



Socioeconomic Disparities and Late-Onset Group B *Streptococcus*, Tennessee, 2010–2014

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August 3rd, 2016

Outline



- Field Experience
- 2015 Database Audit
 - Background
 - Methods
 - Results
 - Discussion
- Late onset group B Streptococcus
 - Background
 - Methods
 - Results
 - Discussion
- Competencies

Field Experience

- Tennessee Emerging Infections Program
 - Vanderbilt University Medical Center
 - Dr. William Schaffner
 - Tennessee Department of Health
 - Dr. Tim Jones

VANDERBILT  UNIVERSITY
MEDICAL CENTER

 TN Department of
Health

Emerging Infections Program

- Addressing Emerging Infectious Disease Threats: A Preventative Strategy for The United States, Executive Summary¹
- Founded in 1995
- Four Goals:
 - Detect, investigate, and monitor emerging pathogens, the diseases they cause, and factors influencing their emergence
 - Integrate both laboratory science and epidemiology to optimize public health practice
 - Enhance communication of public health information about emerging diseases and ensure prompt implementation of prevention strategies
 - Strengthen local, state, and federal public health infrastructures to support surveillance and implement prevention and control programs

Emerging Infections Program

1995: Emerging Infections Program Network initiated with four states: California, Connecticut, Minnesota, Oregon

1999: Tennessee joins the EIP

2002/2003: New Mexico joins the EIP

1994: MMWR publishes *Addressing Emerging Infectious Disease Threats: A Prevention Strategy for the United States, Executive Summary.*



History of the Emerging Infections Program

2015: Emerging Infectious Diseases publishes a special issue on the Emerging Infections Program for its 20th anniversary².

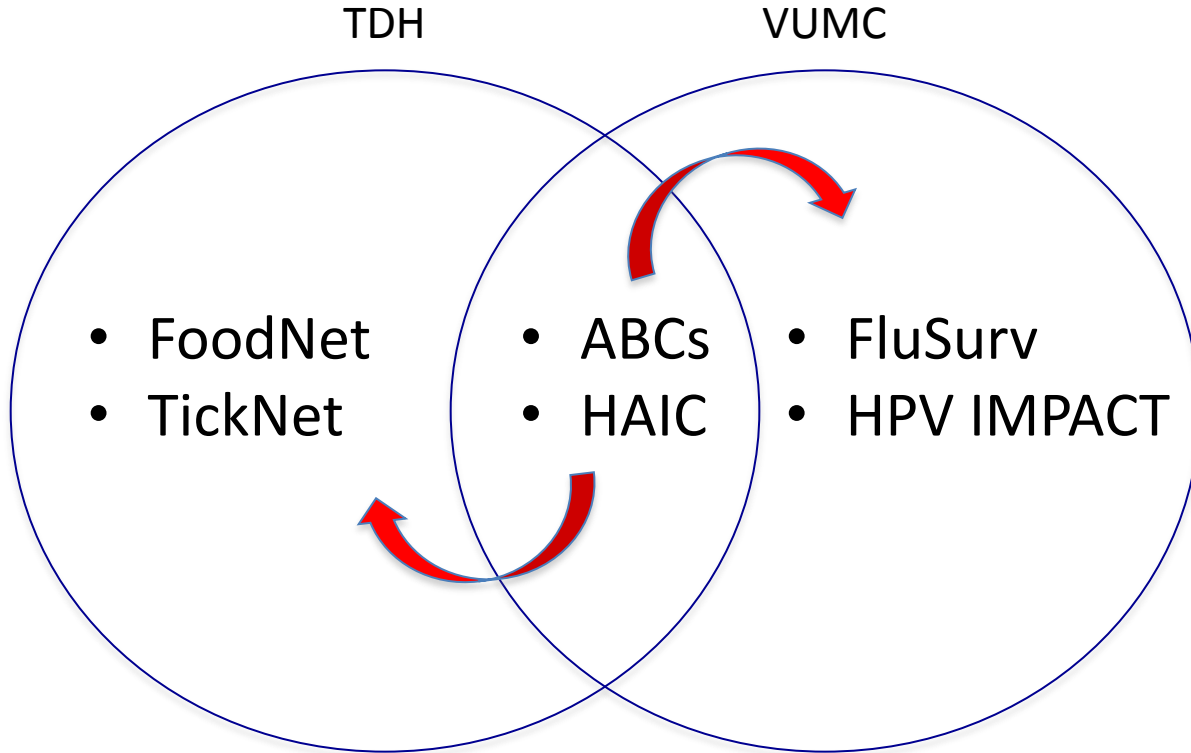
1997: Georgia, Maryland, and New York join the EIP

2000: Colorado joins the EIP

Emerging Infections Program

- Main Programs
 - Active Bacterial Core surveillance (ABCs)
 - FoodNet
 - Influenza
 - Healthcare Associated Infections– Community Interface (HAIC)
- Minor Programs/ Projects
 - TickNET
 - HPV IMPACT

TN Emerging Infections Program



TN Emerging Infections Program

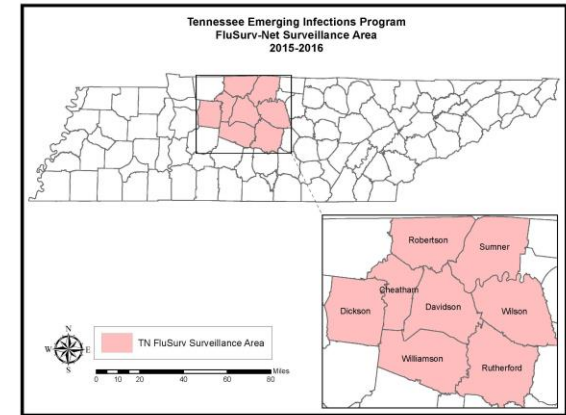
- Active Bacterial Core surveillance (ABCs)
 - Collects surveillance data on invasive pathogens
 - *Nisseria meningitides*, *Streptococcus pneumoniae*, group A and B *Streptococcus*, *Listeria monocytogenes*, and *Haemophilus influenzae*
 - Largest section of the EIP
 - Total population over EIP: 42 million
 - Total population in TN: 3.95 million



Image: CDC.gov

TN Emerging Infections Program

- Flu-Surv Net
 - Collects surveillance on Influenza hospitalizations
 - TN catchment area:
 - Eight middle Tennessee counties
 - Encompasses > 1.6 million people
 - Submits data to the CDC for FluView Report



TN Emerging Infections Program

- HPV– IMPACT

- Evaluates the impact of the HPV vaccination program and HPV vaccine efficacies
- Limited to Davidson County
- Surveillance on CIN2+ events in women



Internship Activities

- Attended meetings at TDH
 - Weekly Surveillance Meeting
 - Monthly meeting with field surveillance
- Assisted in extracting information from medical records for Case Report Forms (HPV, ABCs)
- Edited and reviewed the 2017 EIP grant application for VUMC sections
 - ABCs, Candidemia, Flu, HPV

- ACTIVE BACTERIAL CORE SURVEILLANCE CASE REPORT -

Patient's Name: _____ (Last, First, MI) Phone No.: _____)
 Address: _____ Patient Chart No.: _____
 (Number, Street, Apt. No.)
 (City, State) (Zip Code) Hospital: _____

- Patient identifier information is not transmitted to CDC -

DEPARTMENT OF HEALTH AND HUMAN SERVICES
 CENTERS FOR DISEASE CONTROL
 AND PREVENTION
 ATLANTA, GA 30333

2016 ACTIVE BACTERIAL CORE SURVEILLANCE (ABCs) CASE REPORT

A CORE COMPONENT OF THE EMERGING INFECTIONS PROGRAM NETWORK



CDC Form 1020-09/18

- SHADED AREAS FOR OFFICE USE ONLY -

1. STATE: (Residence of Patient) <input type="text"/>	2. STATE I.D.: <input type="text"/>	3. DATE FIRST POSITIVE CULTURE COLLECTED (Date Specimen Collected) Mo. Day Year <input type="text"/>	4. Date reported to EP site: Mo. Day Year <input type="text"/>
5. CRF Status: 1 Complete 2 Edited & Correct 3 Incomplete 4 Chart Unavailable after 3 requests			

6. COUNTY: (Residence of Patient) <input type="text"/>	7a. HOSPITAL/LAB I.D. WHERE CULTURE IDENTIFIED: <input type="text"/>	7b. HOSPITAL I.D. WHERE PATIENT TREATED: <input type="text"/>
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8. DATE OF BIRTH: Mo. Day Year <input type="text"/>	9a. AGE: <input type="text"/>	10. SEX: 1 Male 2 Female	11a. ETHNIC ORIGIN: 1 Hispanic or Latino 2 Not Hispanic or Latino 9 Unknown
9b. Is age in day/mo/yr? 1 Days 2 Mos. 3 Yes.		11b. RACE: (Check all that apply) 1 White 1 Asian 2 Black 1 Native Hawaiian 3 American Indian or Other Pacific Islander 1 Unknown	

12a. BACTERIAL SPECIES ISOLATED FROM ANY NORMALLY STERILE SITE: 1 <input type="checkbox"/> Neisseria meningitidis 3 <input type="checkbox"/> Group B Streptococcus 2 <input type="checkbox"/> Haemophilus influenzae 4 <input type="checkbox"/> Listeria monocytogenes 5 <input type="checkbox"/> Streptococcus pneumoniae	12b. OTHER BACTERIAL SPECIES ISOLATED FROM ANY NORMALLY STERILE SITE: Specify: _____
--	---

13. STERILE SITES FROM WHICH ORGANISM ISOLATED: (Check all that apply) 1 Blood 1 Peritoneal fluid 1 Bone 1 Joint 1 CSF 1 Pericardial fluid 1 Muscle/Fascia/Tendon 1 Neural fluid 1 Other normally sterile site (specify): _____	14. OTHER SITES FROM WHICH ORGANISM ISOLATED: (Check all that apply) 1 Isolated 1 Wound 1 Sinus 1 Amniotic fluid 1 Middle ear
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INFLUENZA 15. Did this patient have a positive flu test 10 days prior to or following any ABCs positive culture? 1 Yes 2 No 9 Unknown

