departments stated that it is very important to have a system such as CDC's OMS
- Most jurisdictions do not currently feel prepared for data-management of a large, complex outbreak
- Many jurisdictions have not developed an in-house solution and were planning to evaluate/ implement CDC's OMS 1.2

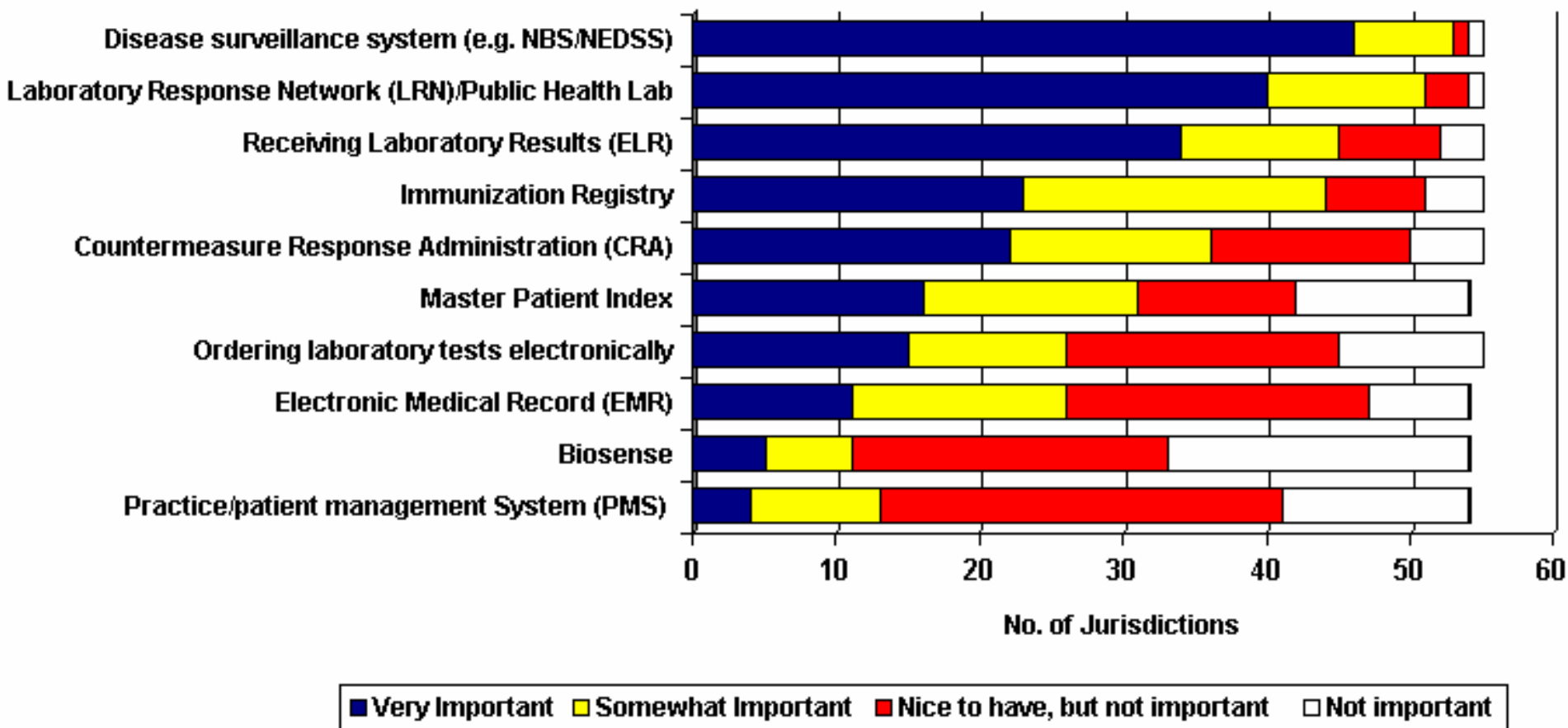
Summary of CSTE Assessment

- **Strong interest in CDC-OMS as a possible solution**
 - limited exposure to the most recent version
 - concerns over whether the application will continue to be developed and supported to meet the outbreak management needs of state and local health departments
- **States and public health jurisdictions want OMS to be able to exchange messages with surveillance and laboratory systems**
- **Strong interest was expressed in having OMS able to be deployed as a web-based and client-server application**

