64TH EIS Conference

APRIL 20–23, 2015

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CS253359

64th Annual Epidemic Intelligence Service (EIS) Conference
April 20–23, 2015

Agenda At-a-Glance

Monday

WELCOME AND CALL TO ORDER 8:15–8:30
SESSION A: Stephen B. Thacker Opening Session 8:30–10:15
CONCURRENT SESSION B1: Vaccine-Preventable Diseases 10:40–12:05
CONCURRENT SESSION B2: Chronic Disease Prevention and Health Promotion 10:40–12:05
LUNCH/SPECIAL SESSION: Ebola in West Africa: Evolution and Control of an Epidemic 12:10–1:25
POSTER SYMPOSIUM I 1:30–2:45
CONCURRENT SESSION C1: Ebola Response in the United States 3:00–4:45
CONCURRENT SESSION C2: Maternal and Child Health 3:00–4:45
EIS CONFERENCE SOCIAL 4:45

Tuesday

CONCURRENT SESSION D1: Ebola Response in Heavily Affected Countries 8:30–10:15
CONCURRENT SESSION D2: STDs/HIV 8:30–10:15
CONCURRENT SESSION E1: Tuberculosis 10:35–12:00
CONCURRENT SESSION E2: Injuries and Illnesses Among Children and Adolescents 10:35–12:00
LUNCH/SPECIAL SESSION: Climate Change: Emerging Public Health Threats 12:05–1:25
POSTER SYMPOSIUM II 1:30–2:45
CONCURRENT SESSION F1: Global Health 3:00–5:05
CONCURRENT SESSION F2: Health Care–Associated Infections 3:00–5:05
PREDICTION RUN 6:00

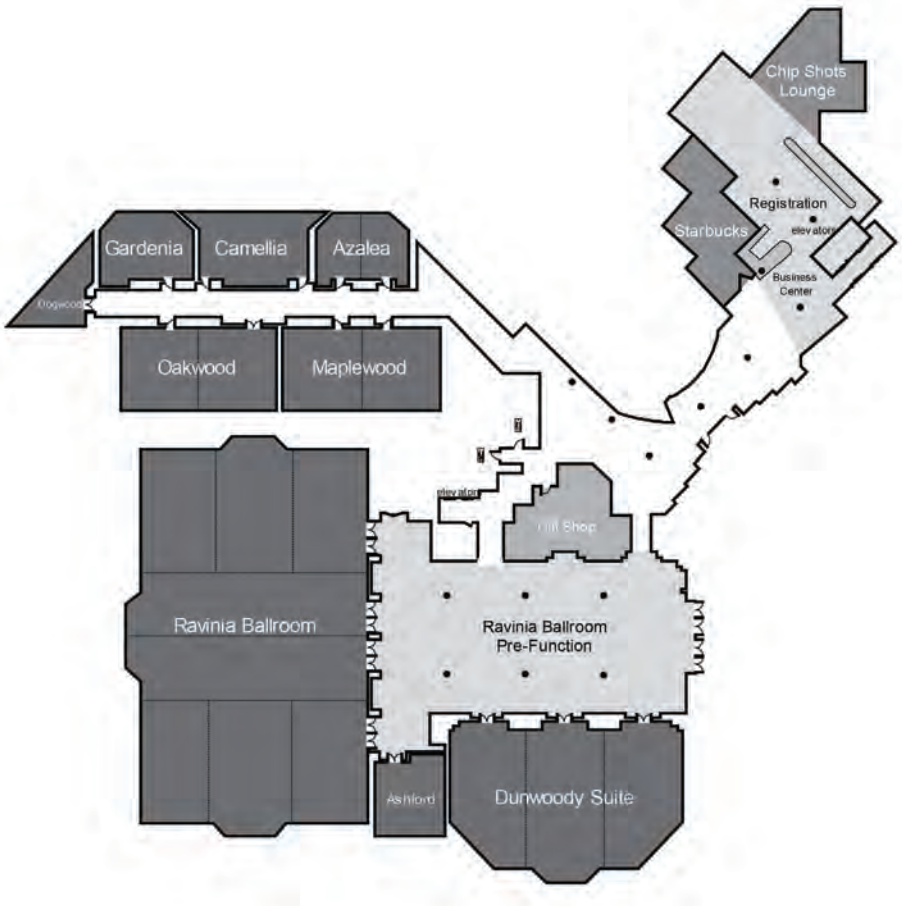
Wednesday

CONCURRENT SESSION G1: Vectorborne and Zoonotic Diseases 8:30–10:15
CONCURRENT SESSION G2: Occupational Health and Safety 8:30–10:15
CONCURRENT SESSION H1: Foodborne Diseases 10:30–11:55
CONCURRENT SESSION H2: Environmental Health 10:30–11:55
LUNCH/SPECIAL SESSION: Prevention and Control of Ebola Virus Disease at Home and Abroad 12:00–1:30
CONCURRENT SESSION I1: Ebola Response in Less-Affected Countries 1:35–3:20
CONCURRENT SESSION I2: Respiratory Diseases 1:35–3:20
SESSION J: Alexander D. Langmuir Lecture 3:45–5:15
EIS Alumni Association Meeting 5:30–7:15
SESSION K: FETP International Night 5:30–10:30

Thursday

SESSION L: Donald C. Mackel Award Finalists 8:30–10:15
SESSION M: J. Virgil Peavy Memorial Award Finalists 10:30–11:55
LUNCH/SPECIAL SESSION: Global Health Security Agenda 12:00–1:30
CONCURRENT SESSION N1: Data for Decision Making: Public Health Surveillance 1:35–3:20
CONCURRENT SESSION N2: Parasitic Diseases and Malaria 1:35–3:20
Presentation of Awards 3:35–3:50
SESSION O: Late-Breaking Reports 3:50–5:15
CLOSING REMARKS 5:15–5:20
POSTCONFERENCE EIS SATIRICAL REVIEW 8:00

Crowne Plaza Atlanta Perimeter at Ravinia Ballroom Floor Plan



Name Tags Color Key

- EIS Alumni
- Current EIS Officers
- Incoming EIS Officers
- Incoming LLS Fellows
- Conference Participants
- Conference Staff
- Field EIS Alumni
- Recruiters
- Media

SAVE THE DATE

65th EIS CONFERENCE

EPIDEMIC INTELLIGENCE SERVICE

MAY 2–5, 2016

Centers for Disease Control and Prevention
Atlanta, Georgia

Contents

Awards presented during session

PREFACE

Dear Colleagues,

I am pleased to welcome you to the 2015 Annual Conference of the Epidemic Intelligence Service (EIS). Given the extraordinary history of EIS and its production of both national and global public health leaders, I am truly humbled to be the new Chief of the EIS Program.

The events of the last year validate what we've all known — how crucial EIS is to safeguarding our health security. This week's conference sessions will make apparent that the past year has been a dramatic one for our program. EIS officers, working with CDC and international partners, have helped the global community make great strides in the control of the Ebola virus disease epidemic. Much of this work has occurred in remote, austere, and sometimes dangerous environments. Indeed, 157 of 158 EIS officers had a role in the Ebola response — many serving in multiple deployments overseas and in CDC's Emergency Operations Center.

Our conference sessions will also highlight perhaps less-publicized yet critically important work controlling communicable threats, such as novel influenza virus infections, MERS-CoV, Enterovirus D68, healthcare-associated legionella disease, chikungunya, and measles, as well as noncommunicable diseases and environmental threats, such as firearm violence, suicide, and lead poisoning. As in prior years, we are featuring special sessions from different centers each day during the lunch break. On Monday, the Center for Global Health (CGH) will present "Ebola in West Africa: Evolution and Control of an Epidemic." On Tuesday, the National Center for Environmental Health (NCEH) will present "Climate Change: Emerging Public Health Threats." On Wednesday, the National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) will lead a session on the Ebola response in less-affected countries. CGH will lead the final special session on Thursday, entitled "The Global Health Security Agenda: Improving Country Capacity and Accelerating Progress Toward International Health Regulations Through Partnerships and Country Commitment."

For the 2015 EIS class, we selected 80 qualified EIS officers who are eager to advance their epidemiologic skills through training and service. This year, we started with 568 completed applications and invited 232 applicants to interview. In the incoming class are 40 physicians, 29 PhD-level scientists, 9 veterinarians, 1 nurse, and 1 physical therapist. Seventy percent (56) of the 2015 class is female. Ten incoming EIS officers are citizens of other countries (Canada, China, Democratic Republic of Congo, India, Nigeria, Pakistan, Peru, South Africa, South Korea, and Taiwan). We prematched 10 officers to states, leaving 70 EIS officers still looking for the assignments while at the conference.

We are also proud to announce another important new fellowship program — the Laboratory Leadership Service (LLS). LLS is a 2-year postdoctoral service learning program that combines competency-based public health laboratory training with practical, applied investigations and service. LLS will provide early career laboratory scientists with a strong foundation for future leadership and management positions in laboratories conducting public health research or providing clinical or environmental testing services. This new fellowship furthers CDC and partners' commitment to advancing laboratory biosafety and quality. LLS training will include Lab-Aids, which will be similar to Epi-Aids, to assist state, local, and federal partners in addressing urgent public health laboratory concerns. LLS is aligned with EIS to promote interdisciplinary training, applied learning, and networking. In fact, the inaugural class of 7 LLS fellows will begin in July and attend the EIS summer course with the new EIS class.

As the EIS Program moves forward, we are mindful of preserving our cherished heritage while incorporating new training, technologies, and partnerships to be ready for emerging and future challenges. One area of emphasis that I'm sure will resonate with all epidemiologists is that we are committed to implementing a data-driven approach to make a strong EIS Program even stronger. A specific focus of our program will be to develop the evidence base needed to define and redefine training competencies, and to target our recruitment strategies in a manner that will keep the EIS Program at the cutting edge of applied public health relevance during the coming decades.

To do this, we will be reaching out to YOU — our alumni, advisory board, state and local partners, and other friends of EIS quite regularly. Through existing and new collaborations, we will work together to ensure that

- the experiential learning and service provided through field responses remains unmatched in quality;
- our training curriculum is adaptable to match the most current needs of the state and federal workforce;
- our recruitment strategies target the brightest candidates who have skillsets that best meet your needs; and
- we evaluate our programs, processes, and outcomes continuously, transparently, and objectively.

Our Epidemiology Workforce Branch (EWB) structure is well-matched to these tasks, and I strongly encourage you to introduce yourself to me and to seek out our leadership team to offer us your candid advice and ideas.

Diana Bensyl — Team Lead for Curriculum, Conference, and Student Programs

Danice Eaton — Team Lead for Field Support and Response

Wences Arvelo — Team Lead for Evaluation, Recruitment, Selection, & Analysis

Beth Lee — EWB Deputy Branch Chief

Also feel free to reach out to Pattie Simone, DSEPD Director, and Kate Glynn, DSEPD Associate Director for Science, who have provided helpful leadership during the transition and remain steadfast in supporting the EIS Program.

In speaking with our staff, you will realize that our top priority is serving the training and programmatic needs unique to both field and CDC-based EIS officers. We look forward to discussing our plans for ongoing, standardized, and high-quality support of EIS officers with you this week — and we remain committed to ensuring that they become the best field epidemiologists in the world.

I hope you are as excited as I am about what lies ahead. I look forward this week to reconnecting with many of you and to meeting new friends and colleagues as well.

Sincerely yours,

Joshua Adam Mott, EIS ’98
Chief, Epidemiology Workforce Branch and EIS Program
“Study the past if you would define the future.”
—Confucius (551–479 BC)

EIS Alumni Association

The EIS Alumni Association (EISAA) represents more than 3,000 alumni worldwide, and all EIS officers who have graduated from the program are eligible to join. EISAA promotes and supports the EIS Program and also provides opportunities for alumni to remain connected through a variety of networking and other activities throughout the year.

Although it's true that EISAA supports the food and beverages between scientific sessions — that is not the only, or even most important, thing that we do at the EIS Conference. EISAA also supports several awards and events throughout the week, including the **Alexander D. Langmuir Prize**, named in honor of the illustrious founder of the EIS Program and awarded to the outstanding manuscript completed during EIS; the **Distinguished Friend of EIS Award**, honoring an individual who has provided exceptional mentoring and support to EIS officers; the **Donald C. Mackel Memorial Award**, recognizing the EIS investigation that best exemplifies collaborative work between epidemiology and laboratory scientists; the **J. Virgil Peavy Memorial Award**, named in honor of a wonderful CDC statistician and beloved EIS mentor and recognizing the investigation that most effectively uses innovative statistics and epidemiologic methods; and the new **EIS Champion Award**, initiated in 2013 in honor of **Dr. Steven B. Thacker**, an inspirational leader who championed the EIS Program and its officers throughout his career. Each year, EISAA also provides competitive travel scholarships for prospective applicants to attend the EIS Conference through the **David J. Sencer Scholarships.** This year, EISAA had the pleasure of receiving 45 applications and awarding 8 travel scholarships. Finally, EISAA provides funding to help support some of our most treasured EIS Conference traditions, such as the **Prediction Run** and **Skit Night**.

Learn more! All EIS alumni and second-year EIS officers are invited to attend the **EISAA Annual Meeting on Wednesday in the Dunwoody Suites**, **5:30–7:15 p.m**. EISAA is not just about the EIS Conference. The organization provides important support to the EIS Program and our members throughout the year. You can learn more about EISAA and its activities by attending the Annual Meeting and talking to members over yummy food and beverages. We hope to see you there!

Enthusiastic and engaged alumni are crucial to our continued strength as an organization and our ability to support the EIS Program. We have much to gain from staying connected, both personally and professionally. Your membership strengthens a network of EIS alumni of diverse career paths, geographic locations, and interests. It also ensures a continued cadre of support for development of future EIS officers.

If you are not already an EISAA member, consider joining TODAY. Doing so can help your EIS class achieve **victory** in the class membership competition and win **funds for a class event** in the coming year.