16. WAS PATIENT HOSPITALIZED? 1 Yes 2 No	17. If patient was hospitalized, was this patient admitted to the ICU during hospitalization? 1 Yes 2 No 9 Unknown	18a. Where was the patient a resident at time of initial culture? 1 Private residence 4 Homeless 7 Non-medical ward 2 Long term care facility 5 Incarcerated 8 Other (specify): _____ 3 Long term acute care facility 6 College dormitory 9 Unknown
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18b. Was the patient at a facility, what was the name of the facility? Facility ID: _____	18c. Was patient transferred from another hospital? 1 Yes 2 No	19a. IF YES, hospital I.D.: <input type="text"/>
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20a. WEIGHT: lbs. or OZ. kg. OZ. Unknown	21. TYPE OF INSURANCE: (Check all that apply) 1 Private 1 Military 1 Other (specify): _____ 2 Medicare 1 Indian Health Service (IHS) 1 Uninsured 3 Medicaid/state assistance program 1 Incarcerated 1 Unknown	20b. HEIGHT: ft. in. OZ. cm. OZ. Unknown
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22. OUTCOME: 1 Survived 2 Died 9 Unknown

22a. If survived, patient discharged to: 1 Home 2 I/C/SNF 3 I/TACH 4 Other _____ 9 Unknown
 If discharged to I/C/SNF or I/TACH, what is the Facility ID: _____

24. At time of first positive culture, patient was:
1 Pregnant 2 Postpartum 3 Neither 9 Unknown

24b. If pregnant or postpartum, what was the outcome of fetus? 1 Survived, no apparent illness 4 Abortion/stillbirth 9 Unknown 2 Survived, clinical infection 5 Induced abortion 3 Live birth/intrauterine death 6 Still pregnant	26. TYPES OF INFECTION CAUSED BY ORGANISM: (Check all that apply) 1 Bacteremia without focus 1 Peritonitis 1 Endocarditis 1 Meningitis 1 Pericarditis 1 STSS 1 Otitis media 1 Septic abortion 1 Necrotizing fasciitis 1 Pneumonia 1 Chorioamnionitis 1 Puerperal sepsis 1 Cellulitis 1 Septic arthritis 1 Septic shock 1 Epiglottitis 1 Osteomyelitis 1 Other (specify): _____ 1 Hemolytic uremic syndrome (HUS) 1 Abscess (not skin) 1 Endocarditis 1 Unknown
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24c. Mark if this is a HIN25a fetal death with placenta and/or amniotic fluid isolate, a stillbirth, or neonate <22 wks gestation.

25. If pregnant <1 month of age, indicate gestational age and birth weight. If pregnant, indicate gestational age of fetus, only.
 Gestational age: wks Birth weight: (gms)

- IMPORTANT - PLEASE COMPLETE THE BACK OF THIS FORM -

27. UNDERLYING CAUSES OR PRIOR ILLNESSES: (Check all that apply OR, if NONE or CHART UNAVAILABLE, check appropriate box) 1 None 1 Unknown

1 AIDS or CD4 count <200	1 Complement Deficiency	1 IVDU, Current
1 Alcohol Abuse, Current	1 Connective Tissue Disease (Lupus, etc.)	1 IVDU, Past
1 Alcohol Abuse, Past	1 CSF Leak	1 Leukemia
1 Asthma	1 Deaf/Profound Hearing Loss	1 Multiple Myeloma
1 Atherosclerotic Cardiovascular Disease (ASCVD)	1 Dementia	1 Premature Birth (specify gestational age at birth) (specify)
1 Bone Marrow Transplant (BMT)	1 Diabetes Mellitus	1 Psychiatric Disorder
1 Cerebral Vascular Accident (CVA)/Stroke/TIA	1 Emphysema/COPD	1 Sickle Cell Anemia
1 Chronic Kidney Disease	1 Heart Failure/CVF	1 Smoker (current)
1 Chronic Liver Disease/cirrhosis	1 HIV Infection	1 Solid Organ Malignancy
1 Current Chronic Dialysis	1 Hodgkin's Disease/Lymphoma	1 Solid Organ Transplant
1 Chronic Skin Breakdown	1 Immunoglobulin Deficiency	1 Splenectomy/Aplasia
1 Cochlear Implant	1 Immunosuppressive Therapy (Steroids, Chemotherapy, Radiation)	1 Other prior illness (specify): _____

- IMPORTANT - PLEASE COMPLETE FOR THE RELEVANT ORGANISM -

HAEMOPHILUS INFLUENZAE
 28a. What was the serotype? 1 1b 2 Not typable 3 4 5 6 9 Other (specify) _____ 9 Not Tested or Unknown

28b. If <15 years of age and serotype 'b' or 'unknown' did patient receive Haemophilus influenzae b vaccine? 1 Yes 2 No 9 Unknown
 IF YES, please complete the list below.

DOSE	DATE GIVEN			VACCINE NAME	MANUFACTURER	LOT NUMBER
	Mo.	Day	Year			
1	<input type="text"/>	<input type="text"/>	<input type="text"/>			
2	<input type="text"/>	<input type="text"/>	<input type="text"/>			
3	<input type="text"/>	<input type="text"/>	<input type="text"/>			
4	<input type="text"/>	<input type="text"/>	<input type="text"/>			

28c. Were records obtained to verify vaccination history? (<3 years of age with HbUnknown serotype only)
 1 Yes 2 No

IF YES, what was the source of the information? (Check all that apply)
 1 Vaccine Registry
 1 Healthcare Provider
 1 Other (specify): _____

NEISSERIA MENINGITIDIS
 29. What was the serogroup? 1 A 2 B 1 C 4 Y 5 W135 6 Not Groupable 8 Other _____ 9 Unknown

30. Is patient currently attending college? 1 Yes 2 No 9 Unknown

31. Did patient receive meningococcal vaccine? 1 Yes 2 No 9 Unknown. IF YES, complete the table below.

DOSE	TYPE	DATE GIVEN			NAME	MANUFACTURER	LOT NUMBER
		Mo.	Day	Year			
1		<input type="text"/>	<input type="text"/>	<input type="text"/>			
2		<input type="text"/>	<input type="text"/>	<input type="text"/>			
3		<input type="text"/>	<input type="text"/>	<input type="text"/>			
4		<input type="text"/>	<input type="text"/>	<input type="text"/>			
5		<input type="text"/>	<input type="text"/>	<input type="text"/>			
6		<input type="text"/>	<input type="text"/>	<input type="text"/>			

TYPE CODES: 1 = ACWY conjugate (Menactra, Menveo, MenIbrix) 2 = ACWY polysaccharide (Menomune)
 3 = B (Bexsero, Trumeny) 9 = Unknown

STREPTOCOCCUS PNEUMONIAE
 IF YES, please note which pneumococcal vaccine was received: (Check all that apply)
 1 Prevnar 7-valent Pneumococcal Conjugate Vaccine (PCV7)
 1 Prevnar 13-valent Pneumococcal Conjugate Vaccine (PCV13)
 1 Pneumovax 23-valent Pneumococcal Polysaccharide Vaccine (PPV23)
 1 Vaccine type not specified

IF between 12 months and < 5 years of age and an isolate is available for serotyping, please complete the Invasive Pneumococcal Disease in Children expanded form.

31b. If survived, did patient have any of the following sequelae evident upon discharge? (check all that apply) 1 None 1 Unknown
 1 Hearing deficits 1 Amputation (digit) 1 Seizures 1 Paralysis or spasticity 1 Skin Scarring/Healed 1 Other (specify): _____

GROUP A STREPTOCOCCUS (IF 3-5 refer to the 14 days prior to first positive culture)
 32. Did the patient have surgery? 1 Yes 2 No 9 Unknown

34. Did the patient deliver a baby (vaginal or C-section)? 1 Yes 2 No 9 Unknown

IF YES, date of surgery or skin incision: Mo. Day Year
 IF YES, date of delivery: Mo. Day Year

35. Did patient have:
 1 Surgical wound (past operative)
 1 Penetrating trauma
 1 Burn trauma
 1 Burns

IF YES to any of the above, record the number of days prior to the first positive culture (P> - Use the most recent skin injury)
 1 0-7 days 2 8-14 days

36. COMMENTS: _____

Public reporting burden of this collection of information is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC, CDC/OSTEO Reports Clearance Office, 1600 Clifton Road, NE, DC 74, Atlanta, GA 30329, ATTN: PPA(5020-9078). Do not send the completed form to this address.

37. Was case first identified through audit? 1 Yes 2 No 9 Unknown

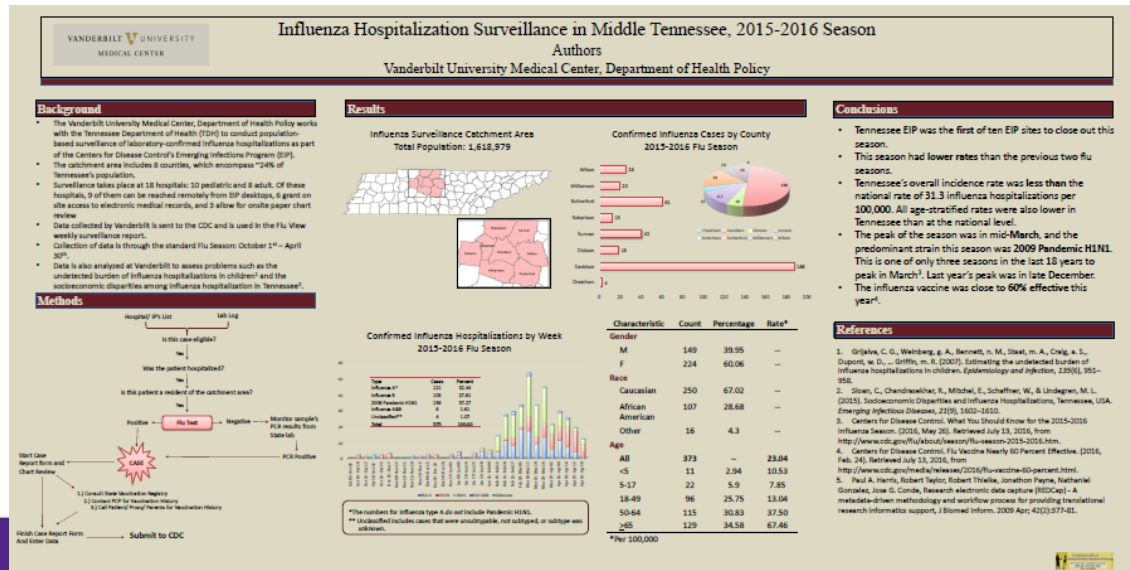
38. Does this case have recurrent disease with the same pathogen? 1 Yes 2 No 9 Unknown