CSTE Recommendations

- Reinststate federal support for CDC's OMS 1.2 (deployment, training)
- Reconvene OMS working group
- Await feedback from experience of CDC's OMS 1.2 in the field and input from the OMS working group before evaluating future enhancements
- Prioritize specific high value enhancements (e.g., messaging)

Importance of OMS Exchanging Messages with Other Systems (N=55)



Gaps/Next Steps for AHIC

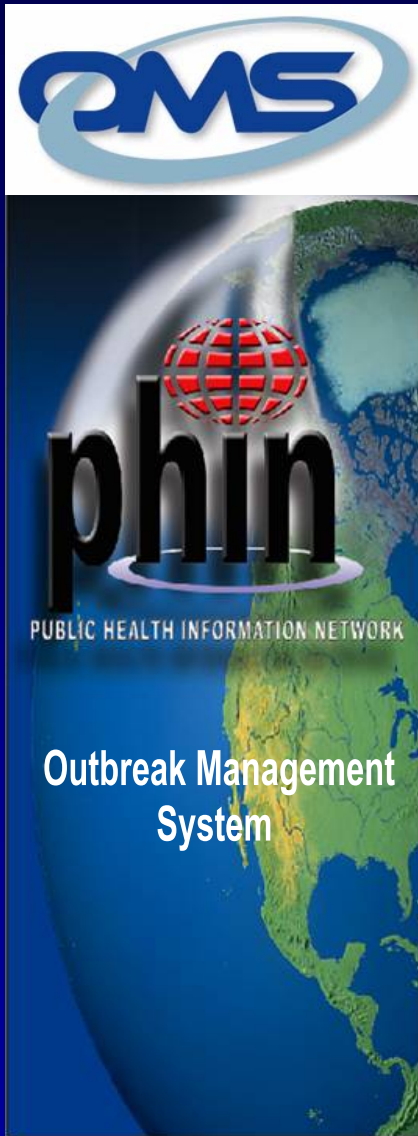
- **Data-needs for management of exposures in healthcare settings**
 - **capture and easily access information on patient/staff movements (location, entry/exit times)**
- **Advocate for additional federal investment in tools for outbreak data-management such as CDC's OMS**

Acknowledgments

- **TN OMS Power Users:**
 - Erin Holt
 - Calondra Tibbs
 - Jennifer Ward
- **OMS Development & Deployment Team**
 - Marty Cicchinelli
 - Tim Pattison
 - Kristi Eckerson
 - Scott Keller
- **Memphis-Shelby County Health Department**
- **Tennessee Department of Health**
- **CSTE**
- **Annie Fine (NYC)**

Questions?

OMS



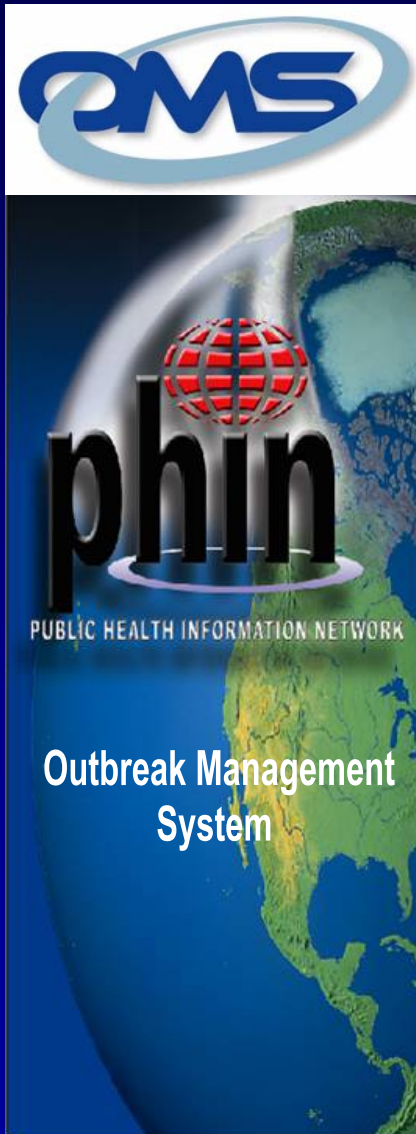
Developed by NCPHI, CDC in recognition of importance of robust data management capacities during large or complex outbreaks due to natural (e.g., SARS, West Nile) or other causes (e.g., terrorism)