- Membership is easy and inexpensive. Annual dues are $25; a lifetime membership is $350. If you are a past member and have lapsed in paying your dues, please consider coming back.
- **Join Now**. You can join at the EISAA table during the conference, during the EISAA Annual Meeting, or online at http://eisalumni.org (select EISAA Membership).
- **Stay Connected**. Join the LinkedIn® (http://www.linkedin.com) Epidemic Intelligence Service (EIS) — Alumni and Current group (nearly 900 members and growing!).

We hope you will join EISAA and stay engaged to better support the EIS Program and stay connected with colleagues and friends. While enjoying the conference this week, please stop by the EISAA table or the Wednesday meeting to say hello. We can't wait to meet you!

Sincerely,

Alexa Oster, MD
President, EIS Alumni Association, EIS '07

Diana Robelotto
Director of Alumni Affairs/EISAA Liaison, CDC Foundation

Scientific Program Committee

Chair, Diana Bensyl, Center for Surveillance, Epidemiology, and Laboratory Services

Chair, Marie de Perio, National Institute for Occupational Safety and Health

Center for Global Health ..... Fred Frederick

National Center on Birth Defects and Developmental Disabilities ..... Cheryl Broussard

National Center for Chronic Disease Prevention and Health Promotion ..... Henraya Davis McGruder

National Center for Emerging and Zoonotic Infectious Disease... Brett Petersen, Latebreaker Committee, and Matthew Wise

National Center for Environmental Health/Agency for Toxic Substances and Disease Registry ..... Suzanne Beavers

National Center for Health Statistics ..... Lara Akinbami

National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention..... Elizabeth Torrone, Latebreaker Committee

National Center for Immunization and Respiratory Diseases ..... Michael Jhung

National Center for Injury Prevention and Control ..... Kevin Vagi, Latebreaker Committee Chair

National Institute for Occupational Safety and Health ..... Cammie Chaumont Menendez, Latebreaker Committee

Center for Surveillance, Epidemiology, and Laboratory Services..... Michael King, and Jennifer Wright

Front row, left to right:
Michael King, Matthew Wise, Henraya Davis McGruder, Marie De Perio, Diana Bensyl, Suzanne Beavers, Dianna Blau, Lara Akinbami, Cheryl Broussard

Back row, left to right:
Kevin Vagi, Michael Jhung, Jennifer Wright, Elizabeth Torrone, Brett Petersen, Frederick Angulo, Cammie Chaumont Menendez

Program Production

Christopher Pritchett, LaTwanda Broughton, Anthony Jordan, Kate Mollenkamp, C. Kay Smith, M. Paul Reid.

Acknowledgments/Disclaimer

The EIS Program extends a special thank you to the EIS Alumni Association and the Council of State and Territorial Epidemiologists for their generous support of this year's 2015 Annual EIS Conference. The EIS Program gratefully acknowledges the valuable assistance and cooperation of the editorial and support staff of all CDC administrative units participating in the 2015 EIS Conference.

Abstracts in this publication were edited and officially cleared by the respective national centers. Therefore, the EIS Program is not responsible for the content, internal consistency, or editorial quality of this material. Use of trade names throughout this publication is for identification only and does not imply endorsement by the US Public Health Service or the US Department of Health and Human Services.

The findings and conclusions in these reports are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Purpose Statement

The primary purpose of the EIS Conference is to provide a forum for EIS officers to give scientific presentations (oral or poster), increase their knowledge of recent investigations and the significance to public health, and maintain and increase their skills in determining the appropriateness of epidemiologic methods, presenting and interpreting results clearly, and developing appropriate conclusions and recommendations.

Overall Conference Goals

- To provide a forum for EIS officers, alumni, and other public health professionals to engage in the scientific exchange of current epidemiologic topics.
- To highlight the breadth of epidemiologic investigations at CDC.
- To provide a venue for recruitment of EIS graduates into leadership positions at CDC and state and local departments of health.

Registration and Information

Staff are available at the conference registration desk. Check-in and onsite registration are available Monday–Wednesday, 7:30 am–5:00 pm. Please wear your conference badge at all times during the conference. Conference staff are wearing purple badges and are available to assist if you need additional information or misplace your badge.

Cyber Café/Message Center

To facilitate conference networking, computers with Internet access are located in the Camellia Room. Preregistered attendees have immediate access to find, communicate, and network with other conference participants, speakers, and staff. You can also upload a picture of yourself to facilitate easy identification. Please see conference staff for assistance if you have any questions about the system. Please limit computer time to 10 minutes per session to allow other conference attendees an opportunity to use the system as well. The Cyber Café will be open Monday–Wednesday, 8:00 am–5:30 pm and Thursday from 8:00 am–3:00 pm.

Speaker Ready-Area

Speakers must drop off their presentations (USB transfer preferred) by 3:00 pm the day before their scheduled talk. Designated computers inside the Camellia Room are available for presenters who need to review or make changes to their presentations. Computers will have PowerPoint and printer access. Dedicated computers will be available Monday–Wednesday, 8:00 am–5:30 pm and Thursday from 8:00 am–3:00 pm.

Environmental Considerations

Smoking is not permitted in any of the conference sessions, hallways, or meeting rooms. As a courtesy to presenters and all meeting attendees, please mute cellular phones during conference sessions. Please limit use of cellular phones to public areas outside the meeting rooms.

Lactation Room

Please visit the EIS information table near the registration area to sign-up for lactation room access. A schedule and key will be available at the table Monday–Thursday, 8:00 am–5:00 pm.

Instructions for Completing Online Conference Evaluations

April 2015 Course Evaluation

Continuing education credit for this conference is available through the CDC Training and Continuing Education Online system only. Please follow the instructions provided on this page. You must complete the online evaluation by May 31, 2015, to receive your continuing education credits or your certificate of completion.

To complete online evaluation

- Go to the CDC Training and Continuing Education Online site at http://www.cdc.gov/tceonline/. If you have not registered as a participant, select **New Participant to create a user ID and password; otherwise select Participant Login.**

If you do not remember your login name or need further assistance,

- send an e-mail to ce@cdc.gov;
- send a fax to 404-498-6045; or
- telephone 1-800-41-TRAIN or 404-639-1292, during business hours (Monday–Friday) 8:00 am–4:00 pm EDT. After hours, you may leave a voice message, and your call will be returned the next business day.
- After logging on to the CDC/ATSDR Training and Continuing Education Online website, you will be on the Participant Services page. Select **Search and Register. Select CDC Courses at the bottom right side of the page.**
- You will be prompted to enter the CDC Center/Course Code. The code for this training is (EISCONF15). Enter the course code and then select **View**. Select the course. The course information page will appear. Scroll down to **Register Here**. Select the type of CE credit that you would like to receive and then select **Submit**. Three demographic questions will display. Complete the questions and then select **Submit**.
- A message thanking you for registering for the conference will display. You will then be prompted to select the sessions that you wish **to attend.**
- After attending your selected conference sessions, return to the CDC Training and Continuing Education Online site. Select **Participant Login** and log onto the site. Select **Evaluations and Tests**, and then select **Conferences**. The conference will be listed with the sessions you selected. You may Add/Edit Sessions until you have completed the evaluation for a particular session. After completing all of the session evaluations, you will be prompted to complete the overall conference evaluation. A record of your conference completion will be located in the **Transcript and Certificate** section of your record.

If you have any questions or problems, contact

CDC/ATSDR Training and Continuing Education Online
1-800-41TRAIN or 404-639-1292
E-mail at: ce@cdc.gov
The printed evaluation form is for tracking purposes only. CE credits will not be issued for completing the printed form.

PLEASE DO NOT HAND IN THE PRINTED VERSION

64th EIS Conference Schedule

Monday, April 20, 2015

7:00 **Registration Desk Opens**

8:15 **Welcome and Call to Order ..... Ravinia Ballroom**

Thomas R. Frieden, Director, Centers for Disease Control and Prevention

8:30 **SESSION A: Stephen B. Thacker Opening Session ..... Ravinia Ballroom**
Moderators: Joshua Mott and Marie de Perio

- **8:35** Ebola Virus Disease Outbreak Complicated by Patients' Efforts To Avoid Diagnosis—Nigeria, 2014. *Deborah Hastings*
- **8:55** Outbreak of Salmonella Newport Infections Linked to Cucumbers—United States, 2014. *Kristina Angelo*
- **9:15** Risk of Ectopic Pregnancy Associated with Assisted Reproductive Technology, United States, 2001–2011. *Kiran Perkins*
- **9:35** Healthcare-Associated Outbreak of Legionnaires' Disease on an Inpatient Hematology-Oncology Unit—Alabama, 2014. *Louise Francois Watkins*
- **9:55** Rapid Assessment of Integration of Ebola Survivors into Emergency Operations and Ebola Response Activities—Bombali District, Sierra Leone, 2014. *Monica Adams*

10:15 **BREAK**

10:40 **CONCURRENT SESSION B1: Vaccine-Preventable Diseases ..... Ravinia Ballroom**
Moderators: Laurence Cohen and Anne Schuchat
Presentation of the Iain C. Hardy Award

- **10:45** Assessing the Potential Impact of 10-Valent Pneumococcal Conjugate Vaccine Using Pneumococcal Colonization Surveys Among Children <5 Years—Kenya, 2009–2010. *Miwako Kobayashi*
- **11:05** Clinical Characteristics of Vaccinated and Unvaccinated Pertussis Cases—United States, 2010–2012. *Lucy McNamara*
- **11:25** Changes in Varicella Epidemiology—Connecticut, 2009–2013. *Jocelyn Mullins*
- **11:45** Sustained Decrease in Rotavirus Activity After Implementation of Rotavirus Vaccines—United States, 2000–2014. *Negar Aliabadi*

10:40 **CONCURRENT SESSION B2: Chronic Disease Prevention and Health Promotion ..... Dunwoody Suite**
Moderators: Peter Briss and Henraya McGruder

- **10:45** Health Professional Advice and Action to Reduce Sodium Intake Among Adults in the United States, Behavioral Risk Factor Surveillance System, 2013. *Sandra Jackson*
- **11:05** Diabetes-Related Complications Among American Indians/Alaska Natives—Idaho, Oregon, and Washington State, 2001–2011. *Jessica Marcinkevage*
- **11:25** Cardiovascular Disease Risk Factor Status and Physical Inactivity—United States, 2013. *John Omura*
- **11:45** Healthful Food Availability, Pricing, and Promotion in Stores and Restaurants in American Samoa, 2014. *Seung Hee Lee-Kwan*

12:10–1:25 **LUNCH**

12:10–1:25 **SPECIAL SESSION: Ebola in West Africa: Evolution and Control of an Epidemic ..... Dunwoody Suite**
Speakers: Thomas R. Frieden, Barbara Marston, Amara Jumbai, James Bangura, and Jordan Tappero

1:30–2:45 **POSTER SYMPOSIUM I.....Dunwoody Suite**
Moderators: Thomas Weiser and Byron Robinson

During the first 30 minutes of the Poster Symposium, the following authors will each give a 2-minute oral presentation at the podium in front of a seated audience. Afterward, the authors will stand with their posters for the remaining session time. The audience is encouraged to view the individual posters and engage in direct discussion with the author.

P1.1 Implementation of the 5As Intervention Increases Odds of Smoking Cessation Among Women Attending WIC Clinics in Ohio, 2006–2011. *Oluwatosin Olaiya*

P1.2 Public Health Surveillance for Ebola Cases—Western District, Sierra Leone, September–October 2014. *Godwin Mindra*

P1.3 Norovirus Syndromic Surveillance Among Commercial Tour Bus Passengers: A Pilot Project—Yellowstone National Park, August 2014. *Cara Cherry*

P1.4 Bicycling in the Boroughs: Trends in Self-Reported Bicycling—New York City, 2007–2013. *Kari Yacisin*

P1.5 Cluster of Ebola Viral Disease Linked to a Single Funeral Event—Sierra Leone, 2014. *Kathryn Curran*

P1.6 Decreased Intended Duration of Breastfeeding Following Inadequate Hospital Support, Infant Feeding Practices Study II, 2005–2007. *Jennifer Nelson*

P1.7 Referral to Specialty Care Among Persons with Chronic Hepatitis C Virus Infection—United States, 2006–2011. *Monique Foster*

P1.8 Ebola Infection in a Maternity Ward—Tonkolili, Sierra Leone, 2014. *Angela Dunn*

P1.9 Nutrition and Physical Activity Recommendations for Cancer Prevention in National Comprehensive Cancer Control Program Plans, 2004–2014. *Mary Puckett*

P1.10 Prevalence of High Fractionated Exhaled Nitric Oxide Among Children and Adolescents with Asthma—United States, 2007–2012. *Duong Nguyen*

P1.11 Ebola Virus Disease in Pregnant Women at a Maternity Hospital—Freetown, Sierra Leone 2014. *Meghan Lyman*

P1.12 Coccidioidomycosis: A Possibly Underreported Cause of Death—Arizona, 2008–2013. *Jefferson Jones*

2:45 **BREAK**

3:00 **CONURRENT SESSION C1: Ebola Response in the United States..... Ravinia Ballroom**
Moderators: Beth Bell and Dianna Blau

3:05 Active Monitoring of Individuals with Risk of Exposure to Ebola Virus Disease—United States, 2014. *Tasha Stehling-Ariza*

3:25 Assessing Domestic Readiness for the Treatment of Ebola Virus Disease Patients: Rapid Ebola Preparedness Teams—United States, 2014. *William Edens*

3:45 Surveillance for Ebola Virus Disease—New York City, 2014. *Isaac Benowitz*

4:05 Off to a Flying Start: Active Post-Arrival Monitoring for Travelers from Ebola-Affected Countries—North Carolina, 2014. *Sarah Rhea*

4:25 Clinical Inquiries for Ebola Virus Disease Received by CDC—United States, July 9–November 15, 2014. *Mateusz Karwowski*