Internship Activities

- Pneumococcal Carriage Study
 - 4/10 EIP sites
 - Objectives³:
 - Define Prevalence and serotype distribution of *S. pneumonia* in adults ≥ 65 prior to widespread use of PCV-13
 - Assess risk factors for colonization
 - Provide baseline data to assess the impact of the new ACIP recommendation on carriage rates in the same patient population through later surveys
 - Cross sectional study that involved naso- and oropharyngeal swabs
 - Assisted in enrolling patients prior to being swabbed by the nurse

Internship Activities

- Flu-Surv Net
 - CDC site visit
 - Society of Clinical Research Associates
 - Completed poster and abstract for annual meeting in October





Minor Project– 2015 ABCs Database Audit

Background

- Under the current grant cycle, the CDC does not require the EIP to perform audits
- Starting in 2017, each site will be required to perform audits on each database (ABCs, HPV, HAIC, etc.)
- This year, the ABCs database was housed in REDCap, previous years were in Access
 - REDCap is a secure web application created by Vanderbilt for building and managing online surveys and databases⁴



Objectives

- Create a database to house future audit information that can be merged with current database
- Complete a 10% audit of the 2015 ABCs database
- Assess the program's data entry protocol and highlight areas that need revisions or reeducation

Methods– Database

- Utilized REDCap to create a database to house the ABCs audit information
 - Can be merged with current and future ABCs databases
- Can enter up to 10 discrepancies per CRF
 - Two types of errors

Methods– Database

- Data Entry Error
 - An error in which an item is entered into the electronic database incorrectly
 - Spelling errors, checking incorrect boxes, correcting errors on a form without updating database
- Data Omission Error
 - An error in which an element of the hard copy CRF is not entered into the database
- Comments

Methods– Database

- Section for data entry manager includes:
 - A place to answer if the error was corrected
 - Date of correction
 - Initials
 - Comments on correction

ABCs Audit 2015-2016

Save Record

Save and Continue

Actions: Download PDF of instrument(s) ▾

Share instrument in the Library

VIDEO: Basic data entry

Error/Correction log

+ Adding new State ID TNK0000	
State ID	TNK0000
Case Year <small>* must provide value</small>	<input type="text" value="2015"/>
Has the case been audited?	<input checked="" type="radio"/> Yes <input type="radio"/> No reset
Was there an error?	<input checked="" type="radio"/> Yes <input type="radio"/> No reset
Error 1	
Nature of Error 1	<input checked="" type="radio"/> Omitted Error <input type="radio"/> Data Entry Error reset
Comments on Error 1	<input type="text"/> Expand
Was Error 1 corrected?	<input checked="" type="radio"/> Yes <input type="radio"/> No reset
Date of Correction <small>* must provide value</small>	<input type="text"/> <input type="button" value="Now"/> D-M-Y H:M:S
Editor's Initials <small>* must provide value</small>	<input type="text"/>
Comments on Correction	<input type="text"/> Expand

Methods– Audit

- Random 10% of cases was pulled using SAS 9.4 from the 2015 database
- Errors were marked on CRF using post-it flags
- Question error was on and what the discrepancy was were annotated in the ‘Comments on Error’ box

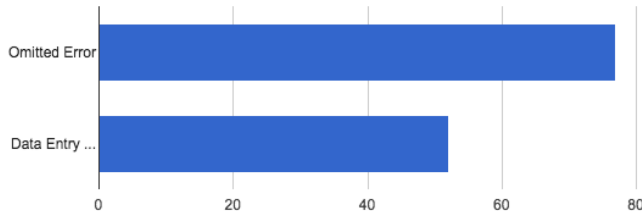
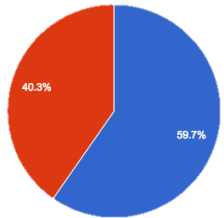
Results

- 129 Case Report Forms were audited
- All contained at least one error

Nature of Error 1

Total Count (N)	Missing	Unique
129	0 (0.0%)	2

Counts/frequency: Omitted Error (77, 59.7%), Data Entry Error (52, 40.3%)



Number of Errors	Omitted Errors	Entry Errors	Total
1	77	52	129
2	54	63	117
3	67	39	106
4	71	26	97
5	72	10	82
6	52	8	60
7	32	2	34
8	15	1	16
9	11	1	12
10	7	0	7
Total	458	202	660
Average/CRF	3.55	1.57	5.12

Results

- There were sections of the CRF that were routinely flagged

Field	Errors	%
Patient Information	66	51.2
Hospital ID	39	30.2
Lab ID	26	20.2
Treatment ID	40	31
Pregnancy Status	40	31
Symptoms	37	28.7
Underlying Conditions	33	25.6
Submitted By	81	62.8
Date	85	65.9

Results

- There were sections of the CRF that were routinely flagged

Field	Errors	%
Patient Information	66	51.2
Hospital ID	39	30.2
Lab ID	26	20.2

- ACTIVE BACTERIAL CORE SURVEILLANCE CASE REPORT -

Patient's Name: Middle Initial Omitted _____ (Last, First, MI.) Phone No.:() _____

Address: _____ (Number, Street, Apt. No.) Patient Chart No.: _____

_____ (City, State) _____ (Zip Code) Hospital: _____

Submitted By	81	62.8
Date	85	65.9

Results

- There were sections of the CRF that were routinely flagged

Field	Errors	%
Patient Information	66	51.2
Hospital ID	39	30.2
Lab ID	26	20.2

- ACTIVE BACTERIAL CORE SURVEILLANCE CASE REPORT -

Patient's Name: _____ (Last, First, MI.) Phone No.:() _____

Address: _____ (Number, Street, Apt. No.) Patient Chart No.: _____

_____ (City, State) _____ (Zip Code) Hospital: _____

Conditions	33	25.0
Submitted By	81	62.8
Date	85	65.9

Results

- There were sections of the CRF that were routinely flagged

Field	Errors	%
Patient Information	66	51.2
Hospital ID	39	30.2
Lab ID	26	20.2
Treatment ID	40	31

1. STATE: <i>(Residence of Patient)</i> <input type="text"/>	2. STATE I.D.: <input type="text"/>	3. DATE FIRST POSITIVE CULTURE COLLECTED <i>(Date Specimen Collected)</i> Mo. Day Year <input type="text"/> <input type="text"/> <input type="text"/>	4. Date reported to EIP site: Mo. Day Year <input type="text"/> <input type="text"/> <input type="text"/>	5. CRF Status: 1 <input type="checkbox"/> Complete 3 <input type="checkbox"/> Edited & Correct 2 <input type="checkbox"/> Incomplete 4 <input type="checkbox"/> Chart unavailable after 3 requests
6. COUNTY: <i>(Residence of Patient)</i> _____		7a. HOSPITAL/LAB I.D. WHERE CULTURE IDENTIFIED: <input type="text"/>		7b. HOSPITAL I.D. WHERE PATIENT TREATED: <input type="text"/>

Results

- There were sections of the CRF that were routinely flagged

10. SEX:

1 Male

2 Female

Field	Errors	%
Patient Information	66	51.2
Hospital ID	39	30.2
Lab ID	26	20.2
Treatment ID	40	31
Pregnancy Status	40	31
Symptoms	37	28.7
Underlying Conditions	33	25.6
Submitted By	81	62.8
Date	85	65.9

24a. At time of first positive culture, patient was:

1 Pregnant 2 Postpartum 3 Neither 9 Unknown

Results

- There were sections of the CRF that were routinely flagged

26. TYPES OF INFECTION CAUSED BY ORGANISM: (Check all that apply)

- | | | |
|--|---|--|
| 1 <input checked="" type="checkbox"/> Bacteremia without Focus | 1 <input type="checkbox"/> Peritonitis | 1 <input type="checkbox"/> Endometritis |
| 1 <input type="checkbox"/> Meningitis | 1 <input type="checkbox"/> Pericarditis | 1 <input type="checkbox"/> STSS |
| 1 <input type="checkbox"/> Otitis media | 1 <input type="checkbox"/> Septic abortion | 1 <input type="checkbox"/> Necrotizing fasciitis |
| 1 <input type="checkbox"/> Pneumonia | 1 <input type="checkbox"/> Chorioamnionitis | 1 <input type="checkbox"/> Puerperal sepsis |
| 1 <input type="checkbox"/> Cellulitis | 1 <input type="checkbox"/> Septic arthritis | 1 <input type="checkbox"/> Septic shock |
| 1 <input type="checkbox"/> Epiglottitis | 1 <input type="checkbox"/> Osteomyelitis | 1 <input type="checkbox"/> Other (specify) _____ |
| 1 <input type="checkbox"/> Hemolytic uremic syndrome (HUS) | 1 <input type="checkbox"/> Empyema | |
| 1 <input type="checkbox"/> Abscess (not skin) | 1 <input type="checkbox"/> Endocarditis | 1 <input type="checkbox"/> Unknown |

Field	Errors	%
Patient Information	66	51.2
Hospital ID	39	30.2
Lab ID	26	20.2
Treatment ID	40	31
Pregnancy Status	40	31
Symptoms	37	28.7
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Symptoms	37	28.7
Underlying Conditions	33	25.6
Admitted By	81	62.8
Date	85	65.9

27. UNDERLYING CAUSES OR PRIOR ILLNESSES: (Check all that apply OR if NONE or CHART UNAVAILABLE, check appropriate box) None Unknown