OMS

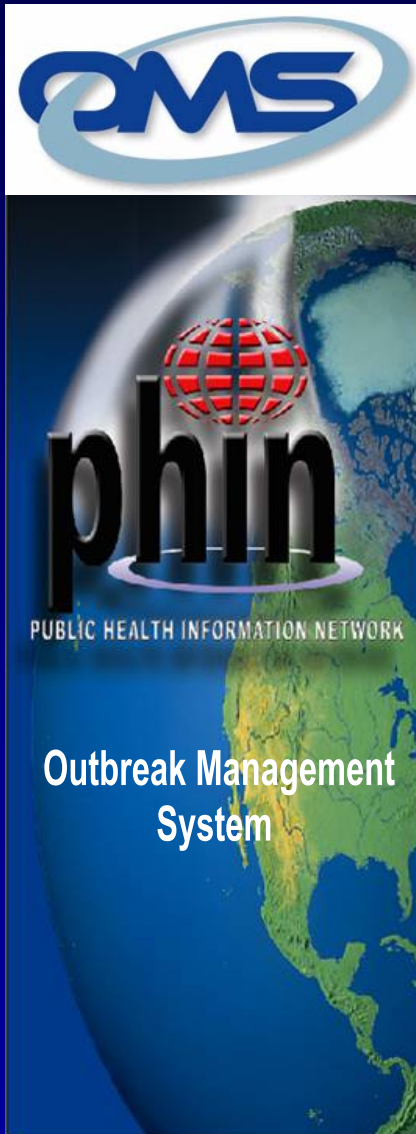
Supports many functions important for

- **initial characterization**
- **investigation**
- **response**
- **containment**