3:00 **CONCURRENT SESSION C2: Maternal and Child Health.....Dunwoody Suite**
Moderators: Cheryl Broussard and Wanda Barfield

3:05 Cluster of Intrahepatic Cholestasis of Pregnancy—North Dakota, 2014. *Dinorah Calles*

3:25 Reproductive Health Counseling Offered to Women Receiving HIV Care in the United States—National HIV Provider Survey, 2013. *Runa Gokhale*

3:45 Factors Associated with Postpartum Use of Long-Acting Reversible Contraceptives: Results from the Pregnancy Risk Assessment Monitoring System (PRAMS), Nine States, 2009–2011. *Titilope Oduyebo*

4:05 Maternal and Neonatal Morbidity by Delivery Type Among HIV-Infected Women in Malawi: Results of the Breastfeeding, Antiretrovirals, and Nutrition (BAN) Study. *Michelle Chevalier*

4:25 Perceptions of Ebola and Health Facility Use Among Pregnant and Lactating Women and Community-Level Health Workers in Kenema District—Sierra Leone, September 2014. *Michelle Dynes*

4:45 **EIS CONFERENCE SOCIAL (CASH BAR)**
Sponsored by the EIS Alumni Association .....Ravinia Ballroom Pre-Function Area

Tuesday, April 21, 2015

8:30 **CONCURRENT SESSION D1: Ebola Response in Heavily Affected Countries ..... Ravinia Ballroom**
Moderators: Brett Petersen and Inger Damon

- **8:35** Knowledge, Attitudes, and Practices Related to Burial Practices and Ebola Response in Bo District, Sierra Leone, 2014. *Seung Hee Lee-Kwan*
- **8:55** Geospatial Analysis of Household Spread of Ebola Virus in a Quarantined Village—Sierra Leone, 2014. *Brigette Gleason*
- **9:15** Ebola Knowledge, Attitudes, and Practices Among Community Members in Three Low-Incidence Counties—Liberia, September 2014. *Karlyn Beer*
- **9:35** Evaluation of a District Level Ebola Response and Establishment of an Ebola Command Center—Tonkolili, Sierra Leone, 2014. *Tushar Singh*
- **9:55** Managing Contacts of Ebola Virus Disease—Firestone District, Liberia, 2014. *Erik Reaves*

8:30 **CONCURRENT SESSION D2: STDs/HIV .....Dunwoody Suite**
Moderators: Elizabeth Torrone and Linda Valleroy

- **8:35** Trends in HIV Viral Load Suppression During and After Pregnancy—United States, January 1996–March 2014. *Monita Patel*
- **8:55** Human Immunodeficiency Virus and Hepatitis C Coinfection in West Virginia, 2001–2013. *Erica Thomasson*
- **9:15** The Performance of Quantitative HIV-1 RNA (Viral Load) Testing To Diagnose Acute HIV Infection in the New HIV Laboratory Testing Algorithm—United States, 2011–2013. *Hsiu Wu*
- **9:35** Is Presumptive Treatment Presumptuous? The Association Between Presumptive Treatment for Gonorrhea and Patients' Receipt of Test Results—Maricopa County, Arizona, 2013–2014. *Virginia Bowen*
- **9:55** The Role of Internet Meet-Up Sites and Mobile Device Applications in Facilitating an Early Syphilis Outbreak—Multnomah County, Oregon, 2014. *Malini DeSilva*

10:15 **BREAK**

10:35 **CONCURRENT SESSION E1: Tuberculosis ..... Ravinia Ballroom**
Moderators: Jonathan Mermin and Michael Iademarco

- **10:40** Evaluation of Drug-Resistant Tuberculosis Surveillance—Botswana, 2014. *Hannah Kirking*
- **11:00** Incidence and Predictors of Tuberculosis Among HIV-Infected Adults After Initiation of Antiretroviral Therapy—Nigeria, 2004–2012. *Ishani Pathmanathan*
- **11:20** Surveillance for Large Outbreaks of Tuberculosis—United States, 2014. *Godwin Mindra*
- **11:40** Tuberculosis Contact Investigation at an Island Resort—Michigan, 2014. *Meghan Pearce Weinberg*

10:35 **CONCURRENT SESSION E2:**
Injuries and Illnesses Among Children and Adolescents.....Dunwoody Suite
Moderators: Lara Akinbami and Debra Houry

- **10:40** Tickborne Relapsing Fever Outbreak at a High School Football Camp—Arizona, 2014. *Jefferson Jones*
- **11:00** Violent Experiences in Childhood and Men's Perpetration of Intimate Partner Violence as a Young Adult: A Multi-Stage Cluster Survey in Malawi. *Kristin Vanderende*
- **11:20** Skin Lesions Among High School Wrestlers—Arizona, 2014. *Candice Williams*
- **11:40** Examination of Trends of Fatal and Non-Fatal Suicidal Behaviors Among Youth—Fairfax County, Virginia, 2011–2014. *Erica Spies*

12:05 **LUNCH**

12:05–1:25 **SPECIAL SESSION: Climate Change: Emerging Public Health Threats**
Moderator: Suzanne Beavers
Speakers: George Luber, Shubhayu Saha, and Paul Schramm

1:30–2:45 **POSTER SYMPOSIUM II ..... Dunwoody Suite**
Moderators: Joseph McLaughlin and Antonio Neri

During the first 30 minutes of the Poster Symposium, the following authors will each give a 2-minute oral presentation at the podium in front of a seated audience. Afterward, the authors will stand with their posters for the remaining session time. The audience is encouraged to view the individual posters and engage in direct discussion with the author.

P2.1 Acellular Pertussis Vaccine Effectiveness Among Children in the Setting of Pertactin-Deficient *Bordetella pertussis*, Vermont, 2011–2013. *Lucy Breakwell*

P2.2 Epidemiologic Features of Human Anaplasmosis—Wisconsin, 2009–2013. *Lina Elbadawi*

P2.3 Group A Streptococcal Necrotizing Fasciitis in Oregon: What Are We Missing? *Emily Fisher*

P2.4 A Systematic Review of Pertussis in Latin America: 1980–2014. *Temitope Folaranmi*

P2.5 *Mycoplasma pneumoniae* Disease Outbreak Associated with an Extended Care Facility—Nebraska, 2014. *Deborah Hastings*

P2.6 Description of Nosocomial *Legionella* Infections—Los Angeles County, October 2005–August 2014. *Amanda Kamali*

P2.7 Back to Basics: Outbreak of Diarrheal Illness Caused by *Shigella flexneri*—American Samoa, May–June 2014. *Julia Painter*

P2.8 Antibody Levels 20 Years After Receipt of Hepatitis A Vaccine. *Ian Plumb*

P2.9 Ebola Virus Disease outbreak and the Role of Hospital Acquired Infections in Lagos, Nigeria. *Ugochukwu Osigwe*

P2.10 Outbreak of *Rhizopus* Surgical Site Infections—Argentina, 2005–2014. *Tiffany Walker*

P2.11 Evaluation of a Routine Health Management Information System for Monitoring Progress Toward Malaria Pre-elimination—Rwanda, 2014. *Ruth Namuyinga*

P2.12 Multicounty Community Mumps Outbreak—Ohio, January–September 2014. *Carolyn McCarty*

2:45 **BREAK**

3:00 **CONCURRENT SESSION F1: Global Health ..... Ravinia Ballroom**
Moderators: Wences Arvelo and Vik Kapil

3:05 Soap Is Not Enough: Hand Hygiene Knowledge and Practice Among Refugees Following a Large Hepatitis E Outbreak—South Sudan, 2013. *Raina Phillips*

3:25 Impact of Cholera Vaccine Campaign on Knowledge and Practices Regarding Cholera, Safe Water, Sanitation, and Hygiene in a Stable Refugee Camp in Thailand. *Edith Nyangoma*

3:45 Concurrent Diarrhea and Acute Respiratory Illness Among Children <5 Years Old in Rural and Urban, Kenya, 2009–2012. *Almea Matanock*

4:05 2014 Outbreak of MERS Coronavirus in Jeddah: A Link to Healthcare Facilities. *Ikwo Oboho*

4:25 Increase in Crimean-Congo Hemorrhagic Fever Case Detection—Georgia, 2014. *Ashley Greiner*

4:45 Measles Outbreak Among a Highly Vaccinated Population—Federated States of Micronesia, 2014. *Edna Moturi*

3:00 **CONCURRENT SESSION F2: Health Care–Associated Infections..... Dunwoody Suite**
Moderators: Matthew Wise and Clifford McDonald

3:05 National Estimates of Incidence, Recurrence, Hospitalization, and Death of Nursing Home-Onset of *Clostridium difficile* Infections—United States, 2012. *Jennifer Hunter*

3:25 Legionnaires' Disease Outbreak at a Long-Term Care Facility: Persistence of Low-Level *Legionella* Contamination in a Water System—North Carolina, 2014. *Sarah Rhea*

3:45 Trends in Central Line-Associated Bloodstream Infections in US Neonatal Intensive Care Units: Are We Making Progress? *Nora Chea*

4:05 Gram-Negative Bloodstream Infections Among Hemodialysis Outpatients—California, 2013–2014. *Jacklyn Wong*

4:25 *Candida* Co-Infection Among Patients with *Clostridium difficile* Infection in Metropolitan Atlanta, 2009–2013. *Snigdha Vallabhaneni*

4:45 *Pseudomonas aeruginosa* in a Neonatal Intensive Care Unit—California, 2013–2014. *Cara Bicking Kinsey*

6:00 **PREDICTION RUN..... Murphey Candler Park**
Sponsored by the EIS Alumni Association
Self-transport to venue; carpooling is encouraged.

Wednesday, April 22, 2015

8:30 **CONCURRENT SESSION G1: Vectorborne and Zoonotic Diseases..... Ravinia Ballroom**
Moderators: Jennifer Wright and Erin Staples

8:35 Heartland Virus Disease—Missouri, 2012–2014. *Daniel Pastula*

8:55 Chikungunya Fever Cases Identified in the Veterans Health Administration System, 2014. *Tara Perti*

9:15 Q Fever Outbreak at a Large-Scale Goat and Cattle Dairy—Missouri, 2013. *Holly Biggs*

9:35 Dengue Knowledge and Practices Among Clinicians—Texas, 2014. *Jessica Adam*

9:55 Chikungunya and Dengue Virus Infections Among United States Community Service Volunteers Returning from the Dominican Republic, 2014. *Alexander Millman*

8:30 **CONCURRENT SESSION G2: Occupational Health and Safety..... Dunwoody Suite**
Moderators: Cammie Chaumont Menendez and Bruce Bernard

8:35 Cluster of Ebola Cases Among Liberian and U.S. Health Care Workers in an Ebola Treatment Unit and Adjacent Hospital—Liberia, 2014. *Joseph Forrester*

8:55 Elevated Blood Lead Levels in Adults—Missouri, 2012. *Kerton Victory*

9:15 Readying the Responders—Infection Control Training for US Clinicians Bound for West Africa. *Rupa Narra*

9:35 *Cryptosporidium parvum* Outbreak at an Academic Animal Research Facility—Colorado, 2014. *Jessica Hancock Allen*

9:55 Long Term Prophylaxis After Possible Anthrax Exposure. *Leisha Nolen*

10:15 **BREAK**

10:30 **CONCURRENT SESSION H1: Foodborne Diseases..... Ravinia Ballroom**
Moderators: Stacey Bosch and John Dunn

10:35 Multistate Outbreak of Multiple *Salmonella* Serotype Infections Linked to Sprouted Chia Seed Powder—United States, 2014. *Robert Harvey*

10:55 Cryptosporidiosis Associated with Consumption of Raw Goat Milk—Idaho, 2014. *Mariana Rosenthal*

11:15 Toxigenic *Vibrio cholerae* Serogroup Non-O1, Non-O139 Infections in the United States, 1984–2014. *Samuel Crowe*

11:35 *Campylobacter jejuni* Infection Associated with Raw Milk Consumption—Utah, 2014. *Angela Dunn*

10:30 **CONCURRENT SESSION H2: Environmental Health..... Dunwoody Suite**
Moderators: Suzanne Beavers and Patrick Breysse

10:35 Calls to U.S. Poison Centers Regarding Electronic Cigarettes—United States, September 2010–October 2014. *Kevin Chatham Stephens*

10:55 Assessing Injuries, Chronic Disease Exacerbations, and Mental Health Problems After the South Napa Earthquake—California, 2014. *Kathleen Attfield*

11:15 Parking Prices and Walking and Bicycling to Work in U.S. Cities. *Geoffrey Whitfield*

11:35 Assessment of Impact and Recovery Needs in Communities Affected by the Elk River Chemical Spill—West Virginia, April 2014. *Ethan Fechter-Leggett*

12:00 **LUNCH**

12:05–1:30 **SPECIAL SESSION:**
Prevention and Control of Ebola Virus Disease at Home and Abroad.....Dunwoody Suite
Moderator: Barbara Knust
Speakers: Michael Jhung, Neil Gupta, Tai-Ho Chen, John Jernigan, and Jay Varma

1:35 **CONCURRENT SESSION I1: Ebola Response in Less-Affected Countries..... Ravinia Ballroom**
Moderators: Frederick Angulo and Mary Reynolds

1:40 Challenges in Detecting Ebola Virus Disease in an Unaffected Country—Guinea-Bissau, 2014. *Amelia Kasper*

2:00 Preparedness for Ebola Virus Disease (EVD)—Western Côte d'Ivoire, October 2014. *Prathit Kulkarni*

2:20 Rapid Containment of Ebola Using Contact Tracing Following an Imported Case of Ebola Virus Disease—Senegal, 2014. *Kelsey Mirkovic*

2:40 Pivoting from Preparedness to Response: Containment of the First Outbreak of Ebola Virus Disease in a Previously Unaffected Country—Mali, 2014. *Magdalena Paczkowski*

3:00 Public Health Response to an Imported Case of Ebola Virus Disease—New York City, 2014. *Kari Yacisin*

1:35 **CONCURRENT SESSION I2: Respiratory Diseases..... Dunwoody Suite**
Moderators: Michael Jhung and David Swerdlow

1:40 Middle East Respiratory Syndrome–Coronavirus in an Extended Family: Risk Factors for Household Transmission—Saudi Arabia, 2014. *M. Allison Arwady*

2:00 The Benefit of Early Influenza Antiviral Treatment of Pregnant Women Hospitalized with Laboratory-Confirmed Influenza. *Ikwo Oboho*

2:20 Penicillin Nonsusceptibility Among Cases of Invasive Pneumococcal Disease—New York State, January 2013–March 2014. *Misha Robyn*

2:40 Influenza Testing and Antiviral Prescriptions During Acute Respiratory Hospitalizations—Yale–New Haven Hospital, Connecticut, October 2009–April 2013. *Melissa Rolfes*

3:00 Getting Under the Skin: Socioeconomic Disparities in Invasive Pneumococcal Disease Among Children <5 Years Old, Selected States, 2013. *Matthew Westercamp*

3:20 **BREAK**

3:45 **SESSION J: Alexander D. Langmuir Memorial Lecture..... Ravinia Ballroom**
Moderator: Patricia Simone
Speaker: Jeff Dean, PhD: Large-Scale Machine Learning and Its Application to Public Health
Presentation of Awards
- Alexander D. Langmuir Prize Manuscript Award
- Distinguished Friend of EIS Award

This event is cosponsored by the EIS Alumni Association and the Center for Surveillance, Epidemiology, and Laboratory Services.