<input type="checkbox"/> AIDS or CD4 count <200	<input type="checkbox"/> Complement Deficiency	<input type="checkbox"/> IVDU, Current	<input type="checkbox"/> Peptic Ulcer Disease
<input type="checkbox"/> Alcohol Abuse, Current	<input type="checkbox"/> Connective Tissue Disease (Lupus, etc.)	<input type="checkbox"/> IVDU, Past	<input type="checkbox"/> Peripheral Neuropathy
<input type="checkbox"/> Alcohol Abuse, Past	<input type="checkbox"/> CSF Leak	<input type="checkbox"/> Leukemia	<input type="checkbox"/> Peripheral Vascular Disease
<input type="checkbox"/> Asthma	<input type="checkbox"/> Deaf/Profound Hearing Loss	<input type="checkbox"/> Multiple Myeloma	<input type="checkbox"/> Plegias/Paralysis
<input type="checkbox"/> Atherosclerotic Cardiovascular Disease (ASCVD)/CAD	<input type="checkbox"/> Dementia	<input type="checkbox"/> Multiple Sclerosis	<input type="checkbox"/> Premature Birth (specify gestational age at birth) <input type="text"/> (wks)
<input type="checkbox"/> Bone Marrow Transplant (BMT)	<input type="checkbox"/> Diabetes Mellitus	<input type="checkbox"/> Myocardial Infarction	<input type="checkbox"/> Seizure/Seizure Disorder
<input type="checkbox"/> Cerebral Vascular Accident (CVA)/Stroke/TIA	<input type="checkbox"/> Emphysema/COPD	<input type="checkbox"/> Nephrotic Syndrome	<input type="checkbox"/> Sickle Cell Anemia
<input type="checkbox"/> Chronic Kidney Disease	<input type="checkbox"/> Heart Failure/CHF	<input type="checkbox"/> Neuromuscular Disorder	<input type="checkbox"/> Smoker (current)
<input type="checkbox"/> Chronic Liver Disease/cirrhosis	<input type="checkbox"/> HIV Infection	<input type="checkbox"/> Obesity	<input type="checkbox"/> Solid Organ Malignancy
<input type="checkbox"/> Current Chronic Dialysis	<input type="checkbox"/> Hodgkin's Disease/Lymphoma	<input type="checkbox"/> Other Drug Use, Current	<input type="checkbox"/> Solid Organ Transplant
<input type="checkbox"/> Chronic Skin Breakdown	<input type="checkbox"/> Immunoglobulin Deficiency	<input type="checkbox"/> Other Drug Use, Past	<input type="checkbox"/> Splenectomy/Asplenia
<input type="checkbox"/> Cochlear Implant	<input type="checkbox"/> Immunosuppressive Therapy (Steroids, Chemotherapy, Radiation)	<input type="checkbox"/> Parkinson's Disease	<input type="checkbox"/> Other prior illness (specify): _____

Results

- There were sections of the CRF that were routinely flagged

Field	Errors	%
Patient Information	66	51.2
Hospital ID	39	30.2
Lab ID	26	20.2
Treatment ID	40	31
Underlying Conditions	33	25.6
Submitted By	81	62.8
Date	85	65.9

Submitted By: **Omitted** _____ Phone No.:() _____ Date: ____/____/____
Physician's Name: _____ Phone No.:() _____

Discussion– Database

- Easy to use interface
 - Decent reporting
- Needs new error type
 - Blank CRF field
- Needed drop down menu for Question Number
 - Added; needs to be refined

Discussion

- Audit
 - Met with Data Entry Manager and Lead SO
 - CDC needs vs. Site needs
 - Standardization and reeducation on parts of the CRF for data manager and SOs
 - Hospital ID codes
 - Bacteremia without focus
 - Pregnancy status for Males
 - Fully paperless in the future
 - If information isn't entered into electronic database, then it is lost



Socioeconomic Disparities
and Late Onset Group B
Streptococcus, Tennessee,
2010–2014

Late Onset Group B *Streptococcus*

- Analysis of Tennessee's late onset group B *Streptococcus* (GBS) data from 2010–2014
- Provide an in depth look into raw data as a pilot study for future analyses

Background

- GBS emerged as the leading cause of neonatal sepsis in the 1970's
- *Streptococcus agalactiae* is a gram positive bacterium that inhabits the GI tract
 - Secondary colonization site in the urogenital tract
- Causes invasive disease in infants, pregnant or post partum women, and the elderly
- Highest incidence is in neonates under 3 months of age



Background



- Two classifications in Neonates
 - Early Onset (EO): Less than 7 days of age
 - Late Onset (LO): 7–89 days of age
- Early onset is a result of vertical transmission
- Late onset is caused by environmental sources
- Infant infection can cause⁵:
 - Primarily: Sepsis, pneumonia, and meningitis
 - Meningitis can result in long term sequelae
 - Less: focal infection including osteomyelitis, septic arthritis, and cellulitis

Background



Early Onset Risk Factors^{5,6} Late Onset Risk Factors⁷

- Maternal colonization with GBS in the urogenital tract
- Prolonged rupture of membrane
- Preterm delivery
- GBS bacteriuria during pregnancy
- Birth of a previous child with GBS
- Maternal chorioamnionitis
- Young maternal age
- Black race
- Hispanic Ethnicity
- Low levels of GBS antigen specific antibodies

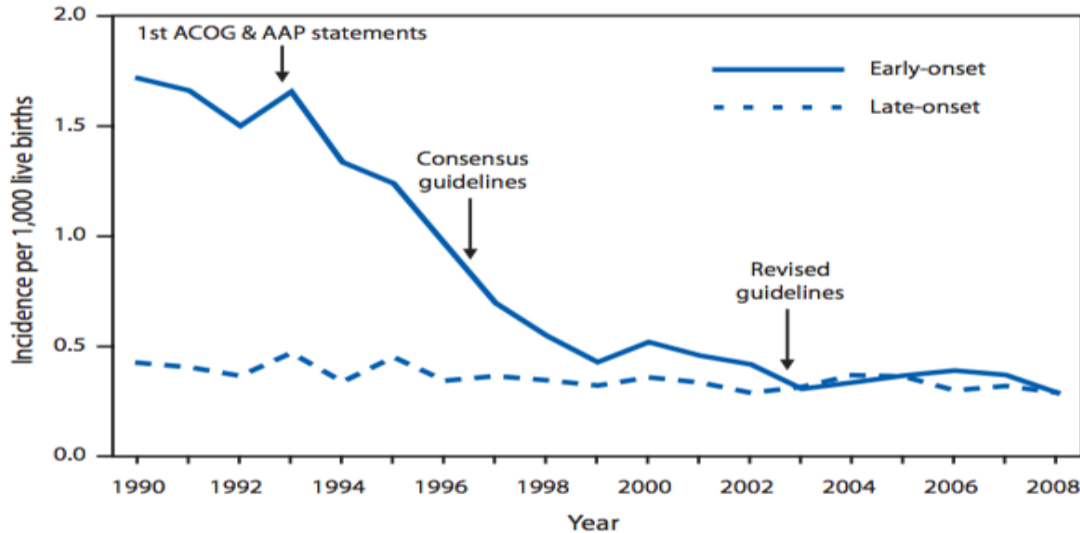
- Male
- Black Race
- Maternal Colonization with GBS
- Having a twin with LO GBS
- Extreme Prematurity

Background



- Intrapartum Prophylaxis (IPP) with penicillin best prevention method for EO disease and maternal illness⁷
- The CDC created guidelines for the identification of candidates to be treated with IPP:
 - 1996– guidelines based on the 1992 recommendations from the American Academy of Pediatrics (AAP) and the American College of Obstetricians and Gynecologists (ACOG)⁸
 - 2002– Unified universal screening⁹
 - 2010– Current guidelines¹⁰

Background



Abbreviations: ACOG = American College of Obstetricians and Gynecologists and AAP = American Academy of Pediatrics.

Source: Adapted from Jordan HT, Farley MM, Craig A, et al. Revisiting the need for vaccine prevention of late-onset neonatal group B streptococcal disease. *Pediatr Infect Dis J* 2008;27:1057–64.

* Incidence rates for 2008 are preliminary because the live birth denominator has not been finalized.

- Current Incidence (2014)¹¹
 - Early Onset: 0.25 / 1000 live births
 - Late Onset: 0.28 / 1000 live births
- Proportion of LO cases has risen from 25% to 50%

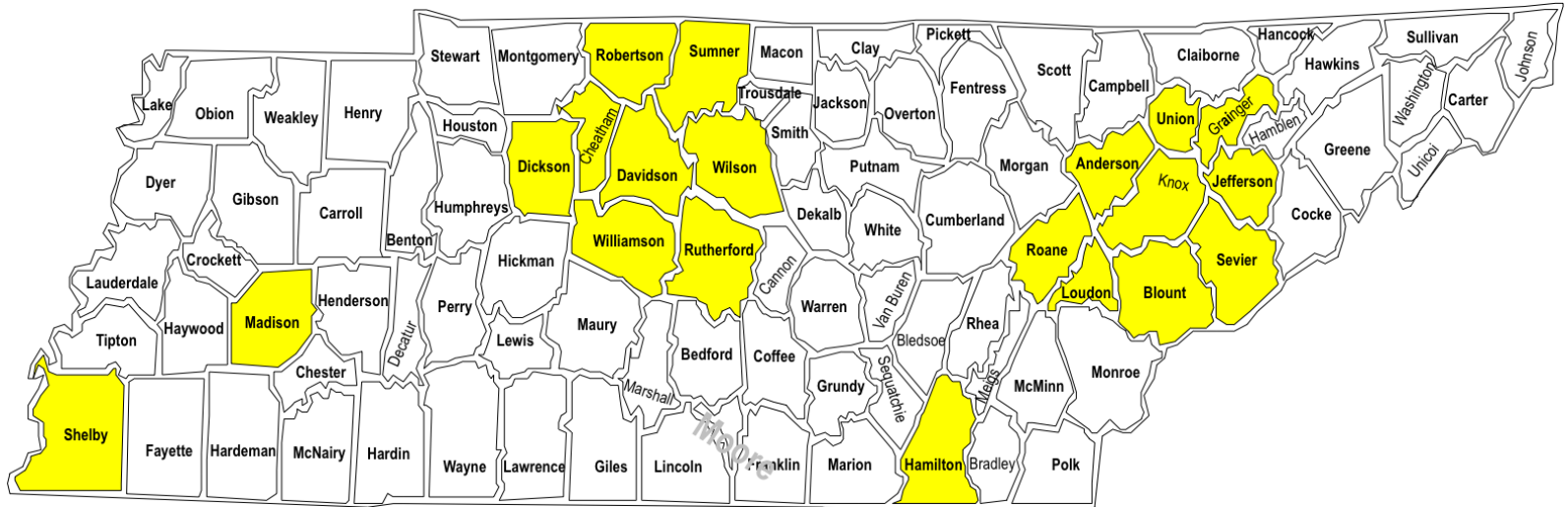
Image from Verani, et. al.