of outbreaks

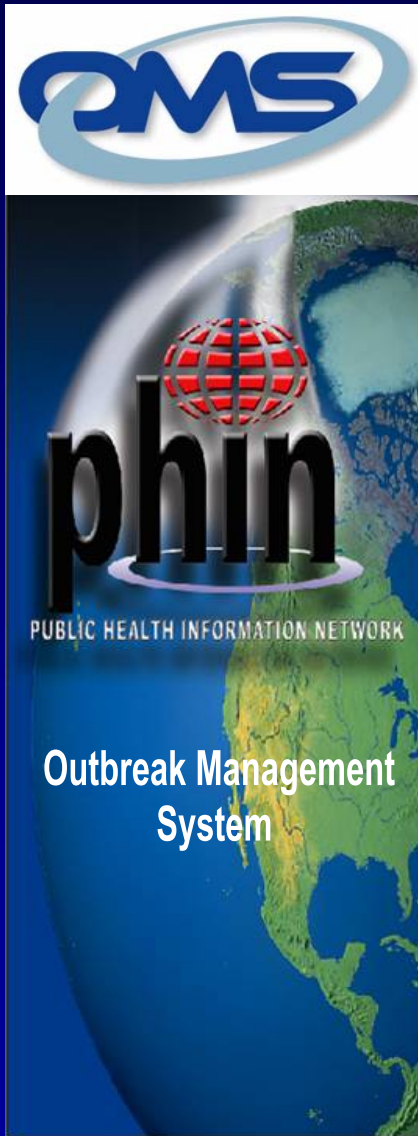


OMS Working Group



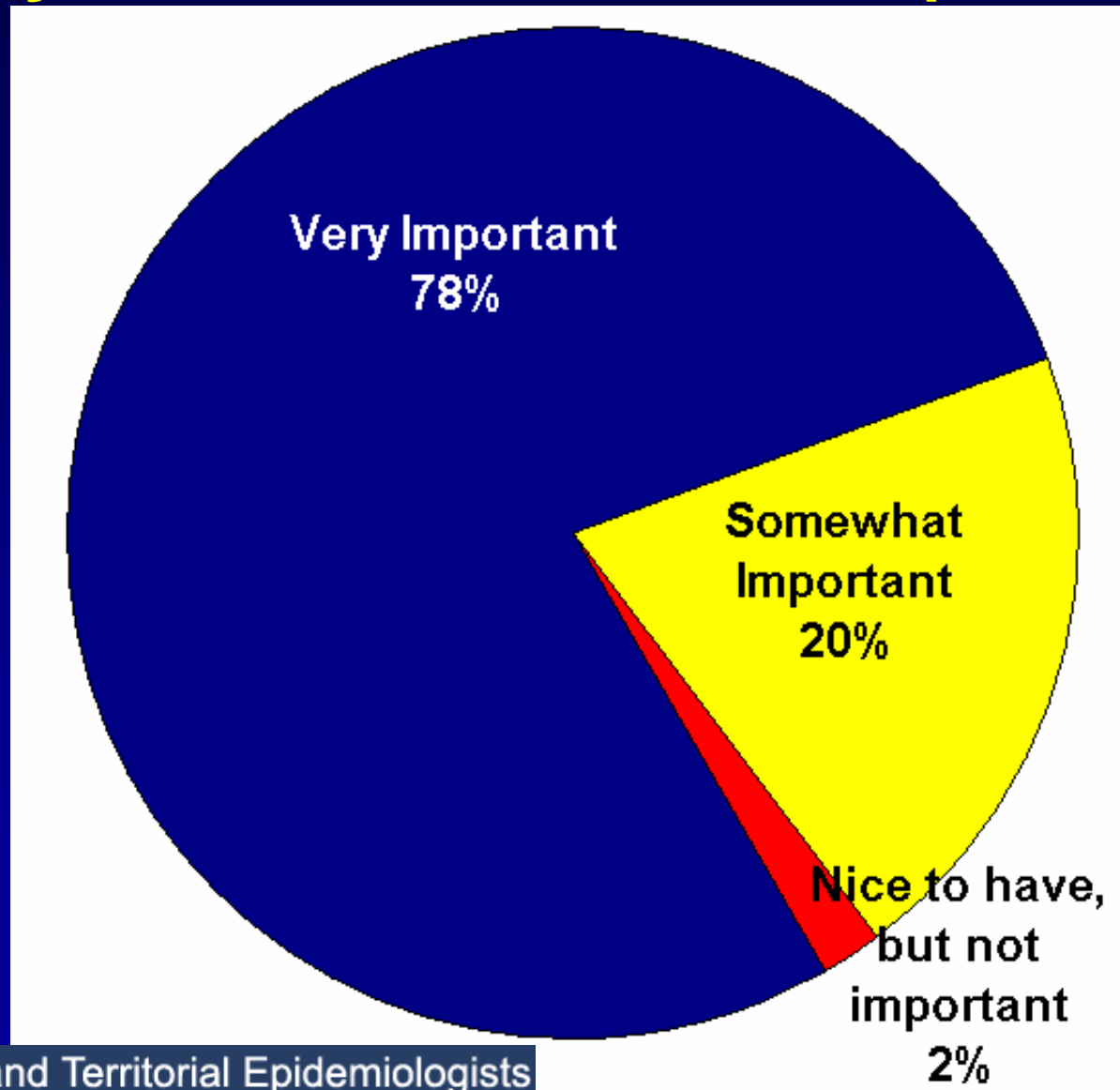
- Representatives from state and local health departments
- Worked closely with CDC since 2005
- Evaluate existing functions
- Prioritize new features
- **A TRUE PARTNERSHIP**
- Input was sought and **APPLIED**