5:30–7:15 **EIS ALUMNI ASSOCIATION MEETING .....Dunwoody Suite**

All EIS alumni and second-year EIS officers are invited to attend the EIS Alumni Association (EISAA) Annual Meeting. Talk with other alumni and learn more about EISAA and its activities over food and beverages.

5:30–10:30 **SESSION K: FETP International Night ..... Ravinia Ballroom**
- 5:30 Poster Presentations
- 6:45 Photo Contest
- 7:30–10:30 Oral Presentations and Awards

7:40 Elevated Lead Exposure Among Children Aged 1 to 5 Years—Philadelphia, 2014. *Rebecca Merrill*

FETP International Night is cosponsored by the Center for Global Health (CGH)/Division of Global Health Protection (DGHP) and the Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET). The posters and presentations featured during FETP International Night are from participants in international programs in applied field epidemiology similar to that of EIS. Some of the programs are sponsored by or partnered with CDC, and some are independent. All conference attendees are invited to attend these sessions.

Thursday, April 23, 2015

8:30 **Session L: Donald C. Mackel Memorial Award Finalists..... Ravinia Ballroom**
Moderators: Kate Glynn and Beth Skaggs

8:35 Molecular Epidemiology of *Mycoplasma pneumoniae* (Mp) During an Outbreak of Mp-Associated Stevens-Johnson Syndrome—Colorado, 2013. *Louise Francois Watkins*

8:55 Case-Control Evaluation of Ebola Viral Disease versus Co-Infection with Malaria—Guinea, 2014. *Meredith Dixon*

9:15 Severe Respiratory Illness Associated with a Nationwide Outbreak of Enterovirus D68—United States, 2014. *Claire Midgley*

9:35 Investigation of an Outbreak of Infections with Rare *Salmonella* Serotypes Linked to Pet Bearded Dragon Lizards, 2012–2014. *Craig Kiebler*

9:55 Outbreak of Severe Respiratory Infections Among Unaccompanied Children—Multiple States, June–July 2014. *Sara Tomczyk*

10:15 **BREAK**

10:30 **SESSION M: J. Virgil Peavy Memorial Award Finalists ..... Ravinia Ballroom**
Moderators: Danice Eaton and Chad Heilig

10:35 Mortality Among Patients Treated for Multidrug-Resistant Tuberculosis—9 Countries, 2005–2010. *Hannah Kirking*

10:55 Lifetime Risk of Symptomatic Hand Osteoarthritis. *Jin Qin*

11:15 Predicting Gun Violence Perpetration Through Administrative Data—Wilmington, Delaware, 2014. *Steven Sumner*

11:35 *Salmonella* Serotypes—Index of Association with Foodborne Transmission. *Ulzii Orshikh Luvsansharav*

12:00 **LUNCH**

12:00–1:30 **SPECIAL SESSION: Global Health Security Agenda: Improving Country Capacity and Accelerating Progress Towards IHR through Partnerships and Country Commitment .....Dunwoody Suite**
Moderator: Jordan Tappero
Speakers: Jason Thomas, Beth Skaggs, Linda Quick, Nicki Pesik, and Arun Balajee

1:35 **CONCURRENT SESSION N1:**
Data for Decision Making: Public Health Surveillance..... Ravinia Ballroom
Moderators: Michael King and Chesley Richards

1:40 An Analysis of Suspect Case Definitions Utilized During the 2014 Ebola Epidemic. *Christopher Hsu*

2:00 Is Receiving Post-Acute Care Associated with Subsequent Hospitalization Costs One Year After Stroke Among Medicare Beneficiaries? *Iman Martin*

2:20 Increase in *Vibrio alginolyticus* Infections in the United States, 1988–2012. *Kara Jacobs Slifka*

2:40 Claims Data Evaluation for Lyme Disease Surveillance—Tennessee, 2011–2013. *Joshua Clayton*

3:00 Fetal and Infant Mortality Reporting: Are Data Complete?—Wyoming, 2006–2013. *Alexia Harrist*

1:35 **CONCURRENT SESSION N2: Parasitic Diseases and Malaria.....Dunwoody Suite**
Moderators: Alexander Rowe and Douglas Hamilton

1:40 Efficacy of Artemether-Lumefantrine and Artesunate-Amodiaquine for Uncomplicated *Plasmodium falciparum* Malaria—Malawi, 2014. *Magdalena Paczkowski*

2:00 Four Years of "Test and Treat" in Uganda: Understanding the Role of Malaria Case Management in Reporting Malaria Burden to the Health Management Information System (HMIS)—Uganda, 2014. *Nelli Westercamp*

2:20 Blood Demand and the Appropriate Use of Blood in Tanzania, 2013. *Ibironke Apata*

2:40 Lymphatic Filariasis and Onchocerciasis Among Residents of Three Senegal Districts Who Have Received Mass Ivermectin Administration for Onchocerciasis. *Nana Wilson*

3:00 Lymphatic Filariasis Mass Drug Administration in Seven Communes in and Around Metropolitan Port-au-Prince, Haiti, March–May 2014: Has Coverage Been Attained? *Maximilian Nerlander*

3:20 **BREAK**

3:35 **Presentation of Awards..... Ravinia Ballroom**
Moderator: Diana Bensyl

- Donald C. Mackel Memorial Award
- J. Virgil Peavy Memorial Award
- Paul C. Schnitker International Health Award
- James H. Steele Veterinary Public Health Award
- Outstanding Poster Presentation Award
- Mitch Singal Excellence in Occupational and Environmental Health Awards

3:50 **Session O: Late-Breaking Reports..... Ravinia Ballroom**
Moderators: Kevin Vagi and Diana Bensyl

3:55 Outbreak of *Listeria monocytogenes* Infections Linked to Whole Apples Used in Commercially Produced, Prepackaged Caramel Apples—United States, 2014–2015. *Kristina Angelo*

4:05 Rapid Measles Containment—Utah, 2015. *Angela Dunn*

4:15 Ebola Virus Disease Extended Transmission from Single Funeral Ceremony—Kissidougou, Guinea, December 2014–January 2015. *Kerton Victory*

4:25 Adverse Events Associated with Administration of Simulation Intravenous Fluids to Patients—United States, 2014. *Misha Robyn*

4:35 Serogroup B Meningococcal Disease Outbreak and Carriage Evaluation at a College—Rhode Island, 2015. *Heidi Soeters*

4:45 Preventing the International Spread of Ebola: Advancing the Capacity of 16 Unaffected African Countries to Rapidly Detect and Contain Ebola Virus Disease. *Lucy Breakwell*

4:55 Rapid Detection of a Winter Outbreak of Legionellosis—New York City, 2014–2015. *Isaac Benowitz*

5:05 Development and Implementation of an Accountable and Managed Contact-Tracing System for Ebola Virus Disease (EVD) in Kambia District, Sierra Leone, December 2014–January 2015. *Rebecca Levine*

5:15 **CLOSING REMARKS AND ADJOURNMENT ..... Ravinia Ballroom**
Diana Bensyl, Scientific Program Committee Chair

POSTCONFERENCE ACTIVITY

8:00 **EIS Satirial Review ..... Ravinia Ballroom**
Presentation of Philip S. Brachman Award

Awards presented during session

Awards Descriptions and Committee Members

Alexander D. Langmuir Prize Manuscript Award

The Alexander D. Langmuir Prize, established in 1966 by the EIS Alumni Association, recognizes a current EIS officer or recent alumnus (1 year) for excellence in a written report or an epidemiologic investigation or study.

2015 Committee Members: Alexa Oster (Chair), Carol Ciesielski, Neil Gupta, Mary Kamb, Christina Mikosz, Sarah Patrick, Steve Waterman

Philip S. Brachman Award

The Philip S. Brachman Award, sponsored by the graduating class of EIS officers, recognizes excellence in teaching epidemiology to EIS officers.

2015 Committee Members: 2013 EIS Class

Distinguished Friend of EIS Award

The Distinguished Friend of EIS Award, sponsored by the EIS Alumni Association, recognizes an individual for contributions to the health, welfare, and happiness of EIS officers and the EIS Program.

2015 Committee Members: Carol Ciesielski (Chair), Kris Bisgard, Mary Kamb, Pam Mahoney, Christina Mikosz, Alice Shumate

Iain C. Hardy Award

The Iain C. Hardy Award, sponsored by the National Center for Immunization and Respiratory Diseases, recognizes a current EIS officer or alumnus (within 5 years) who has made an outstanding contribution to the control of vaccine-preventable diseases.

2015 Committee Members: David Swerdlow (Chair), Melinda Wharton, John Modlin, William Schaffner

J. Virgil Peavy Memorial Award

The J. Virgil Peavy Memorial Award, established in 2003 by the EIS Alumni Association, recognizes a current EIS officer for the oral presentation that best exemplifies the effective and innovative application of statistics and epidemiologic methods in an investigation or study.

2015 Committee Members: Matthew Wise (Chair), Lara Akinbami, Cheryl Broussard, Anindya De, Glen Satten

Donald C. Mackel Memorial Award

The Donald C. Mackel Memorial Award, sponsored by the EIS Alumni Association, recognizes a current EIS officer for the oral presentation that best exemplifies the effective application of a combined epidemiology and laboratory approach to an investigation or study.

2015 Committee Members: Frederick Angulo (Chair), Michael Jhung, Jennifer Wright, Julu Bhatnagar, Vitaliano Cama, Sharon Flores

Outstanding Poster Presentation Award

The Outstanding Poster Presentation Award is presented by the EIS Scientific Program Committee to a current EIS officer for the poster that best exemplifies scientific content, including originality, study design, and analysis; public health impact; and presentation effectiveness.

2015 Committee Members: Henraya McGruder (Chair), Suzanne Beavers, Michael King, Kate Mollenkamp, Betsy Lescosky

Paul C. Schnitker International Health Award

Paul C. Schnitker, MD, died in a plane crash in Nigeria in 1969. He was en route to serve as a public health officer in the response to famine and other public health problems resulting from the Biafra Civil War in Nigeria. He is the only person who has died while serving as an EIS officer. The Paul C. Schnitker International Health Award, sponsored by the Schnitker family, recognizes a current EIS officer or alumnus (1 year) who has made a significant contribution to international public health.

2015 Committee Members: Ezra J. Barzilay (Chair), W. Roodly Archer, J. Lyle Conrad, Tom Handzel, Asim Jani, Nancy Messonnier

James H. Steele Veterinary Public Health Award

The James H. Steele Veterinary Public Health Award, sponsored by CDC veterinarians, recognizes a current EIS officer or alumnus (within 5 years) who has made outstanding contributions in the field of veterinary public health through outstanding contributions in the investigation, control, or prevention of zoonotic diseases or other animal-related human health problems.

2015 Committee Members: Casey Barton Behravesh (Chair), Frederick Angulo, Barbara Knust, Jennifer McQuiston, Kirk Smith

Mitch Singal Excellence in Occupational and Environmental Health Award

The Mitch Singal Excellence in Occupational and Environmental Health Award, co-sponsored by the National Institute for Occupational Safety and Health and the National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, established in 2010 recognizes a current EIS officer for excellence in an oral presentation that best exemplifies the effective application of public health to an investigation in the area of occupational or environmental health.

2015 Committee Members: Yulia Iossifova(Chair), Suzanne Beavers, Sally Brown, Kristin Cummings, Timothy Jones, Alex Macedo De Oliveira, Josephine Malilay, Cammie Chaumont Menéndez, Kanta Sircar

Stephen B. Thacker Champion Award

The Stephen B. Thacker EIS Champion Award, established in 2013 by the EIS Alumni Association, recognizes an individual who inspires the EIS community through deep and unwavering commitment to the EIS Program, officers, and alumni.