Objectives

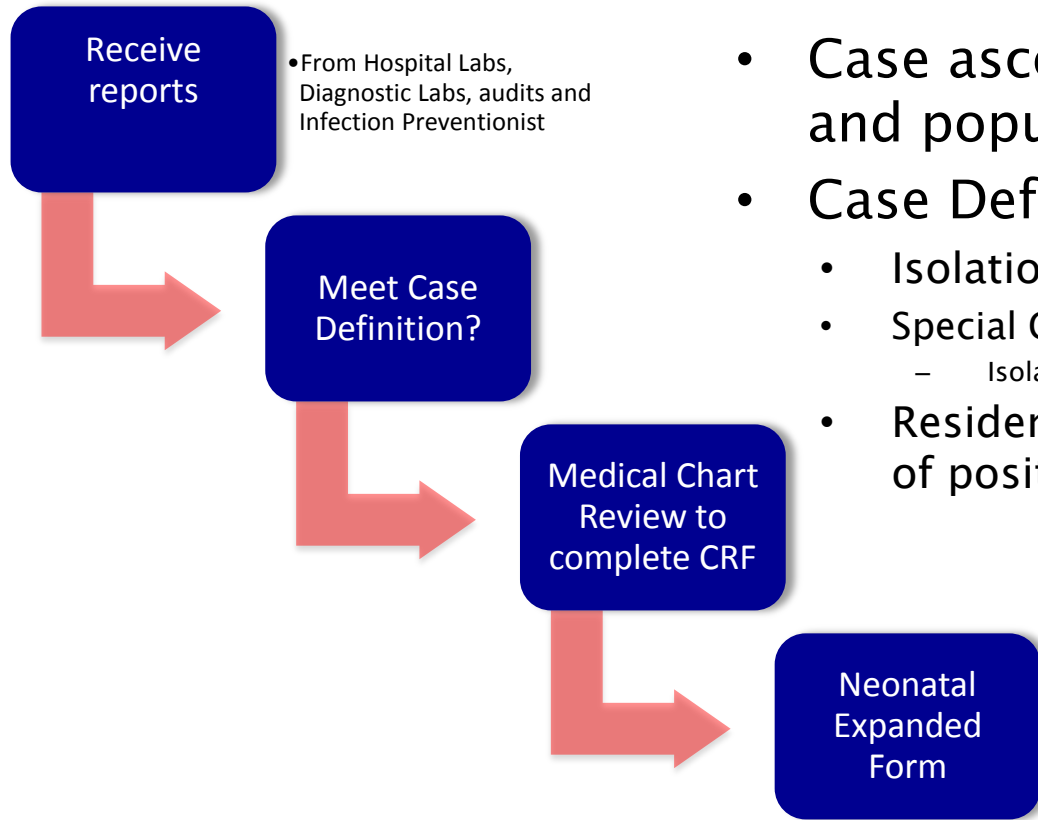
- Clean and summarize raw LO GBS data
- Decide what risk factors to consider for analysis
- Evaluate data to assess risk factors at individual- and neighborhood level
- Serve as a pilot for a larger, more in depth study of late onset GBS in Tennessee and other EIP locations

Methods– Data Collection

- GBS is collected under ABCs
 - Encompasses 20 counties and comprised of 3.95 million people (60% of total population)



Methods– Data Collection



- Case ascertainment is active–, lab–, and population based
- Case Definition
 - Isolation of GBS from a normally sterile site
 - Special Circumstances
 - Isolation from placenta and/or amniotic fluid with fetal demise
 - Resident within catchment area at the time of positive culture

NEONATAL INFECTION EXPANDED TRACKING FORM

Infant's Name: _____ Infant's Chart No.: _____
 (Last, First, MI) (Last, First, MI)

Mother's Name: _____ Mother's Chart No.: _____
 (Last, First, MI) (Last, First, MI)

Mother's Date of Birth: _____ Culture date: _____ Hospital Name: _____
 month day year (4 digits)

Patient identifier information is NOT transmitted to CDC-

**ACTIVE BACTERIAL CORE SURVEILLANCE (ABCs)
NEONATAL INFECTION EXPANDED TRACKING FORM**



CDC No. 0820-0178

STATED _____

HOSPITAL ID (of birth; if home birth leave blank) _____

Infant Information Were labor & delivery records available? Yes (1) No (0)

1. Date of Birth: _____ month / day / year (4 digits)		2. Did this birth occur outside of the hospital? <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) <input type="checkbox"/> Unknown (9)	
Time of birth: _____ (times in military format) <input type="checkbox"/> Unknown (1)		IF YES, please check one: <input type="checkbox"/> Home Birth (1) <input type="checkbox"/> Birthing Center (2) <input type="checkbox"/> En route to hospital (3) <input type="checkbox"/> Other (4) <input type="checkbox"/> Unknown (9)	
3a. Gestational age of infant at birth in completed weeks: _____ (do not round up)	3b. Date of maternal last menstrual period (LMP): _____ month / day / year (4 digits) <input type="checkbox"/> Unknown (1)	4. Birth weight: _____ lbs _____ oz OR _____ grams	
5. Date & time of newborn discharge from hospital of birth: _____ month / day / year (4 digits) _____ time <input type="checkbox"/> Unknown (1)			
6. Outcome: <input type="checkbox"/> Survived (1) <input type="checkbox"/> Died (2) <input type="checkbox"/> Unknown (9)			
7. Was the infant discharged to home and readmitted to the birth hospital? (for GBS cases only) <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) IF YES, date & time of readmission: _____ month / day / year (4 digits) _____ time <input type="checkbox"/> Unknown (1)			
8. Was the infant admitted to a different hospital from home? (for GBS cases only) <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) IF YES, hospital ID: _____ AND date & time of admission: _____ month / day / year (4 digits) _____ time <input type="checkbox"/> Unknown (1)			
9a. Were any ICD-9 codes reported in the discharge diagnosis of the infant's chart? <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) <input type="checkbox"/> Unknown (9)			
9b. IF YES, Were any of the following ICD-9 codes reported in the discharge diagnosis of the chart? (Check all that apply) <input type="checkbox"/> 041.02: Streptococcus group b (1) <input type="checkbox"/> 038.0: Streptococcus septicemia (1) <input type="checkbox"/> 041.0: Streptococcus, unspecified (1) <input type="checkbox"/> 320.2: Streptococcal meningitis (1)			
9c. Were any ICD-10 codes reported in the discharge diagnosis of the infant's chart? <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) <input type="checkbox"/> Unknown (9)			
9d. IF YES, were any of the following ICD-10 codes reported in the discharge diagnosis of the chart? (Check all that apply) <input type="checkbox"/> A40.1: Sepsis due to streptococcus, group B (1) <input type="checkbox"/> P36.1: Sepsis of newborn to other unspecified streptococci (1) <input type="checkbox"/> A40.9: Streptococcus sepsis, unspecified (1) <input type="checkbox"/> B95.1: Streptococcus, group b as the cause of disease classified elsewhere (1) <input type="checkbox"/> P36: Bacterial sepsis of newborn (1) <input type="checkbox"/> B95.5: Unspecified streptococcus as the cause of disease classified elsewhere (1) <input type="checkbox"/> P36.0: Sepsis of newborn due to streptococcus, group B (1) <input type="checkbox"/> G00.2: Streptococcal meningitis (1)			
10. Did the baby receive breast milk from the mother? (for late-onset GBS cases only) <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) <input type="checkbox"/> Unknown (9) IF YES, did the baby receive breast milk before onset of GBS <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) <input type="checkbox"/> Unknown (9)			

Public reporting burden of this collection of information is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection information, including suggestions for reducing this burden to CDC, CDC/NRIS/Reports Clearance Office, 1600 Clifton Road, MS-D-14, Atlanta, GA 30333, ATTN: PRA/REGISTRATION. Do not send the completed form to this address.