OMS Development & Support

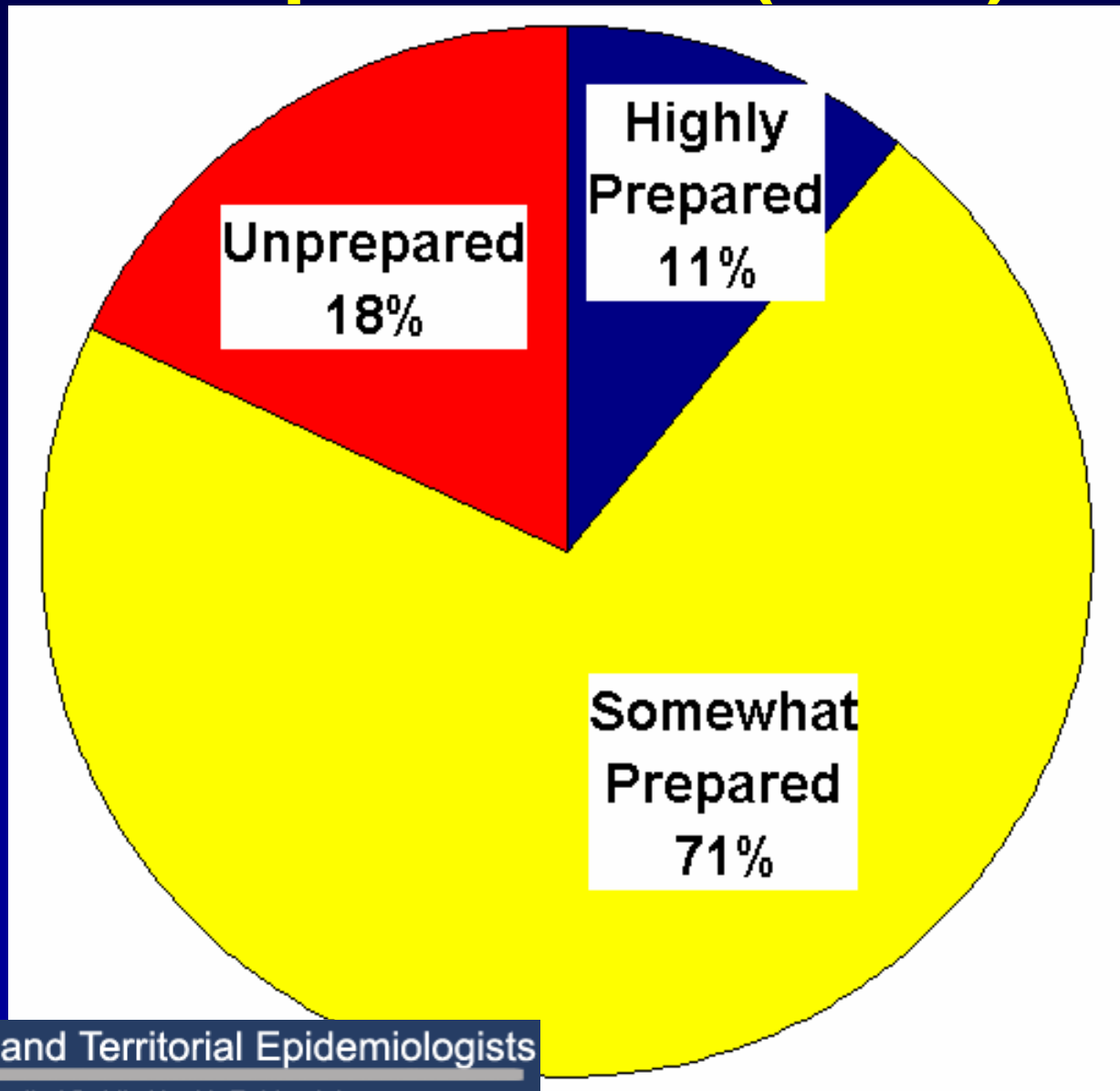


- In September 2006, CDC paused development and support for CDC's OMS
- Wished to assess the need for such a system
- Evaluate capacity of CDC's OMS to meet that need

Importance of Data-Management System Such as OMS (N=54)



Level of Data-Management Preparedness (N=55)



Jurisdictional Development of In House Solutions

- **10 completed building an in-house solution**
 - **5 (50%) stated that it met their needs**
- **11 development in progress**
- **31 did not attempt to develop in-house solution**