2015 Committee Members: Mary Kamb (Chair), Carol Ciesielski, Steve Waterman, Ken Castro, Maria Thacker, Larry Cohen

Awards Presented at the 2014 EIS Conference

Alexander D. Langmuir Prize Manuscript Award
Neil Vora

Philip S. Brachman Award
Douglas H. Hamilton

Distinguished Friend of EIS Award
William Keene

Iain C. Hardy Award
Catherine Yen

Donald C. Mackel Memorial Award
Neil Vora

J. Virgil Peavy Memorial Award
Matthew Maenner

Outstanding Poster Presentation
Jolene Nakao

Paul C. Schnitker International Health Award
Eugene Lam and Miriam Shiferaw

Mitch Singal Excellence in Occupational and Environmental Health Award
Candice Johnson

James H. Steele Veterinary Public Health Award
Danielle Buttke

Stephen B. Thacker EIS Champion Award
Lyle Conrad

Alexander D. Langmuir Lectures, 1972–2014

1972 Prevention of Rheumatic Heart Disease—Fact or Fancy.
Charles H. Rammelkamp

1973 Cytomegaloviral Disease in Man: An Ever Developing Problem.
Thomas H. Weller

1974 Hepatitis B Revisited (By the Non-Parenteral Route).
Robert W. McCollum

1975 Origin, Spread, and Disappearance of Kuru: Implications of the Epidemic Behavior of a Disease in New Guineans for the Epidemiologic Study of Transmissible Virus Dementias.
D. Carleton Gajdusek

1976 The Future of Epidemiology in the Hospital.
Paul F. Wehrle

1977 The Historical Evolution of Epidemiology.
Abraham Lilienfeld

1978 The Biology of Cancer: An Epidemiological Perspective.
Sir Richard Doll

1979 The Epidemiology of Antibiotic Resistance.
Theodore C. Eickoff

1980 Health and Population Growth.
Thomas McKeown

1981 The Pathogenesis of Dengue: Molecular Epidemiology in Infectious Disease.
Scott B. Halstead

1982 The Epidemiology of Coronary Heart Disease: Public Health Implications.
Henry W. Blackburn, Jr.

1983 Sexually Transmitted Diseases—Past, Present, and Future.
King K. Holmes

1984 Poliomyelitis Immunization—Past and Future.
Jonas E. Salk

1985 An Epidemiologist's View of Postmenopausal Estrogen Use, or What to Tell Your Mother.
Elizabeth Barrett-Connor

1986 Hepatitis B Virus and Hepatocellular Carcinoma: Epidemiologic Considerations.
Robert Palmer Beasley

1987 Environmental Hazards and the Public Health.
Geoffrey Rose

1988 Lymphotropic Retroviruses in Immunosuppression.
Myron E. (Max) Essex

1989 Aspirin in the Secondary and Primary Prevention of Cardiovascular Disease.
Charles H. Hennekens

1990 Epidemiology and Global Health.
William H. Foege

1991 Public Health Action in a New Domain: The Epidemiology and Prevention of Violence.
Garen J. Wintemute

1992 *Helicobacter pylori*, Gastritis, Peptic Ulcer Disease, and Gastric Cancer.
Martin J. Blasér

1993 Diet and Health: How Firm Is Our Footing?
Walter C. Willett

1994 Alexander D. *Langmu*ir: A Tribute to the Man.
Philip S. Brachman and William H. Foege

1995 Epidemiology and the Elucidation of Lyme Disease.
Allen C. Steere

1996 50 Years of Epidemiology at CDC.
Jeffrey P. Koplan

1997 Public Health, Population-Based Medicine, and Managed Care.
Diana B. Petitti

1998 Pandemic Influenza: Again?
Robert Couch

1999 The Evolution of Chemical Epidemiology.
Philip J. Landrigan

2000 Does *Chlamydia pneumoniae* Cause Atherosclerotic Cardiovascular Disease? Evaluating the Role of Infectious Agents in Chronic Diseases.
Walter E. Stamm

2001 Halfway Through a Century of Excellence.
J. Donald Millar

2002 Public Health Response to Terrorism: Rising to the Challenge.
Marcelle Layton

2003 Alex Langmuir's Somewhat Quiet Legacy: Epidemiology, Sexual Health, and Personal Choices.
Willard (Ward) Cates, Jr.

2004 HIV, Epidemiology, and the CDC.
James W. Curran

2005 Killin' Time: Alcohol and Injury.
Alexander C. Wagenaar

2006 Measuring Malaria.
Brian Greenwood

2007 Implications of Tuberculosis Control on Evidence-Based Public Health Practice.
Thomas R. Frieden

2008 Physical Activity and Public Health: Does the Environment Matter?
Ross C. Brownson

2009 Epidemiology, Public Health, and Public Policy.
Jim Marks

2010 Community Health Rankings—Epidemiology in Action.
Pat Remington

2011 Skirmishes, Battles, and Wars: Tracking Infection .. Control Success in the Age of Social Networks.
Robert A. Weinstein

2012 Prevention of Teen Pregnancy: What Do We Know? Where Do We Go?
Robert Blum

2013 The Role of EIS in Communities of Solution: Using GIS and Epidemiology to Activate Health Partnerships.
Robert Phillips

2014 EIS in an Era of Data, Technology, and Urban Transformations.
Martin-J. Sepulveda

Alexander D. Langmuir Prize Manuscripts, 1966–2013

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Philip S. Brachman Awards, 1983–2014

1983 Philip Brachman
1984 Michael Gregg
1985 Howard Ory
1986 J. Lyle Conrad
1987 Andrew G. Dean
1988 Richard C. Dicker
1989 Carl W. Tyler, Jr.
1990 Richard C. Dicker
1991 Richard C. Dicker
1992 Jeffrey J. Sacks
1993 J. Lyle Conrad and Michael Toole
1994 Willard (Ward) Cates and Robert Breiman
1995 John Horan
1996 Polly Marchbanks
1997 William Mac Kenzie
1998 Laura A. Coker

1999	Christine Zahniser
2000	Jeffrey J. Sacks
2001	Douglas H. Hamilton
2002	Marcelle Layton, Steve Weirsma, James L. Hadler, Eddy Bresnitz, Elizabeth Barrett, Robert B. Stroube, Ross J. Brechner, David S.B. Blythe, Larry Siegel, Karyn Berry, Sherri Adams, John Eisold, and Greg Martin
2003	Deborah W. Gould
2004	Jim Alexander
2005	Julie Magri
2006	Ralph Henderson
2007	Joshua Mott and Peter Cegielski
2008	Lisa Pealer
2009	C. Kay Smith and Julie Magri
2010	Betsy Gunnels
2011	William Schaffner
2012	Rachel N. Avchen
2013	Stephen B. Thacker
2014	Douglas H. Hamilton

Distinguished Friend of EIS Awards, 1984–2014

1984	J. Virgil Peavy
1985	William Schaffner
1986	Mary Moreman
1987	James Chin
1988	Frances H. Porcher
1989	Not Awarded
1990	J. Lyle Conrad
1991	Alexander D. Langmuir
1992	Laurence R. Foster
1993	Kenneth L. Herrmann and William Roper
1994	Louise McFarland
1995	Mike Osterholm
1996	Jim Curran and Larry Schonberger
1997	Patsy Bellamy
1998	John Horan
1999	Not Awarded
2000	James Hadler
2001	Barbara R. Holloway and William R. Jarvis
2002	Patricia Fleming and Stephen B. Thacker
2003	Paul Blake
2004	David Sencer
2005	Not Awarded
2006	Robert Tauxe and Kashef Ijaz
2007	Dixie Snider
2008	Denise Koo
2009	Arjun Srinivasan
2010	Robert Quick
2011	Thomas Peterman
2012	Jeffrey P. Davis
2013	Douglas H. Hamilton
2014	William Keene

Iain C. Hardy Awards, 1996–2014

1996	Peter Strebel
1997	D. Rebecca Prevots
1998	Beth P. Bell
1999	Charles R. Vitek
2000	Linda Quick and Nancy Rosenstein
2001	Orin S. Levine
2002	Umesh D. Parashar
2003	Karen A. Hennessey
2004	Tim Uyeki and Montse Soriano-Gabarro
2005	Julie Jacobson-Bell
2006	Gustavo Dayan
2007	Brendan Flannery
2008	Mona Marin
2009	Amanda Cohn and Rosalyn O'Laughlin
2010	Amy Parker Fiebelkorn
2011	Jacqueline E. Tate
2012	Preeta Kutty
2013	James L. Goodson
2014	Catherine Yen

J. Virgil Peavy Memorial Awards, 2003–2014

2003	Danice Eaton
2004	Lori A. Pollack
2005	Andrea Sharma
2006	Andrea Sharma
2007	Abhijeet Anand and David Lowrance
2008	Katherine Ellingson
2009	Michael L. Jackson
2010	Erin Murray
2011	Matthew Willis
2012	Noha H. Farag
2013	Alison Laufer
2014	Matthew Maenner

Donald C. Mackel Memorial Awards, 1987–2014

1987 Fatal Parathion Poisoning—Sierra Leone.
Ruth A. Etzel

1988 Multistate Outbreak of Legionnaires Disease Involving Tours to Vermont.
Margaret Mamolen

1989 Nosocomial Outbreak of Legionnaires' Disease Associated with Shower Use: Possible Role of Amoebae.
Robert F. Breiman

1990 Legionnaires' Disease Outbreak Associated with a Grocery Store Mist Machine.
Frank J. Mahoney

1991 Nosocomial Outbreak of Isoniazid- and Streptomycin-Resistant Tuberculosis Among AIDS Patients, New York City.
Brian R. Edlin

1992 Bacillary Angiomatosis, New Infectious Disease: Epidemiology, Clinical Spectrum, and Diagnostics.
Janet C. Mohle-Boetani

1993 Hepatitis B Virus Transmission Associated with Thoracic Surgery, Los Angeles.
Rafael Harpaz

1994 Schistosomiasis and Lake Malawi: A New Site of Transmission Posing a Serious Risk to Expatriates and Tourists.
Martin S. Cetron

1995 Use of Urinary Antigen Testing To Detect an Outbreak of Nosocomial Legionnaires Disease in Connecticut, 1994.
Lisa A. Lepine

1996 International Outbreak of *Salmonella* Infections Caused by Alfalfa Sprouts Grown from Contaminated Seed.
Barbara E. Mahon
and
Malassezia pachydermatis Fungemia in Neonatal Intensive Care Unit Patients: There's a [New] Fungus Among Us!
Huan Justina Chang

1997 Epidemic of Deaths from Acute Renal Failure Among Children in Haiti.
Katherine L. O'Brien

1998 And Weighing in at 25 Million Pounds—A Multistate Outbreak of *Escherichia coli* 0157:H7 Infections and the Largest Ground Beef Recall in United States History.
Kate Glynn

1999 Clinical Mismanagement of Community Outbreak? The Contribution of DNA Finger-Printing to the Analysis of Chronic, Drug-Resistant Tuberculosis in Buenaventura, Colombia, 1998.
Kayla F. Laserson

2000 *Serratia liquefaciens* Bloodstream Infections and Pyrogenic Reactions Associated with Extrinsically Contaminated Erythropoietin—Colorado.
Lisa Grohskoph

2001 When Beauty Is More Than Skin Deep: An Outbreak of Rapidly Growing Mycobacterial Furunculosis Associated with a Nail Salon—California, 2000.
Kevin L. Winthrop

2002 Dances with Cows? A Large Outbreak of *E. coli* O157 Infections at Multi-Use Community Facility—Lorain County, Ohio, September 2001.
Jay K. Varma

2003 Hepatitis C Virus Transmission from an Antibody-Negative Organ and Tissue Donor.
Barna D. Tugwell

2004 Multiple Hepatitis A Outbreaks Associated with Green Onions Among Restaurant Patrons—Tennessee, Georgia, and North Carolina, 2003.
Joseph J. Amon

2005 Case-Control Study of an Acute Aflatoxicosis Outbreak.
E. Azziz-Baumgatner

2006 Delayed Onset of *Pseudomonas fluorescens* Group Bloodstream Infections After Exposure to Contaminated Heparin Flush—Michigan and South Dakota.
Mark Gershman

2007 Epidemiologic and Molecular Investigation of an Outbreak of Hepatitis C Viral Infection at Hemodialysis Unit—Richmond Virginia, 2006.
Nicola Thompson

2008 Multistate Measles Outbreak Associated with an International Youth Sporting Event—Pennsylvania, Michigan, and Texas, August–September 2007.
Tai-Ho Chen

2009 Cardiac Events and Deaths in a Dialysis Facility Associated with Healthcare Provider—Texas, 2008.
Melissa K. Schaefer

2010 Fatal Case of Laboratory-Acquired Infection with an Attenuated *Yersinia pestis* Strain of Plague—Illinois, 2009.
Andrew Medina-Marino

2011 Outbreak of Nosocomial Listeriosis—Texas, 2010.
Noha H. Farag

2012 Pyrrolizidine Alkaloid Toxicity as the Cause of Unknown Liver Disease—Tigray, Ethiopia, 2007–2011.
Danielle E. Buttke

2013 Active Surveillance for Variant Influenza Among Swine, the Environment, and Employees at Live Animal Markets—Minnesota, 2012.
Mary J. Choi

2014 Raccoon Rabies Virus Variant Transmission Through Solid Organ Transplantation—United States, 2013.
Neil M. Vora

Outstanding Poster Presentation Awards, 1986–2014

1986 Gender Gap in the Diaper Set: A Closer Look at Differences in Sex-Specific Mortality.
Ray Yip

1987 Socioeconomic Differences in Smoking Behavior in Selected States.
Thomas E. Novotny

1988 Late-Stage Diagnosis of Breast Cancer Among Women in Low Socioeconomic Groups, Connecticut, 1984–1985.
Thomas A. Farley

1989 Malaria Infection in Early Infancy, Malawi.
Laurence Slutsker

1990 Seroprevalence of Human Immunodeficiency Virus Type I Among College Students, United States.
Brian R. Edlin

1991 Diarrheal Outbreak Associated with a Cyanobacteria (Blue-Green Algae)-Like Body, Chicago.
Philip P. Huang

1992 Response to One Dose of Inactivated Poliovirus Vaccine after Three Doses of Oral Poliovirus Vaccine, Abidjan, Côte d'Ivoire.
Bernard J. Moriniere

1993 Cholera Outbreak in Rumonge, Burundi.
Maureen E. Birmingham

1994 Salivary Testing as an Epidemiologic Tool During an Outbreak of Hepatitis A in an Amish Community in Indiana.
Edmundo Muniz