Maternal Information

11. Maternal admission date & time: _____ month / day / year (4 digits) _____ time <input type="checkbox"/> Unknown (1)	13. Maternal blood type: <input type="checkbox"/> A (1) <input type="checkbox"/> B (2) <input type="checkbox"/> AB (3) <input type="checkbox"/> O (4)
12. Maternal age at delivery (years): _____ years	13. Maternal blood type: <input type="checkbox"/> A (1) <input type="checkbox"/> B (2) <input type="checkbox"/> AB (3) <input type="checkbox"/> O (4)
14. Did mother have a prior history of penicillin allergy? <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) IF YES, was a previous maternal history of anaphylaxis noted? <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0)	
15. Date & time of membrane rupture: _____ month / day / year (4 digits) _____ time <input type="checkbox"/> Unknown (1)	
16. Was duration of membrane rupture greater than or equal to 18 hours? <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) <input type="checkbox"/> Unknown (9)	
17. If membranes ruptured at less than 37 weeks, did membranes rupture before onset of labor? <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) <input type="checkbox"/> Unknown (9)	
18. Type of rupture: <input type="checkbox"/> Spontaneous (1) <input type="checkbox"/> Artificial (2)	
19. Type of delivery: (Check all that apply) <input type="checkbox"/> Vaginal (1) <input type="checkbox"/> Vaginal after previous C-section (1) <input type="checkbox"/> Primary C-section (1) <input type="checkbox"/> Repeat C-section (1) <input type="checkbox"/> Forceps (1) <input type="checkbox"/> Vacuum (1) <input type="checkbox"/> Unknown (1) If delivery was by C-section: Did labor begin before C-section? <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) <input type="checkbox"/> Unknown (9) Did membrane rupture happen before C-section? <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) <input type="checkbox"/> Unknown (9)	
20. Intrapartum fever (T ≥ 100.4 F or 38.0 C): <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) <input type="checkbox"/> Unknown (9) IF YES, 1 st recorded T ≥ 100.4 F or 38.0 C at: _____ month / day / year (4 digits) _____ time <input type="checkbox"/> Unknown (1)	
21. Were antibiotics given to the mother intrapartum? <input type="checkbox"/> Yes (1) <input type="checkbox"/> No (0) <input type="checkbox"/> Unknown (9) IF YES, answer a-b and Questions 22-23	
a) Date & time antibiotics 1 st administered: (before delivery) _____ month / day / year (4 digits) _____ time <input type="checkbox"/> Unknown (9)	
b) Antibiotic 1: _____ <input type="checkbox"/> IV (1) <input type="checkbox"/> IM (2) <input type="checkbox"/> PO (3) # doses given before delivery: _____ Start date: _____ / _____ / _____ Stop date (if applicable): _____ / _____ / _____	
Antibiotic 2: _____ <input type="checkbox"/> IV (1) <input type="checkbox"/> IM (2) <input type="checkbox"/> PO (3) # doses given before delivery: _____ Start date: _____ / _____ / _____ Stop date (if applicable): _____ / _____ / _____	
Antibiotic 3: _____ <input type="checkbox"/> IV (1) <input type="checkbox"/> IM (2) <input type="checkbox"/> PO (3) # doses given before delivery: _____ Start date: _____ / _____ / _____ Stop date (if applicable): _____ / _____ / _____	
Antibiotic 4: _____ <input type="checkbox"/> IV (1) <input type="checkbox"/> IM (2) <input type="checkbox"/> PO (3) # doses given before delivery: _____ Start date: _____ / _____ / _____ Stop date (if applicable): _____ / _____ / _____	
Antibiotic 5: _____ <input type="checkbox"/> IV (1) <input type="checkbox"/> IM (2) <input type="checkbox"/> PO (3) # doses given before delivery: _____ Start date: _____ / _____ / _____ Stop date (if applicable): _____ / _____ / _____	
Antibiotic 6: _____ <input type="checkbox"/> IV (1) <input type="checkbox"/> IM (2) <input type="checkbox"/> PO (3) # doses given before delivery: _____ Start date: _____ / _____ / _____ Stop date (if applicable): _____ / _____ / _____	

22. Interval between receipt of 1st antibiotic and delivery: _____ (hours) _____ (minutes) _____ (days)*
*Day variable should only be completed if the number of hours >24

23. What was the reason for administration of intrapartum antibiotics? (Check all that apply)
 GBS prophylaxis (1) Prolonged latency (1) Mitral valve prolapse prophylaxis (1)
 Suspected amnionitis/chorioamnionitis (1) C-section prophylaxis (1) Other (1)
 Unknown (1)

24. Did mother have chorioamnionitis or suspected chorioamnionitis? Yes (1) No (0)

*****Questions 25–33 should only be completed for early- and late-onset GBS cases*****

25. Did mother receive prenatal care? Yes (1) No (0) Unknown (9)

26. Please record the following: the total number of prenatal visits AND the first and last visit dates to the prenatal as recorded in the labor and delivery chart
 No. of visits: ____ First visit: ____/____/____ Last visit: ____/____/____ Unknown (1)
month day year (4 digits) month day year (4 digits)

27. Estimated gestational age (EGA) at last documented prenatal visit: ____ . ____ (weeks)

28. GBS bacteriuria during this pregnancy? Yes (1) No (0) Unknown (9)
 IF YES, what order of magnitude was the colony count?
 0 (1) <10,000 (2) 10k–<25,000 (3) 25k–<50,000 (4) 50k–<75,000 (5) 75k–<100,000 (6)
 ≥100,000 (7) Unknown (9)

29. Previous infant with invasive GBS disease? Yes (1) No (0) Unknown (9)

30. Previous pregnancy with GBS colonization? Yes (1) No (0) Unknown (9)

31a. Was maternal group B strep colonization screened for BEFORE admission (in prenatal care)?
 Yes (1) No (0) Unknown (9)
IF YES, list dates, test type, and test results below:

Test date (list most recent first):	Test type:	Test Result (Do not include urine here!)
1. ____/____/____	<input type="checkbox"/> Culture (1) <input type="checkbox"/> PCR (2) <input type="checkbox"/> Rapid antigen (3) <input type="checkbox"/> Other (4) <input type="checkbox"/> Unknown (9)	<input type="checkbox"/> Positive (1) <input type="checkbox"/> Negative (0) <input type="checkbox"/> Unknown (9)
2. ____/____/____	<input type="checkbox"/> Culture (1) <input type="checkbox"/> PCR (2) <input type="checkbox"/> Rapid antigen (3) <input type="checkbox"/> Other (4) <input type="checkbox"/> Unknown (9)	<input type="checkbox"/> Positive (1) <input type="checkbox"/> Negative (0) <input type="checkbox"/> Unknown (9)

31b. If the most recent test was GBS positive was antimicrobial susceptibility performed BEFORE admission (in prenatal care)?
 Yes (1) No (0) Unknown (9)
 IF YES, Was the isolate resistant to clindamycin? Yes (1) No (0) Unknown (9)
 Was the isolate resistant to erythromycin? Yes (1) No (0) Unknown (9)

32a. Was maternal group B strep colonization screened for AFTER admission (before delivery)? Yes (1) No (0) Unknown (9)
IF YES, list date of most recent test, test type and test results below:

Test date (list most recent first):	Test type:	Test Result (Do not include urine here!)
____/____/____	<input type="checkbox"/> Culture (1) <input type="checkbox"/> PCR (2) <input type="checkbox"/> Rapid antigen (3) <input type="checkbox"/> Other (4) <input type="checkbox"/> Unknown (9)	<input type="checkbox"/> Positive (1) <input type="checkbox"/> Negative (0) <input type="checkbox"/> Unknown (9)

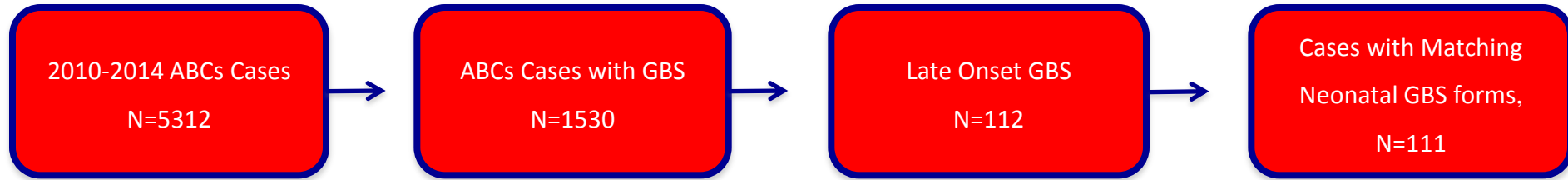
32b. If the most recent test was GBS positive, was antimicrobial susceptibility performed AFTER admission?
 Yes (1) No (0) Unknown (9)
 IF YES, Was the isolate resistant to clindamycin? Yes (1) No (0) Unknown (9)
 Was the isolate resistant to erythromycin? Yes (1) No (0) Unknown (9)

33. Were GBS test results available to care givers at the time of delivery? Yes (1) No (0) Unknown (9)

34. COMMENTS: _____

35. Neonatal Infection Expanded Form Tracking Status:
 Complete (1) Partial (2) Chart unavailable (3) Edited & corrected (4)

Methods– Data Cleaning



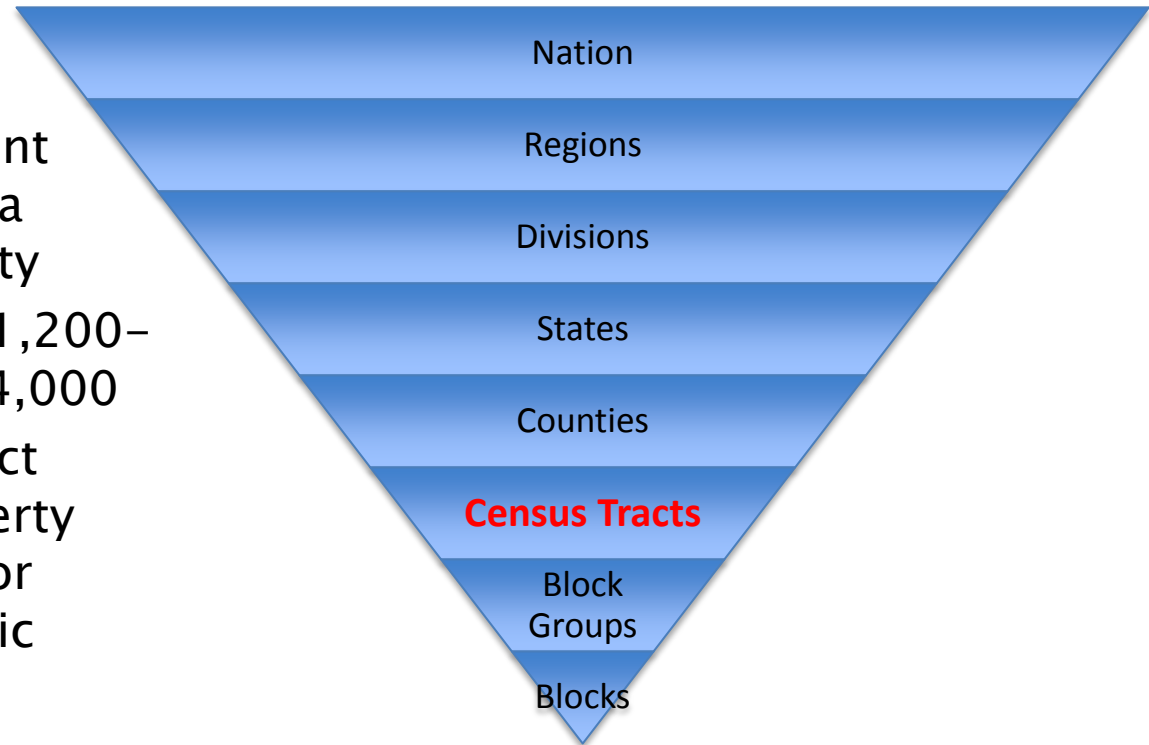
Methods– Geocoding

- Geocoding
 - Needed for neighborhood level analyses
 - According to the mother's residence at time of culture
 - Clean addresses and assign to a **Census Tract** using ArcMap
 - Merge with **American Community Survey** data