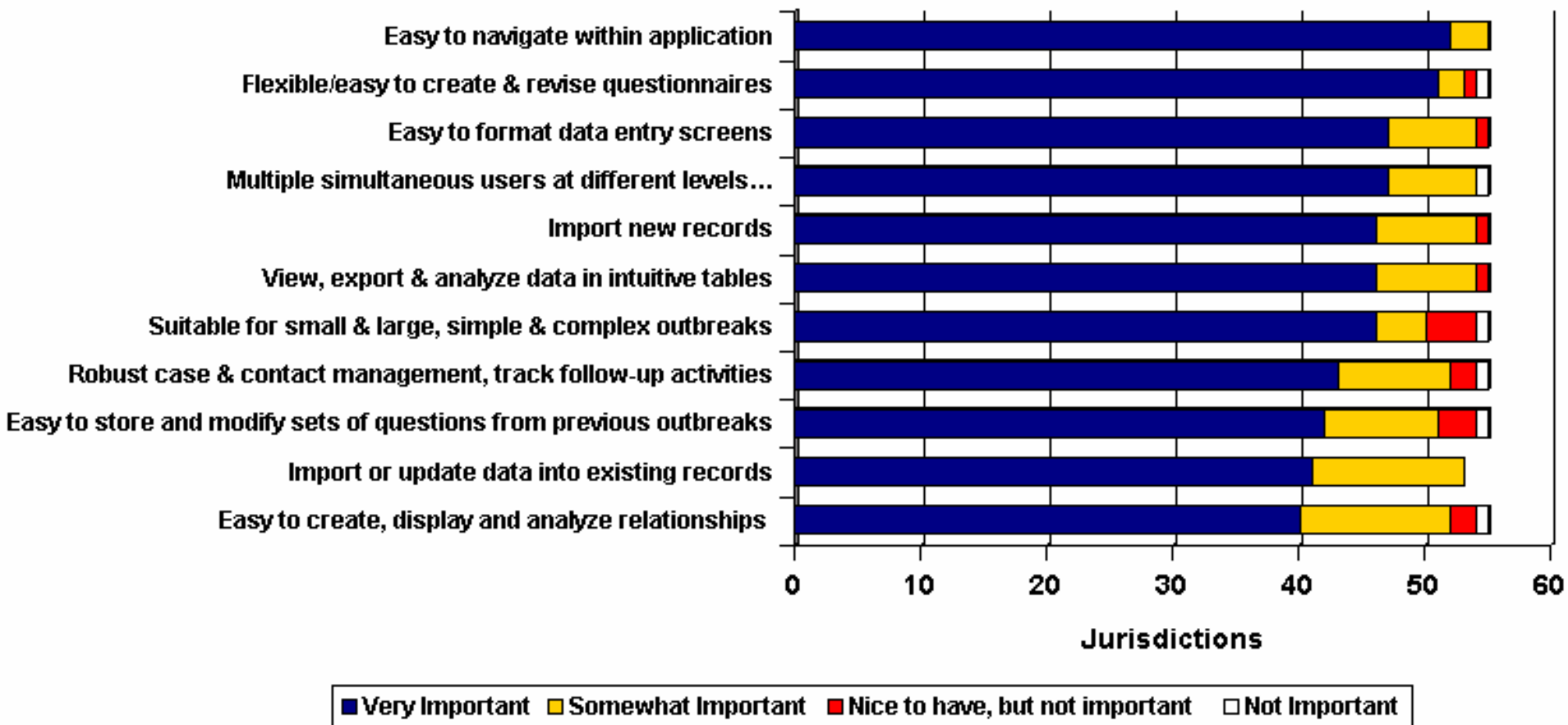
Interest in and Commitment to CDC's OMS

- 33 (60%) jurisdictions were interested in implementing CDC's OMS version 1.2, but most had not had a chance to evaluate it yet