1995 Longitudinal Predictors of Initiation of Smokeless Tobacco Use.
Scott L. Tomar

1996 Nonvenomous Animal-Related Fatalities in the U.S. Workplace, 1992–1994.
Constance C. Austin

1997 Multidrug-Resistant Pneumococcal Meningitis in a Day Care Center—Tennessee.
Allen Craig

1998 Beliefs About the Tobacco Industry and Opinions About Anti-Tobacco Policies: How Tight is the Link?
Arthur E. Chin

1999 Cold Breakfast Cereal: A New Vehicle Implicated in a Multistate Outbreak of *Salmonella* Agona Infections.
Thomas Breuer

2000 Hurricane—Puerto Rico, 1998.
Dan O'Leary

2001 Counting Crows: Crow Mortality as a Sentinel for West Nile Virus Disease in Humans—Northeastern United States, 2000.
Kathleen G. Julian

2002 Outbreak of Echovirus 18 Meningitis at a Summer Camp—Alaska, 2001.
Joseph B. Mclaughlin

2003 Surveillance for Chlamydia in Women—South Carolina, 1998–2001.
Wayne A. Duffus

2004 Hospitalizations Associated with Rotavirus Diarrhea—United States, 1996–2000.
Myrna Charles

2005 Risk of Secondary Transmission from Imported Lassa Fever—New Jersey, 2004.
Ester Tan

2006 Risk Factors for *Helicobacter pylori* in a Rural Community—Montana, 2005.
Elizabeth Melius

2007 Outbreak of *Escherichia coli* 0157 Associated with Packaged Spinach—Wisconsin, 2006.
Authur M. Wendel

2008 The Power of Combining Routine Molecular Subtyping and Specific Food Exposure Interviews During *Escherichia coli* O157:H7 Outbreak—Minnesota, 2007.
Stacy M. Holzbauer

2009 Seroprevalence of Herpes Simplex 2—National Health and Nutritional Examination Surveys, United State, 2005–2006.
Sara E. Forhan

2010 Travelers' Impressions of 2009 H1N1 Influenza National Health Messaging Campaign.
Emily Jentes

2011 *Vibrio mimicus* Infection After Consumption of Crayfish—Spokane, Washington, 2010.
Meagan K. Kay

2012 Associations Between *Salmonella* Serotypes and Particular Food Commodities—United States, 1998–2008.
Brendan R. Jackson

2013 A Spicy Catch: *Salmonella* Bareilly and Nchanga Infections Associated with Raw Scraped Tuna Product—United States, 2012.
W. Thane Hancock

2014 Two Fish, One Fish: Decreasing Number of Outbreaks Attributed to Fish—United States, 1998–2011.
Jolene Nakao

Paul C. Schnitker International Health Awards, 1995–2014

1995 Leslie F. Roberts
1996 Peter Kilmarx
1997 Alexander K. Rowe and Eric L. Mouzin
1998 Etienne G. Krug
1999 Kayla F. Laserson
2000 John MacArthur and Peter Salama
2001 Valerie D. Garrett
2002 Robert D. Newman and Lorna E. Thorpe
2003 Puneet Dewan, Lisa Nelson, and Pratima Raghunathan
2004 Tracy Creek
2005 Oleg Bilukha
2006 Kevin Cain
2007 Avid Reza
2008 Sapna Bamrah and David Lowrance
2009 Rinn Song
2010 Andrew Auld
2011 W. Roodly Archer
2012 Sudhir Bunga and Janell A. Routh
2013 Kevin R. Clarke
2014 Eugene Lam and Miriam Shiferaw

James H. Steele Veterinary Public Health Awards, 1999–2014

1999 Fred Angulo and Jordan Tappero
2000 David Ashford
2001 Kate Glynn
2002 Kirk Smith
2003 Mike Bunning
2004 Jennifer McQuiston
2005 John Crump
2006 Katherine Feldman and James Kile
2007 Jennifer Wright
2008 John Dunn
2009 Casey Barton Behravesh and Stacy Holzbauer
2010 Kendra Stauffer
2011 Jennifer Adjemian and Adam Langer
2012 Barbara Knust
2013 Maho Imanishi and Megin Nichols
2014 Danielle Buttke

Mitch Singal Excellence in Occupational and Environmental Health Awards, 2010–2014

2010 Surveillance and Prevention of Occupational Injury Deaths—Wyoming, 2003–2007.
Paul Anderson

2011 Unprecedented Outbreak of Acute Childhood Lead Poisoning—Zamfara State, Nigeria, 2010.
Carrie A. Dooyema

2012 Pyrrolizidine Alkaloid Toxicity as the Cause of Unknown Liver Disease—Tigray, Ethiopia (2007–2011).
Danielle E. Buttke

2013 Impact of Aerial Insecticide Spraying on West Nile Virus Disease—North Texas, 2012.
Duke J. Ruktanonchai

2014 Workplace Secondhand Smoke Exposure Among Nonsmoking Women of Reproductive Age—United States, 2010.
Candice Johnson

Stephen B. Thacker EIS Champion Awards, 2013–2014

2013 Stephen B. Thacker
2014 Lyle Conrad

Monday, April 20, 2015

SESSION A: Stephen B. Thacker Opening Session

8:30–10:15 AM

Ravinia Ballroom

Moderators: Joshua Mott and Marie de Perio

8:35 Ebola Virus Disease Outbreak Complicated by Patients' Efforts To Avoid Diagnosis — Nigeria, 2014

Authors: Deborah Hastings, M. Nanyunja, J. Vertefeuille, F. Shuaib

Background: On July 20, 2014 an ill airline passenger from Liberia arrived in Nigeria. He was confirmed to have Ebola Virus Disease (EVD). The importation led to 20 cases and 8 deaths. Certain contacts actively sought to conceal disease. We evaluated the impact on EVD containment of contacts who intentionally evaded monitoring during the 21 day risk period.

Methods: The contact tracing team (CTT) from the Nigeria emergency operations center (EOC) investigated every EVD case to identify all contacts. We identified evasive contacts, defined as contacts who hid their illness, and interviewed the contact, or family and friends. We determined the resulting additional contacts.

Results: We identified two evasive contacts. Patient A developed symptoms but refused to speak with the CTT; he traveled by air for privately arranged care in a hotel room, and returned home by air while symptomatic. The physician who treated Patient A, the physician's wife and sister, and a patient hospitalized with the physician contracted EVD; the physician and hospitalized patient died. An additional 530 contacts were identified as a result of this patient. Patient B, a physician, omitted his name from the contact list provided to the CTT. When he fell ill he sought care at 3 facilities but was refused entry; he died at home. When his wife developed EVD Patient B's illness became known. Forty-five additional contacts were identified as a result of this patient. Interviews revealed patients' concerns about stigma.

Conclusions: The Nigerian outbreak was extended by more than a month, and 575 additional people were put at risk by the actions of these patients. Public health authorities should address stigma in their planning and communications.

8:55 Outbreak of *Salmonella* Newport Infections Linked to Cucumbers — United States, 2014

Authors: Kristina Angelo, A. Chu, M. Anand, T. Nguyen, L. Bottichio, M. Wise, I. Williams, S. Seelman, R. Bell, M. Fatica, S. Lance, D. Baldwin, K. Shannon, H. Lee, E. Trees, E. Strain, L. Gieraltowski

Background: *Salmonella* causes approximately 1 million foodborne infections and 400 deaths annually in the United States. In August 2014, PulseNet, the national molecular subtyping network for foodborne disease surveillance, detected a multistate cluster of *Salmonella* Newport (SN) infections with an indistinguishable pulse-field gel electrophoresis pattern. This strain has previously been linked to tomatoes from the Delmarva Peninsula of the Eastern US. We investigated to identify the source and prevent further illnesses.

Methods: A case was defined as an illness with the outbreak strain with onset from 5/20/2014-9/30/2014. Information was collected on travel, restaurant, and food exposures in the 7 days before illness onset using a structured questionnaire. Reported food frequencies were compared to the 2006-2007 FoodNet Population Survey. A non-regulatory traceback was performed to identify the source of food items consumed in illness sub-clusters. Whole genome sequencing (WGS) was conducted to further characterize relatedness of Salmonella isolates.

Results: A total of 275 cases from 29 states and DC were identified; 34% (48/141) were hospitalized and 1 death was reported. A significantly higher percentage of ill persons consumed cucumbers in the week before illness onset than expected, (62% vs. 46.9%, p = 0.002). Traceback of 8 illness sub-clusters led to a common cucumber grower in the Delmarva region of Maryland. WGS analysis showed that genetic sequences of clinical isolates from MD and DE were highly related but distinct from a NY sub-cluster.

Conclusions: Epidemiologic and traceback evidence suggest cucumbers were a major source of illness in this outbreak. This is the first multistate outbreak of SN infections linked to a produce item from the Delmarva Peninsula other than tomatoes, suggesting an environmental reservoir may be responsible for recurring outbreaks.

9:15 Risk of Ectopic Pregnancy Associated with Assisted Reproductive Technology, United States, 2001–2011

Authors: Kiran Perkins, S. Boulet, D. Kissin, D. Jamieson

Background: Ectopic pregnancy—the implantation of an embryo outside the uterus—is a leading cause of maternal disease and death, with a pregnancy-related mortality rate of 31.9 deaths per 100,000 pregnancies. There have been inconsistent reports of the risk of ectopic pregnancy following assisted reproductive technology (ART). Therefore, we assessed national incidence trends for ectopic pregnancy among ART users and identified risk factors associated with ectopic pregnancy.

Methods: We identified 553,577 pregnancies reported to the National ART Surveillance System during 2001-2011. We assessed temporal trends for the incidence of annual ectopic pregnancy by using Poisson regression. We used log-binomial regression models with generalized estimating equations for correlated outcomes within clinics to calculate unadjusted and adjusted risk ratios for the association between ectopic pregnancy and selected patient characteristics and treatment factors.

Results: 9,480 (1.7%) pregnancies were ectopic. The rate of ectopic pregnancy declined from 2.0% (n = 735, 95% CI 1.9-2.2) in 2001 to 1.6% (n = 968, 95% CI 1.5-1.7) in 2011 (P for trend <.001). The ectopic pregnancy rate ranged from 2.0% (n = 7,469, 95% CI 1.9-2.0) for fresh, nondonor cycles to 1.0% (n = 641, 95% CI 0.9-1.1) for fresh, donor cycles. Among fresh, nondonor cycles, the rate of ectopic pregnancy was 1.6% (95% CI 1.4-1.7) when one embryo was transferred, compared with 1.7% (95% CI 1.7-1.8), 2.2% (95% CI 2.1-2.3), and 2.5% (95% CI 2.4-2.6) when two, three, or four or more embryos were transferred, respectively (aRRs 1.11 95% CI 0.94-1.30, 1.33 95% CI 1.12-1.56, and 1.49 95% CI 1.25-1.78).

Conclusions: Ectopic pregnancy incidence after ART has decreased over time and may decrease further if fewer embryos are transferred during ART.

9:35 Healthcare-Associated Outbreak of Legionnaires' Disease on an Inpatient Hematology-Oncology Unit — Alabama, 2014

Authors: Louise Francois Watkins, A.M. Harris, K. Toews, S. Davidson, B.C. Camins, C.E. Lucas, S. Ayers-Millsap, B.C. Hubbard, N.A. Kozak-Muiznieks, A.E. Khan, M.G. McIntyre, P.K. Kutty

Background: In May 2014, the Alabama Department of Public Health detected an outbreak of Legionnaires' disease (LD) associated with a new hematology-oncology unit at Hospital A. Healthcare-associated LD has a 14-40% mortality rate; immunocompromised patients are particularly susceptible. We characterized the outbreak and evaluated contributing factors to stop transmission.

Methods: An LD case was defined as radiographically-confirmed pneumonia in a person with a positive urinary antigen test and/or respiratory culture for *Legionella* and exposure to the hematology-oncology unit. Cases were classified as definitely or probably healthcare-associated based on extent of exposure during the incubation period (2–10 days). Medical charts were reviewed. We conducted an environmental assessment and collected representative water samples for culture. Clinical and environmental isolates were compared by monoclonal antibody (mAb) testing and sequence-based typing.

Results: We identified 10 cases (nine inpatients and one visitor), including six definitely and four probably healthcare-associated cases over a 12-week period. Eight patients (80%) had active leukemia and seven (70%) received chemotherapy during the admission prior to LD onset. Environmental sampling revealed *Legionella pneumophila* serogroup 1 (Lp1) in the potable water at 50% (17/34) of hematology-oncology unit sites, including all patient rooms tested; the three clinical isolates were identical to environmental isolates from the unit (mAb2-positive, sequence type ST36). No new cases occurred with exposure after implementation of water restrictions followed by point-of-use filters.

Conclusions: Contamination of the hospital's potable water system with uncommon Lp1 strain ST36 was the likely source of this outbreak. Clinicians caring for immunocompromised patients should maintain a high index of suspicion for healthcare-associated LD. Strict water restriction precautions were effective and should be considered in LD outbreak settings involving immunocompromised patients.

9:55 Rapid Assessment of Integration of Ebola Survivors into Emergency Operations and Ebola Response Activities — Bombali District, Sierra Leone, 2014

Authors: Monica Adams, B. Gleason, J. Redd, J. Mermin, A. Sheriff, S.B. Conteh, T. Sesay, B.Y. Tommy

Background: The current outbreak of Ebola virus disease (Ebola) has produced unprecedented numbers of survivors thought to be clinically resistant to reinfection. Despite thousands of survivors, little is known about their needs, long-term clinical sequelae, and potential for participation in the public health response. Our objectives were twofold: identify how a District Emergency Operations Center (EOC) in Bombali District could integrate survivor needs and care management into EOC protocols and assess feasibility of survivors contributing to the local Ebola response.