Methods – Geocoding

Census Tract

- Small, relatively permanent statistical subdivision of a county or equivalent entity
- Populations ranges from 1,200–8,000 people, optimum 4,000
- Harvard Geocoding Project recommends the CT poverty measures the most apt for monitoring socioeconomic inequalities^{12,13}



Methods– Geocoding

- ACS
 - US Census Bureau’s American Census Survey
 - Provides annual information about the nation and communities, aggregated over 5 years (2010–2014)
 - Extracted socioeconomic indicators at such as percent living below poverty, percent of population educated, etc.
 - Merge by CT

Case → Census Tract → Breakdown of SES factors/ population within CT

Methods– Data Analysis

- Calculated crude average incidence rates (IR) of LO GBS in Tennessee from 2010-2014

Individual Level

- Gender, Race
- Denominator: live birth data

Neighborhood Level

- Population density, % below poverty level, % college educated, % employed, % with female head of household
- Denominator: population less than 5 years of age in census tract

- Calculated Rate Ratio and Rate Difference
- Age standardization was not possible due to small age range

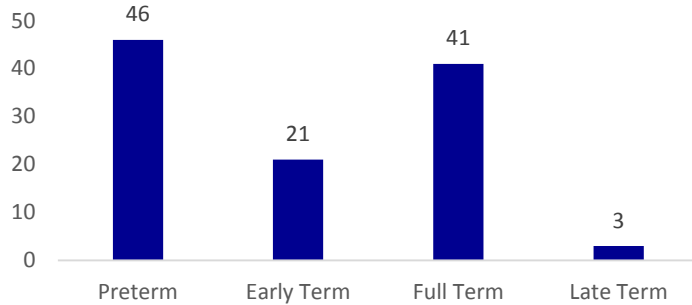
Methods – Data Analysis

- Incidence Rate (IR)
 - # new cases / population at risk in a given time
- Incidence Rate Ratio (RR)
 - Incidence Rate of disease in exposed group /
Ratio of disease in unexposed (reference) group
- Rate Difference (RD)
 - Rate of disease in exposed group – Rate of
disease in unexposed (reference) group

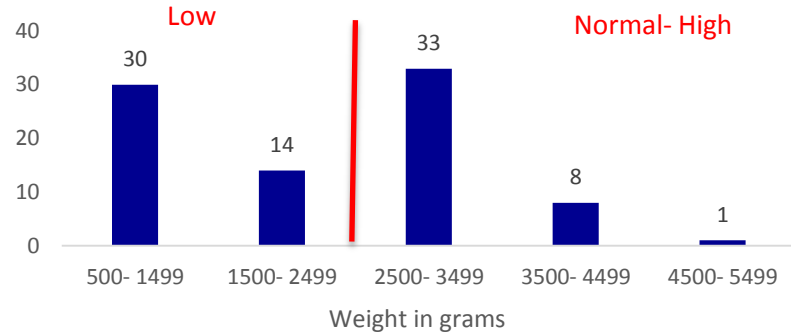
Results



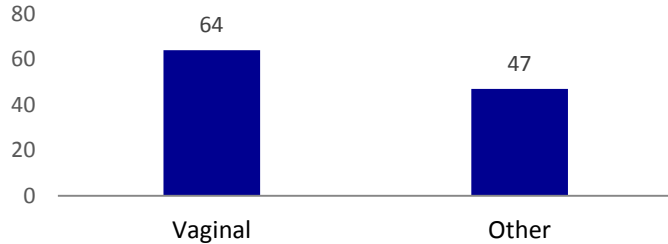
Gestational Age at Birth



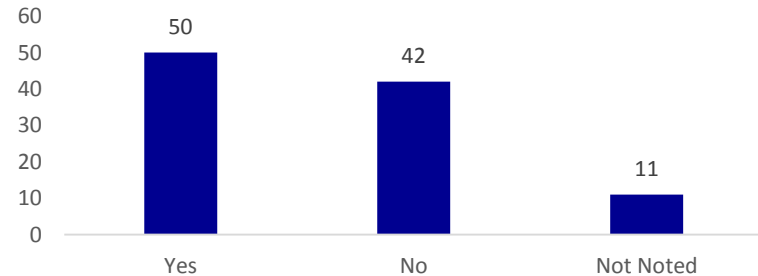
Birth Weight



Delivery Type



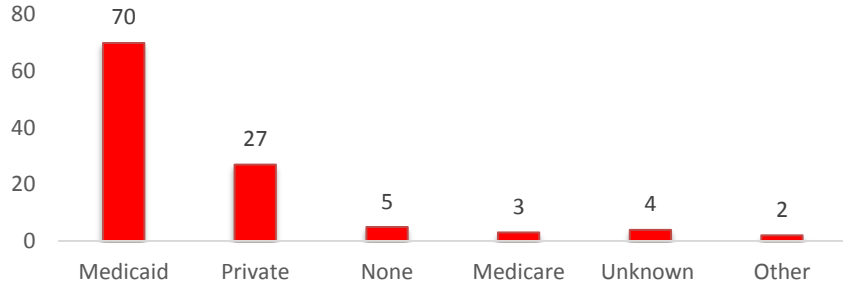
Breast Fed



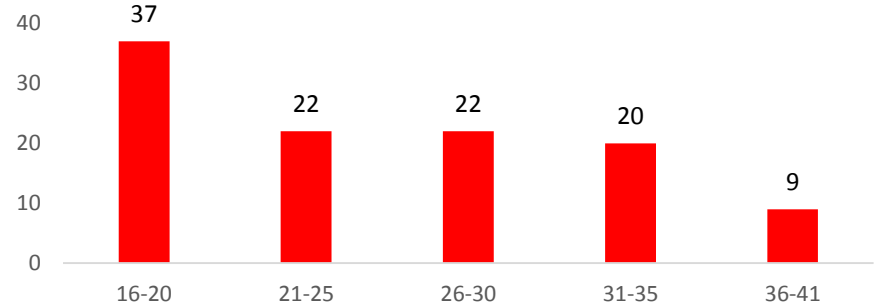
Results



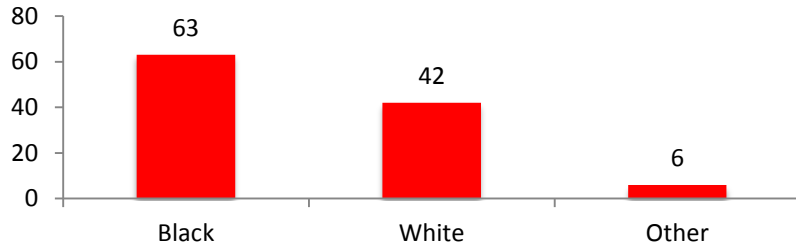
Insurance Type



Mother's Age at Birth



Race



Insurance	Percent	Mother's Age	Percent	Race	Percent
Medicaid	63.1%	16-25	53.2%	Black	56.6%
Private	24.3%	26-35	37.8%	White	37.8%
Other	12.6%	36+	9.0%	Other	5.6%

Results

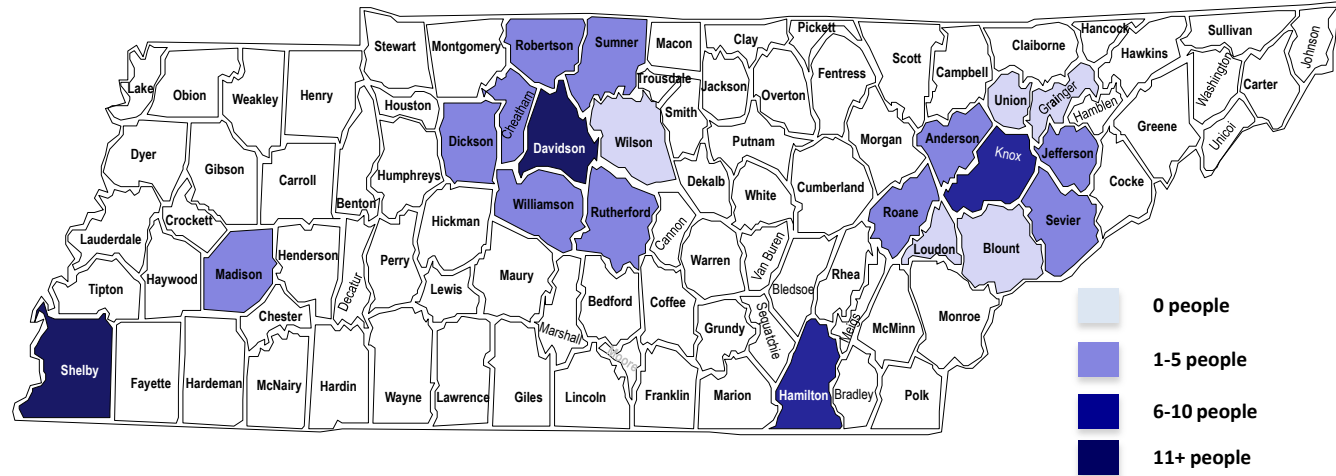


Cases Per County

County	Cases	Percentage
Anderson	1	0.9
Blount	0	0.0
Cheatham	2	1.8
Davidson	21	18.9
Dickson	1	0.9
Grainger	0	0.0
Hamilton	8	7.2
Jefferson	3	2.7
Knox	10	9.0
Loudon	0	0.0
Madison	4	3.6
Roane	1	0.9
Robertson	2	1.8
Rutherford	5	4.5
Sevir	1	0.9
Shelby	45	40.5
Sumner	3	2.7
Union	0	0.0
Williamson	4	3.6
Wilson	0	0.0
Total	111	100.0