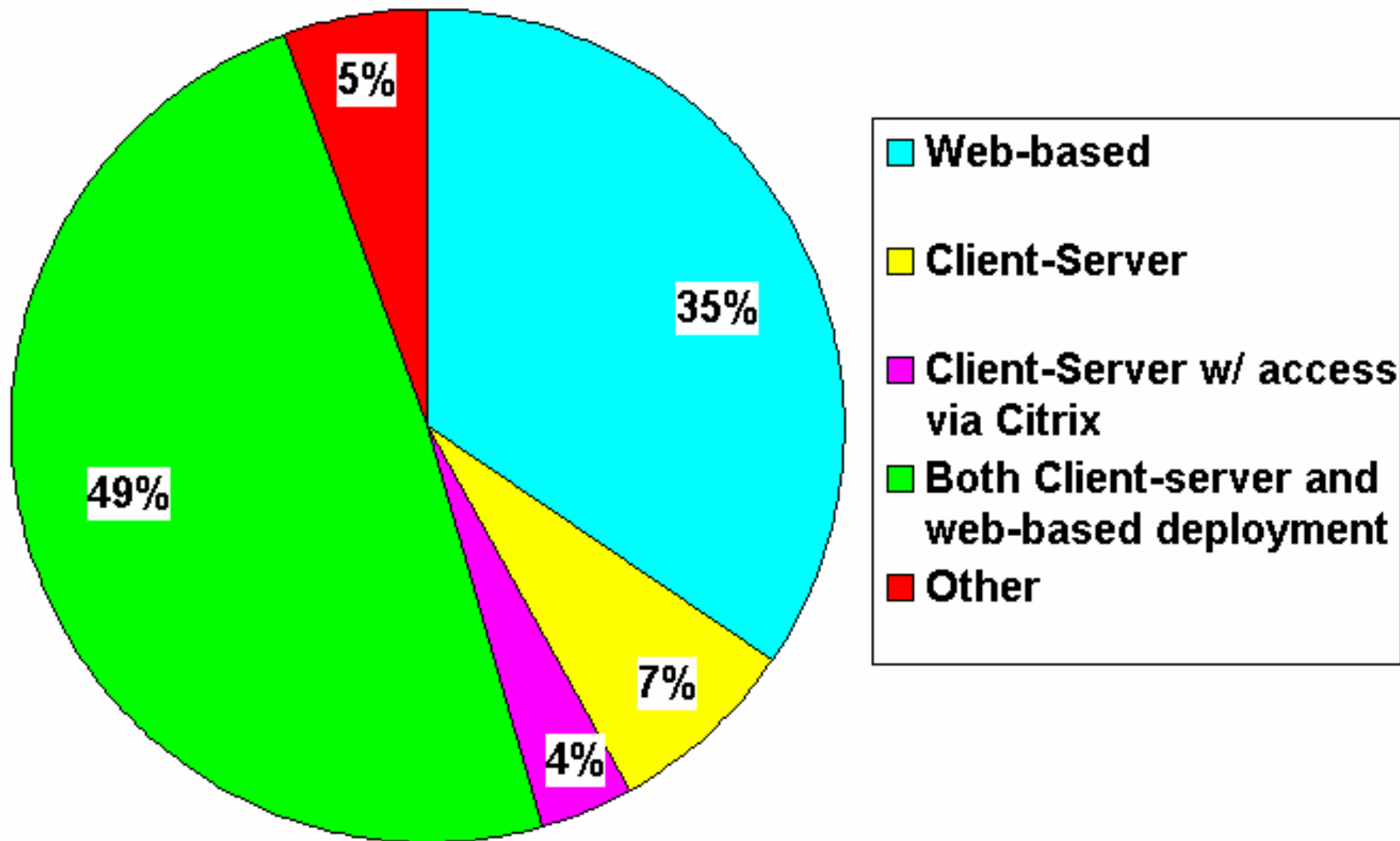
Future commitment to CDC's OMS

- 12 (22%) committed to implementing CDC's OMS
- 17 (31%) had planned to implement CDC's OMS, but are now concerned about future development and support for OMS from CDC
- 10 (19%) had alternative plans

Important Areas of Functionality for the Management of Outbreaks (N=55)



Preferred Deployment for OMS (N=55)





Analysis and Reporting

- Detailed search parameters able to be combined & saved

	With MS Access 2003	Without MS Access 2003
Tables can be linked by Global Unique Identifier (GUID) to combine information from different tables to tailor generated reports	X	
<ul style="list-style-type: none">• Direct access to OMS data through SAS (ODBC connection)• Able to manipulate data in SAS & export to MS Access (any version)• Able to create reports & daily investigation follow-up activity sheets in MS Access	X	X