Methods: We conducted a rapid assessment in Bombali from October 2-6. The team interviewed five EOC Psychosocial Support Pillar members, observed psychosocial counseling, reviewed all survivor records, and co-facilitated a group discussion with 24 survivors recruited by the district regarding potential roles in the response and barriers to recovery and reintegration. Content analysis was performed to generate themes on qualitative data; quantitative data was analyzed descriptively.

Results: As of October 6, 71 survivors returned to Bombali from treatment facilities; median age was 28.5 years, 37 (52%) were female and earliest date of discharge was August 10. Gaps in management activities were identified (e.g. transportation, family reunification for children, and follow-up). Respondents identified four potential roles dependent upon individual survivor skills: community educators, media spokespersons, medical and supportive care providers, and spiritual guides. The majority of survivors were interested in participating in Ebola response activities; however, they noted three types of unmet needs: immediate (e.g. food, clothing, and housing), short-term (e.g. stigmatization and discrimination), and long-term (e.g. education).

Conclusions: Survivors are interested in contributing to the local response. Current strategies require additional coordination, comprehension, and tangible supports. Integration of survivor issues into emergency planning is warranted.

CONCURRENT SESSION B1: Vaccine-Preventable Diseases

10:40 AM–12:05 PM

Ravinia Ballroom

Moderators: Laurence Cohen and Anne Schuchat

10:45 Assessing the Potential Impact of 10-Valent Pneumococcal Conjugate Vaccine Using Pneumococcal Colonization Surveys Among Children <5 Years — Kenya, 2009–2010

Authors: Miwako Kobayashi, L.M. Conklin, G. Bigogo, G. Jagero, L. Hampton, K.E. Fleming-Dutra, M. Junghae, M. da Gloria Carvalho, F. Pimenta, B. Beall, T. Taylor, K.F. Laserson, J. Vulule, C. Van Beneden, T. Pilishvili, L. Kim

Background: *Streptococcus pneumoniae* (pneumococcus) is a leading cause of serious infections in developing countries. Pneumococci are spread by persons with nasopharyngeal colonization, and colonization is a necessary precursor to invasive disease. To demonstrate potential impact of 10-valent pneumococcal conjugate vaccine (PCV10) among Kenyan children <5 years, we examined pneumococcal colonization, including antimicrobial susceptibility patterns, during 2009 and 2010, the years before vaccine introduction (2011).

Methods: Two cross-sectional colonization surveys were conducted in two Kenyan sites with ongoing population-based surveillance. Nasopharyngeal swabs were obtained, and pneumococcal isolates were serotyped (multiplex-PCR and Quellung). Serotypes were categorized according to whether they were included in PCV10. Antimicrobial susceptibility testing was performed on isolates from 2009. Antimicrobial nonsusceptiblity was defined as intermediate or resistant to ≥1 antimicrobial class according to the 2007 Clinical and Laboratory Standards Institute's nonmeningitis criteria for penicillin and 2012 criteria for all other antimicrobials. Multidrug resistance (MDR) was defined as resistance to ≥3 antimicrobial classes. Risk factors associated with MDR were assessed using multivariable logistic regression.

Results: A total of 1,087 children were enrolled. Median age was 28 months (range 4– 59); 50.3% were female. Ninety percent (n = 983) were colonized with pneumococcus; 42% (n = 408) were PCV10 serotypes. Isolates were most frequently nonsusceptible to cotrimoxazole (622/634; 98.1%). Sixteen percent (103/635) of isolates exhibited MDR; 49.5% (51/103) of MDR isolates were PCV10 serotypes. PCV10 serotypes were more likely to be MDR than other serotypes (OR = 1.69; 95% CI = 1.07–2.68).

Conclusions: Pneumococcal colonization was high among Kenyan children <5 years prior to PCV10 introduction. PCV10 introduction might lead to significant reductions in vaccine-type and MDR pneumococcal disease among this population by preventing colonization.

11:05 Clinical Characteristics of Vaccinated and Unvaccinated Pertussis Cases — United States, 2010–2012

Authors: Lucy McNamara, T. Skoff, A. Faulkner, E. Briere, L. Miller, K. Kudish, C. Kenyon, M. Bargsten, S. Zansky, L. Reynolds, S. Martin

Background: Over 48,000 pertussis cases were reported in the US in 2012. Many cases occurred among vaccinated individuals, indicating that acellular pertussis vaccination does not eliminate risk of disease. However, pertussis vaccination might lessen disease severity. We assessed whether serious pertussis symptoms or complications are more common among case-patients who are not up-to-date (nUTD) for pertussis vaccination for age.

Methods: We analyzed data on cases meeting the CSTE probable or confirmed case definition in patients aged ≥ 3 months reported through Enhanced Pertussis Surveillance (Emerging Infections Program Network), 2010–2012. Data were collected at six sites through physician and patient interview and vaccine registries. Odds ratios (OR) were calculated comparing clinical characteristics in up-to-date (UTD) and nUTD case-patients (Tdap received vs. not for adults ≥ 20 years); multivariate analysis was performed using logistic regression.

Results: The analysis included 10,092 pertussis case-patients (median age 11 years, range 0–99). Among case-patients ≤ 19 years old, 81% were UTD; among adults, 45% had received Tdap. UTD status was protective against severe disease (seizure, encephalopathy, pneumonia, or hospitalization) in children 7 months–6 years old (OR 0.37; 95% CI 0.22–0.61) and against post-tussive vomiting in persons aged 19 months–64 years (OR 0.72; 95% CI 0.64–0.80). In multivariate analysis, UTD status (adjusted OR (aOR) 0.72; 95% CI 0.64–0.80) and antibiotic treatment within 1 week of symptom onset (aOR 0.60; 95% CI 0.53–0.68) were independently protective against vomiting in persons 19 months–64 years old.

Conclusions: UTD case-patients have reduced odds of serious pertussis symptoms and complications, demonstrating that the positive impact of pertussis vaccination extends beyond preventing cases.

11:25 Changes in Varicella Epidemiology — Connecticut, 2009–2013

Authors: Jocelyn Mullins, J. Hadler, L. Sosa, K. Kudish

Background: Varicella is a highly contagious vaccine-preventable illness. In 1996, the Advisory Committee for Immunization Practices recommended 1 dose of vaccine for children and in 2006, 2 doses; Connecticut required 2 doses for school entry starting in 2011. Connecticut varicella incidence overall and among persons aged 1–14 years declined during 2005–2008. We examined varicella data for 2009–2013 to determine if incidence continued to decline.

Methods: Using passive surveillance data, incidence trends and changes in proportion of potentially preventable cases (defined as those among persons not up-to-date with vaccinations and without previous varicella infection) were assessed with chi-square tests for trend and proportion, respectively. Associations between percentages of populations living in poverty (≤100% of federal poverty level) and age-adjusted incidence were evaluated at the census-tract level with Poisson regression.

Results: Varicella incidence per 100,000 persons decreased from 13.8 in 2009 to 6.0 cases in 2013 (P <.01); age-specific incidence decreased among groups aged 1–4 years (81.5 to 49.1 cases), 5–9 years (80.1 to 23.9 cases), and 10–14 years (44.2 to 14.5 cases) (P <.01). Incidence was relatively stable among groups aged <1 years (48.5 to 32.7 cases), 15–19 years (7.5 to 5.1 cases), 20–29 years (1.8 to 3.1 cases), and ≥30 years (1.1 to 0.6 cases). Proportion of potentially preventable cases decreased from 44% to 35% (P = .04). Age-adjusted varicella incidence decreased with increasing poverty (P = .02); this association did not remain significant after adjusting for race.

Conclusions: Connecticut varicella incidence continued to decline overall and among children aged 1–14 years. Further studies should investigate associations between race, poverty and varicella incidence.

11:45 Sustained Decrease in Rotavirus Activity After Implementation of Rotavirus Vaccines — United States, 2000–2014

Authors: Negar Aliabadi, J.E. Tate, A.K. Haynes, U.D. Parashar

Background: Before implementation of rotavirus vaccination in 2006, rotavirus caused 55,000-70,000 hospitalizations and 410,000 clinic visits annually in US children. This report examines the long-term impact of vaccine introduction on rotavirus detection and seasonality through comparison of pre (2000-2006) and post (2007-2014) vaccine seasons.

Methods: The National Respiratory and Enteric Virus Surveillance System (NREVSS) is a passive laboratory system which collects results of weekly aggregate stool specimens and positive rotavirus detections. To characterize changes in rotavirus detection, total and positive specimens for each season after vaccine introduction from 23 continuously reporting (≥26 weeks per season) laboratories were compared to median values for 2000-2006. Data from ~290 participating laboratories was used to determine pre and post-vaccine changes in season onset (first of two consecutive weeks during which ≥10% of specimens tested positive), duration, and peak.

Results: Nationally, positive tests declined by 57.8%-89.9% in each post-vaccine season compared to 2000-2006. Pre-vaccine, median season onset occurred in epidemiological week 50, median peak activity in week 9 (43.1% positive) and seasons lasted a median of 26 weeks; post-vaccine seasons started later (weeks 1-9), had lower peak activity (10.9%-27.3%), and were shorter (0-18 weeks). A biennial pattern emerged, with alternating years of lower and greater activity. All regions had similar reductions in positive tests. In the South, season onset and duration vacillated, with some post-vaccine seasons' onset and duration comparable to 2000-2006, whereas the remaining regions seasonality pattern was similar to each other.

Conclusions: Rotavirus vaccine substantially and sustainably reduced the burden and changed the epidemiology of rotavirus in US children. The biennial pattern observed may be explained by accumulating unvaccinated children over two successive seasons resulting in stronger rotavirus seasons every alternate year.

CONCURRENT SESSION B2: Chronic Disease Prevention and Health Promotion

10:40 AM–12:05 PM

Dunwoody Suite

Moderators: Peter Briss and Henraya McGruder

10:45 Health Professional Advice and Action To Reduce Sodium Intake Among Adults in the United States, Behavioral Risk Factor Surveillance System, 2013

Authors: Sandra Jackson, S.M. Coleman King, S. Park, J. Fang, E.C. Odom, M.E. Cogswell

Background: Excessive sodium intake is a key modifiable risk factor for hypertension and cardiovascular disease. Although 95% of US adults exceed intake recommendations, knowledge about adults attempting to reduce sodium intake is limited. Our objectives were to describe the prevalence and determinants of taking action to reduce sodium intake, and to test whether receiving health professional advice was associated with taking action.

Methods: We used self-reported data from the 2013 Behavioral Risk Factor Surveillance System, a state-based telephone survey representative of noninstitutionalized adults. Twenty-six states, the District of Columbia, and Puerto Rico used the new, optional sodium module, yielding 173,778 respondents with complete data. We estimated prevalence ratios (PR) on average marginal predictions, accounting for the complex survey design.

Results: Fifty-three percent of adults reported watching or reducing sodium intake (taking action). The prevalence of taking action was highest among adults who received health professional advice to reduce sodium intake (82%), followed by adults taking antihypertensive medications, adults with diabetes, adults with kidney disease, or adults with a history of cardiovascular disease (73%-75%), and lowest among adults aged 18-24 years (29%). Overall, 23% of adults reported receiving advice to reduce sodium intake. Receiving advice was associated with taking action to reduce sodium intake (PR 1.59, 95% CI 1.56-1.61) independent of sociodemographic and health characteristics, although some disparities were observed in stratified analyses.

Conclusions: Results suggest slightly more than half of US adults are taking action to reduce sodium intake, and receiving advice is strongly associated with taking action. The substantial proportion of respondents who do not report receiving advice from health professionals may indicate a missed opportunity for reducing sodium intake, particularly among high-risk groups.

11:05 Diabetes-Related Complications Among American Indians/Alaska Natives — Idaho, Oregon, and Washington State, 2001–2011

Authors: Jessica Marcinkevage, T. Weiser, E. Gregg, K. Lopez, V. Warren-Mears

Background: Diabetes-related complication rates reported in the United States declined during 1990–2010. Whether such improvements have also benefited American Indians/Alaska Natives (AI/ANs), a group disproportionately affected by diabetes, is unknown. We examined incidence of diabetes-related complications for 2001–2011 among Idaho, Oregon, and Washington AI/ANs.

Methods: We analyzed data from the Indian Health Service (IHS) National Data Warehouse (NDW), a repository of demographic, clinical, and billing data from IHS, tribal, and urban Indian clinics, with a user population representing ~70% of all Pacific Northwest AI/ANs. Using *International Classification of Diseases*, 9th Revision codes, we calculated the 2001–2011 prevalence of diabetes diagnoses in the NDW among AI/AN patients in the Pacific Northwest and calculated annual and cumulative incidence overall and individually for 5 diabetes-related complications: acute myocardial infarction (MI), lower-extremity amputation, stroke, end-stage renal disease (ESRD), and sepsis.

Results: During 2001–2011, the prevalence of diabetes within the NDW user population increased from 3.1% (95% confidence interval [CI]: 3.0–3.2) to 5.0% (95% CI: 4.8–5.1). The annual incidence of amputations/10,000 patients with diabetes decreased from 28.6 (95% CI: 13.3–54.2) in 2001 to 1.9 (95% CI: 0.1–9.2) in 2011; no significant change was detected for MI, stroke, ESRD, or sepsis. During 2001–2011, the cumulative incidence of all 5 diabetes-related complications was 1,635.9 (95% CI: 1,568.0–1,705.0)/10,000 patients with diabetes. The 3 conditions with highest cumulative incidence were ESRD (919.2 [95% CI: 866.8–973.8]), followed by stroke (372.2 [95% CI: 338.3–408.4]), and MI (199.0 [95% CI: 174.4–226.1]).

Conclusions: The burden of diabetes persists among Pacific Northwest AI/ANs. Clinical and community programs promoting diabetes management are needed to improve outcomes and prevent complications.