Cases Per Year

Year	Cases	Percentage
2010	24	21.6
2011	21	18.9
2012	25	22.5
2013	19	17.1
2014	22	19.8
Total	111	100



Results – Individual Level

	Cases, no. (%) N=111	Incidence* (95% CI)	Rate Ratio (95% CI)	Rate Diff. (95% CI)
Sex				
M	56 (50.5)	4.34 (3.2- 5.65)	Ref.	Ref.
F	55 (49.6)	4.47 (3.73- 5.31)	1.03 (0.71- 1.49)	0.13 (-1.23- 1.36)
Race				
White	42 (37.8)	2.45 (1.63- 3.27)	Ref.	Ref.
Black	63 (57.8)	8.82 (7.38- 10.27)	3.64 (2.47- 5.38)	6.37 (4.71- 8.03)
Other	6 (5.4)	6.58 (2.5- 10.67)	2.69 (1.14- 6.28)	4.13 (-0.05- 8.31)
* Per 10,000 population				

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Race				
White	42 (37.8)	2.45 (1.63- 3.27)	Ref.	Ref.
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* Per 10,000 population

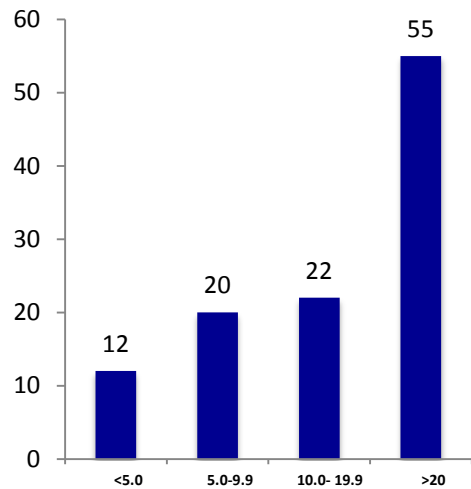
Results – Individual Level

	Cases, no. (%) N=111	Incidence* (95% CI)	Rate Ratio (95% CI)	Rate Diff. (95% CI)
Sex				
M	56 (50.5)	4.34 (3.2- 5.65)	Ref.	Ref.
F	55 (49.6)	4.47 (3.73- 5.31)	1.03 (0.71- 1.49)	0.13 (-1.23- 1.36)
Race				
White	42 (37.8)	2.45 (1.63- 3.27)	Ref.	Ref.
Black	63 (57.8)	8.82 (7.38- 10.27)	3.64 (2.47- 5.38)	6.37 (4.71- 8.03)
Other	6 (5.4)	6.58 (2.5- 10.67)	2.69 (1.14- 6.28)	4.13 (-0.05- 8.31)

* Per 10,000 population

Results– Neighborhood Level

% of Population below Poverty

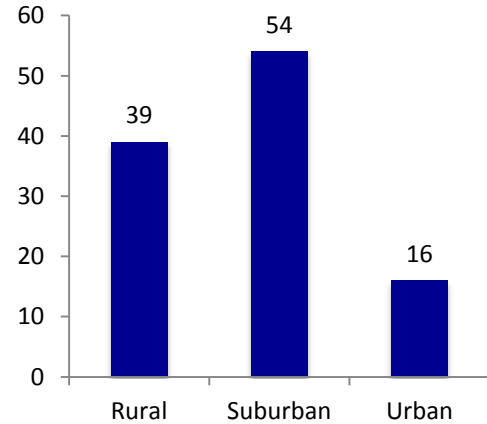


	Cases, no. (%) N=109	Incidence* (95% CI)	Rate Ratio (95% CI)	Rate Diff. (95% CI)
% Below Poverty				
<5.0	12 (11.0)	6.21 (1.79- 10.64)	Ref.	Ref.
5.0-9.9	20 (18.4)	6.44 (3.80- 9.08)	1.04 (0.51- 2.12)	0.23(-4.92- 5.39)
10.0- 19.9	22 (20.2)	5.99 (3.82- 8.15)	0.96 (0.48- 1.94)	-0.22(-4.89- 4.47)
≥20	55 (50.5)	6.96 (6.28- 7.64)	1.12 (0.77- 1.63)	0.75(-4.17- 5.67)

* per 10,000 population

Results– Neighborhood Level

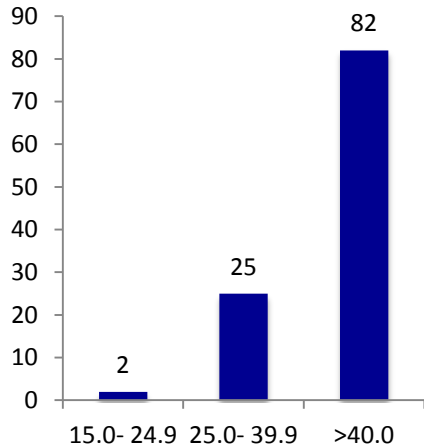
Population Density



	Cases, no. (%) N=109	Incidence* (95% CI)	Rate Ratio (95% CI)	Rate Diff. (95% CI)
Pop. Density Person/sq.mi.				
0-<200 Rural	39 (35.8)	6.85 (5.09- 8.60)	Ref.	Ref.
200-699 Suburban	54 (49.5)	7.15 (5.21- 9.09)	1.04 (0.69- 1.57)	0.30 (-2.31- 2.92)
≥700 Urban	16 (14.7)	4.76 (0.7- 8.8)	0.70 (0.29- 1.24)	-2.09 (-6.51- 2.33)
* Per 10,000 population				

Results– Neighborhood Level

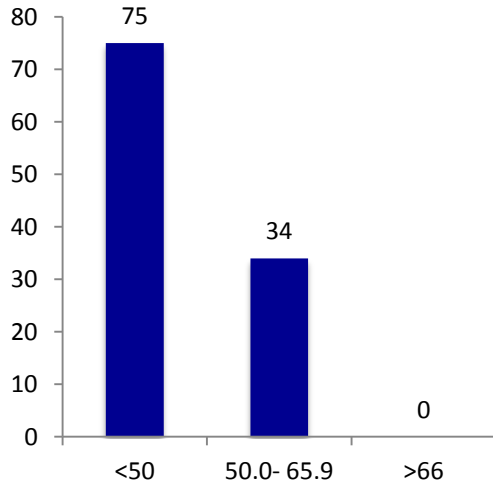
% of Population with a College Education



	Cases, no. (%) N=109	Incidence* (95% CI)	Rate Ratio (95% CI)	Rate Diff. (95% CI)
% College Educated				
15.0- 24.9	2 (1.8)	7.63 (0- 16.8)	Ref.	Ref.
25.0- 39.9	25 (22.9)	7.34 (4.93- 9.74)	0.96 (0.23- 4.05)	-0.29 (-9.77- 9.19)
≥40.0	82 (75.2)	6.33 (5.63- 7.04)	0.83 (0.56-1.33)	-1.3 (-10.50- 7.90)
* Per 10,000 population				

Results– Neighborhood Level

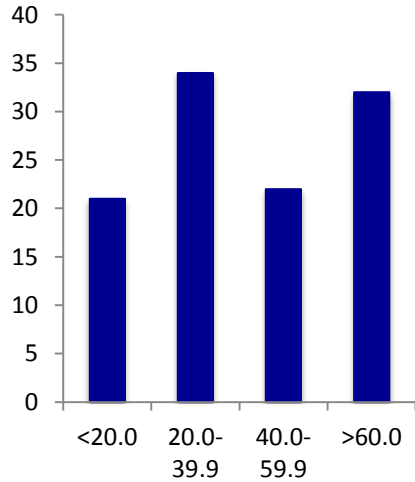
% of Population Employed



	Cases, no. (%) N=109	Incidence* (95% CI)	Rate Ratio (95% CI)	Rate Diff. (95% CI)
% Employed				
<50	75 (68.8)	6.93 (6.52- 7.33)	Ref.	Ref.
50.0- 65.9	34 (31.2)	5.88 (3.18- 8.58)	0.85 (0.57- 1.27)	-1.05 (-3.78- 1.68)
≥66	0 (0)	-	-	-
* Per 10,000 Population				

Results– Neighborhood Level

% Female HH



	Cases, no. (%) N=109	Incidence* (95% CI)	Rate Ratio (95% CI)	Rate Diff. (95% CI)
% Female Head of Household				
<20.0	21 (19.2)	5.96 (3.57- 8.36)	Ref.	Ref.
20.0- 39.9	34 (31.2)	6.95 (4.09- 9.81)	1.17 (0.68- 2.00)	0.99 (-2.74- 4.72)
40.0- 59.9	22 (20.2)	6.31 (4.72- 7.90)	1.06 (0.57- 1.88)	0.35 (-2.52- 3.23)
≥60.0	32 (29.4)	6.91 (6.06- 7.75)	1.16 (0.67- 2.00)	0.95 (-1.59- 3.49)

* Per 10,000 population

Discussion

- Black race as a risk factor was reflected in analysis
- Male gender as a risk factor was not reflected
- College education (75%) and low employment (68.8%)
- Sample size was not large enough to definitively define any neighborhood level risk factors

Limitations



- Abbreviated time period of 2010–2014
- Descriptive statistics instead of inferential
- Does not take into account interaction between variables
- Need for larger dataset

Future Directions

- Larger study encompassing all 10 EIP sites, 2010–Current
- Case–controlled study utilizing outpatient data
 - 4:1 control vs. case
 - Match on age, county
- Include same factors plus insurance type
- Logistic regression/ odds ratio

Core Competencies

- Biostatistics
 - Descriptive statistics
- Epidemiology
 - Measures of Association (IR, RR) and Effect (RD)
 - Collection and maintenance of data
- Environmental Health
 - HAIC
 - Environmental Factors of LO GBS (Breast feeding, Co-sleeping)
- Social and Behavioral Public Health
 - SES of LO GBS cases
- Healthcare Administration
 - TDH regional meetings

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