Results

- **Data entered in OMS, manipulated in SAS, exported into Microsoft Access and social networking software and a GIS**

Case Line Listing

Case Line Listing

<i>Name</i>	<i>Age</i>	<i>Unit</i>	<i>Investigation Status</i>	<i>Health Status</i>	<i>Case Status</i>	<i>Infectious Period Start</i>	<i>Infectious Period End</i>
Smith, John	43	Year	Closed-Confirmed	TB Active	Confirmed-Culture Positive	11/01/2004	08/27/2005
Smith, Mary	27	Year	Active-Ongoing	Unknown	Unknown		
Doe, Jane	4	Year	Active-Ongoing	TB Active	Confirmed-Sputum Smear +		

- Multiple types of line listings were created in Microsoft Access using the OMS data.
- The line lists were used by multiple types of staff to manage the investigation (epidemiologists, disease investigative specialists, clinicians, and case managers).

Missing Data Report

Active - Ongoing Investigations with Missing Critical Data

Name: Smith, John	Age	18 Years	DOB	4/16/1987	Chart No: 4776311	Case Status: Exposed No Evidence
<i>Date 1st PPD Placed</i>	<i>Date 1st PPD Read</i>	<i>1st PPD Result (mm)</i>	<i>Date 2nd PPD Placed</i>	<i>Date 2nd PPD Read</i>	<i>2nd PPD Result (mm):</i>	<i>Symptoms?</i>
09/06/2005	09/08/2005	0	11/18/2005	11/21/2005	0	No
<i>CXR Date:</i>	<i>CXR Result:</i>		<i>OnTreatment:</i> No	<i>Window Therapy:</i>		
Name: Smith, Mark	Age	4 Years	DOB	1/24/2001	Chart No: 4776312	Case Status: Unknown
<i>Date 1st PPD Placed</i>	<i>Date 1st PPD Read</i>	<i>1st PPD Result (mm)</i>	<i>Date 2nd PPD Placed</i>	<i>Date 2nd PPD Read</i>	<i>2nd PPD Result (mm):</i>	<i>Symptoms?</i>
10/12/2005	10/14/2005	0	12/08/2005	12/11/2005	0	No
<i>CXR Date:</i> 10/14/2005	<i>CXR Result:</i> Abnormal		<i>OnTreatment:</i> Yes	<i>Window Therapy:</i> No (1)		
Name: Smith, Sally	Age	63 Years	DOB	6/14/1942	Chart No: 4776313	Case Status: LTBI
<i>Date 1st PPD Placed</i>	<i>Date 1st PPD Read</i>	<i>1st PPD Result (mm)</i>	<i>Date 2nd PPD Placed</i>	<i>Date 2nd PPD Read</i>	<i>2nd PPD Result (mm):</i>	<i>Symptoms?</i>
09/06/2005	09/08/2005	35				No
<i>CXR Date:</i> 09/09/2005	<i>CXR Result:</i> Large heart with prominent aorta		<i>OnTreatment:</i> Yes	<i>Window Therapy:</i> No (1)		

- Example of a report that was generated to identify active investigations with missing critical data.
- Reports of this type can also be used as a line listing.
- The ability to pull data out of OMS allows for limitless possibilities of reports and logs to assist the investigation.

Daily Activity Report

Daily Activities – Investigator: Susan Mitchell

Date:

10/01/2005

Smith, John	<i>Needs medical evaluation and HIV testing</i>	Notes:
Doe, Jane	<i>Has an appointment for 10/04/2005. Needs CXR and consider presumptive LTBI treatment</i>	Notes:
Smith, Sally	<i>Mother has not brought child in to start window prophylaxis. Need to go to patient's home and transport in for medical eval and window prophyl.</i>	Notes:

Reports were generated each day for the investigators and other field staff to outline activities for each case or contact assigned that day.

- Field staff could record information on these sheets to be entered into OMS at the end of the day.
- Activities could also be prioritized by case status and investigation priority.
- This allows many activities to be recorded and given a follow-up date, preventing important tasks from being missed.