11:25 Cardiovascular Disease Risk Factor Status and Physical Inactivity — United States, 2013

Authors: John Omura, S.A. Carlson, P. Paul, K.B. Watson, J.E. Fulton

Background: Cardiovascular diseases (CVDs) are often preceded by intermediate risk factors (IRFs), such as hypertension and diabetes. Thus, individuals with IRFs are an important population for CVD prevention efforts, including physical activity. This study examines the prevalence of physical inactivity among US adults with IRFs and the association of risk factor status with inactivity.

Methods: By using self-reported telephone survey data from the 2013 Behavioral Risk Factor Surveillance System, we categorized respondents (n = 368,485) as having CVD (coronary heart disease, myocardial infarction, or stroke); ≥1 IRF (hypertension, high cholesterol, diabetes, or obesity, and no CVD); or no disease (no CVD or IRF). We assessed the prevalence of inactivity for those with no disease and ≥1 IRF, and used logistic regression (adjusted for sex, age, race, smoking, and education) to examine the association between risk factor status and inactivity (n = 322,593), stratified by age group.

Results: The prevalence of individuals with ≥1 IRF was 57.1% (95% CI 56.7-57.4). Inactivity was more prevalent for all ages among those with ≥1 IRF (≤39 years 27.3%; 40-64 years 31.0%; ≥65 years 34.5%) compared with those with no disease (≤39 years 18.6%; 40-64 years 20.0%; ≥65 years 25.4%). For all ages, those with ≥1 IRF had increased odds of inactivity compared with those with no disease (adjusted Odds Ratio ≤39 years = 1.45 [1.34-1.56]; aOR 40-64 years = 1.58 [1.50-1.66]; aOR ≥65 years = 1.47 [1.36-1.58]).

Conclusions: Adults with IRFs compose a large proportion of the US population. They are more likely to be inactive than individuals with no disease. These findings highlight the need to identify strategies to promote physical activity for CVD prevention among this population.

11:45 Healthful Food Availability, Pricing, and Promotion in Stores and Restaurants in American Samoa, 2014

Authors: Seung Hee Lee-Kwan, G. Kumar, L. McGuire, H.M. Blanck, M.T. Nua

Background: American Samoa (AS) has the highest recorded prevalence of obesity globally; 75% of adults are obese. In addition, 47% have diabetes, a disease strongly associated with obesity. The nutritionally poor food and beverage environment of food retail venues is suspected to be a community-level contributing factor; however, a comprehensive evaluation of the food venues in AS has not been completed.

Methods: Previously validated food environment tools, Nutrition Environment Measurement Survey for Stores (NEMS-S) and Restaurants (NEMS-R), were modified to incorporate AS foods and administered in a geographically representative sample of 70 stores (9 grocery, 61 convenience stores) and 20 restaurants. Healthful and less-healthful foods were defined by the assessment instruments. Descriptive statistics were used to estimate the frequency of product availability, pricing, and promotion information of healthful and less healthful foods items in stores and restaurants.

Results: Fresh fruits and vegetables were available more often in grocery than convenience stores, but prices were comparable. In convenience stores, healthful items were less available than corresponding less-healthful items (e.g., lean meat 0% versus regular meat 74%), and some healthful items were more expensive than their corresponding less-healthful food items (e.g., $1.88 for 100% whole wheat bread versus $1.12 for white bread). For restaurants, 70% offered at least one healthful entrée, but only 30% had healthful side dishes, such as vegetables. Healthful entrées were 9% more expensive than less-healthful entrées, and healthful sides were 15% more expensive than less-healthful sides. Actions to promote healthy eating, such as providing calorie information, were rare among restaurants.

Conclusions: Improving availability, affordability, and the promotion of healthful foods in AS stores and restaurants may support healthy eating among AS residents.

SPECIAL SESSION: Ebola in West Africa: Evolution and Control of an Epidemic

12:10–1:25 PM

Dunwoody Suite

Introduction: Thomas R. Frieden

Overview of the Epidemic: Barbara Marston

Country Perspectives (30 mins) Liberia

- Dr. Amara Jumbai—Deputy Chief Medical Officer, Ministry of Health Liberia
- Dr. James Bangura—District Surveillance Officer, Ministry of Health Liberia Sierra Leone
- Dr. Jordan Tappero—Once We Get to Zero How Do We Stay There

POSTER SYMPOSIUM I

1:30–2:45 PM

Dunwoody Suites

Moderators: Thomas Weiser and Byron Robinson

During the first 30 minutes of the Poster Symposium, the following authors will each give a 2-minute oral presentation at the podium in front of a seated audience. Afterward, the authors will stand with their posters for the remaining session time. The audience is encouraged to view the individual posters and engage in direct discussion with the author.

P1.1 Implementation of the 5As Intervention Increases Odds of Smoking Cessation Among Women Attending WIC Clinics in Ohio, 2006–2011

Authors: Oluwatosin Olaiya, A. Sharma, S. Dee, V. Tong, C. Quinn, I. Agaku, E. Conrey, N. Kuiper, G. Satten

Background: Perinatal smoking is associated with adverse outcomes, including low birthweight. Psychosocial counseling, such as the 5As (ask/advise/assess/assist/arrange), increases smoking cessation among pregnant women. High perinatal smoking prevalence prompted Ohio to implement the 5As in 38 Women, Infants, and Children (WIC) clinics during 2006-2011 and allocate $1,000,000 for interventions in 2014. To guide the use of funds, Ohio asked CDC to help evaluate the effects of the 5As on smoking cessation among pregnant, WIC-enrolled smokers.

Methods: Using 2005-2011 Ohio Pregnancy Nutrition Surveillance System data, we performed conditional logistic regression to estimate the odds of quitting smoking during the last 3 months of pregnancy among women who attended a WIC clinic before it received 5As training, compared with the odds of quitting among women attending that clinic after it was trained. We adjusted for trimester of WIC enrollment; heavy smoking (≥10 cigarettes/day); calendar year; and maternal age, race, and education. Because self-disclosed smoking might differ among 5As participants versus non-participants, we assessed reporting bias by examining whether change in birthweight among quitters differed by clinic training status.

Results: Of 71,526 pregnant women smoking at WIC enrollment, 23% quit. Odds of quitting were higher among women who attended a clinic after versus before it was trained (adjusted odds ratio 1.16, 95% confidence interval: 1.04, 1.29). Mean birthweight increased 85g among women who reported quitting ($P < 0.0001$), regardless of clinic training status, suggesting that self-reported quitting was unbiased by intervention participation.

Conclusions: Smoking cessation increased among pregnant women who attended Ohio WIC clinics trained in the 5As. Implementing the 5As throughout WIC clinics statewide may help 2,100 additional pregnant women quit smoking annually, improving maternal-child health outcomes.

P1.2 Public Health Surveillance for Ebola Cases — Western District, Sierra Leone, September–October 2014

Authors: Godwin Mindra, C. Keimbe, J. Bangura, S. Bunga, R. Njai, F. Hussein, J. McAuley

Background: By October 31, 2014, Sierra Leone had recorded over 3,900 confirmed Ebola cases, including 1,070 deaths, during the largest epidemic in history. Local surveillance officers investigated reports of Ebola cases in the Western District, which includes rural and urban populations of 260,000 and 1.1 million, respectively. In response to initial data suggesting higher Ebola incidence in the rural area, we assessed the case definition's positive predictive value (PPV) and calculated attack rates.

Methods: We reviewed all suspected Ebola cases investigated during September–October 2014 in the Western District. A suspected Ebola case was fever with headache, diarrhea, muscle pain, vomiting, unexplained hemorrhage, or known exposure history; corresponding positive laboratory results were confirmatory for Ebola. We compared PPV and attack rates between rural and urban areas.

Results: The rural area had 532 suspected cases, with 154 (28.9%) laboratory-tested, of which 120 (77.9%) were confirmed for Ebola; the urban area had 649, with 315 (48.5%) laboratory-tested, of which 219 (69.5%) were confirmed (PPV difference = 8.4%; 95% confidence interval [CI]: 0.1%–16.7%). Suspected and confirmed Ebola case attack rates per 10,000 people were 20.5 and 4.6 in the rural, and 5.9 and 2.0 in the urban area, for attack rate ratios of 3.5 (95% CI: 3.1–3.9) and 2.3 (95% CI: 1.9–2.9), respectively.

Conclusions: The high PPV and attack rates in the Western District corroborate concerns of intense Ebola transmission. Increased PPV and attack rates in rural versus urban areas might be real or biased due to laboratory testing and population estimate differences. Quality surveillance data is needed to guide allocation of critical resources, including placement of Ebola infection prevention and care facilities.

P1.3 Norovirus Syndromic Surveillance Among Commercial Tour Bus Passengers: A Pilot Project — Yellowstone National Park, August 2014

Authors: Cara Cherry, G. Larsen, D. Wong

Background: In 2013, a norovirus outbreak associated with infected passengers on commercial tour buses affected >475 visitors and employees at Yellowstone National Park (YNP). Annually, >222,000 visitors enter YNP on buses where crowded settings can facilitate person-to-person norovirus spread. We evaluated a pilot surveillance system to track ill passengers on overnight tour buses.

Methods: During August 4–31, 2014, tour bus guides registering their groups' first YNP hotel stay voluntarily completed a questionnaire assessing the number of passengers with self-reported vomiting or diarrhea, tour company name, date and first overnight stay location, and city of tour origin. Completed questionnaires were faxed daily to the National Park Service Office of Public Health. Front desk managers completed a postpilot evaluation addressing system feasibility.

Results: Response was high, with 290 of 299 (97%) guides completing the questionnaire. Data quality was less complete; only 191 of 290 (66%) forms contained date and first overnight stay location. Five of 191 (3%) guides reported passengers with vomiting or diarrhea. No associations between illness and previously described variables were identified. Front desk managers indicated a median of 1 minute (range: <1–10 minutes) for questionnaire completion. Seventeen of 18 (94%) responding managers indicated guides were receptive to the questionnaire. Eight of 18 (44%) managers agreed the questionnaire helped ensure prompt identification of ill passengers. Nine of 18 (50%) managers were interested in continuing this surveillance system.

Conclusions: Bus-specific syndromic surveillance posed a minimal time burden for bus guides, but aided prompt identification of five potential norovirus clusters. Locating park-associated clusters early is essential for limiting transmission. This system appears useful in detecting outbreaks; further testing in other high-volume tourism settings is warranted.

P1.4 Bicycling in the Boroughs: Trends in Self-Reported Bicycling — New York City, 2007–2013

Authors: Kari Yacisin, H. Parton

Background: Lack of physical activity is a risk factor for cardiovascular disease and cancer, the top 2 causes of death in New York City (NYC). The NYC Health Department promotes active transportation as a way to increase physical activity. Since 2006, NYC doubled its bike lane networks and in 2013 launched a bike share program in Manhattan and Brooklyn. Characterizing bicycling provides evidence for program planners to assess ways to increase NYC residents' physical activity. We sought to describe NYC bicycling frequency trends.

Methods: We analyzed biennial data (2007, 2009, 2011, 2013) from the Community Health Survey, an annual random-digit-dial survey of noninstitutionalized NYC adults. Self-reported bicycling frequency in the past year was categorized into moderate (≥1 time/month), light (<1 time/month), and no bicycling. Using SAS®-callable SUDAAN®, we calculated weighted prevalence of bicycling frequency by sex, borough, household-level poverty, and zip-code–level poverty and performed linear test-for-trends.

Results: From 2007 to 2013, moderate bicycling increased from 9% to 15% ($p^{trend}<.01$), light bicycling decreased from 13% to 8% ($p^{trend}<.01$), and no bicycling decreased from 78% to 77% ($p^{trend}=.04$). Moderate bicycling increased for men (13% to 23%; $p^{trend}<.01$) and women (5% to 8%; $p^{trend}<.01$). Moderate bicycling increased citywide, most in Staten Island (6% to 16%; $p<.01$) and least in The Bronx (8% to 12%; $p<.01$) and increased most in poorer households (7% to 17%; $p<.01$) and neighborhoods (9% to 16%; $p<.01$).

Conclusions: This preliminary analysis suggests NYC's increased moderate bicycling might represent increased use among those already bicycling rather than recruiting new bicyclists. Analysis is ongoing to explore disparities and identify subpopulations that might benefit from public health messaging around bicycling as active transportation.

P1.5 Cluster of Ebola Viral Disease Linked to a Single Funeral Event — Sierra Leone, 2014

Authors: Kathyrn Curran, J.J. Gibson, D. Marke, V. Caulker, J. Bomeh, S. Bunga, J. Brunkard, P.H. Kilmarx

Background: As of 24 November 2014, 6,599 cases (82% confirmed) of Ebola Virus Disease (EVD) have been reported in Sierra Leone. During September 2014, a sudden increase of EVD cases occurred in Moyamba, a rural district with a population of approximately 260,000. We investigated to determine the source and risk factors, and recommend prevention and control measures.

Methods: We conducted a retrospective cohort analysis of laboratory-confirmed EVD cases in Moyamba. Interviewers completed standardized forms with patients or proxies regarding potential exposures during one month before illness onset, including contact with suspected cases, corpses, or ill persons, funeral attendance, and hospital or traditional healer visits.

Results: Among 163 suspect cases investigated during July 11–October 24, 2014, 73 (45%) were confirmed positive; 44% (32/73) of whom died. Median age was 32 (range: 6-84) years; 62% were male. Incidence peaked the week of September 15-21 (34 confirmed cases). Fifty-five (75%) of the confirmed cases reported contact with an ill person, 40 (55%) attended a funeral, 35 (48%) touched a corpse, and 8 (11%) visited a hospital or traditional healer. Twenty-six confirmed cases attended the same pharmacist's funeral September 5-7 and developed symptoms a median of 8.5 (interquartile range: 7-12) days afterwards; 8 died. Of these, 16 (62%) had contact with the pharmacist while he was ill; 85% touched his corpse. Contact with funeral attendees led to 3 known additional confirmed cases.

Conclusions: A single funeral led to a spike in EVD cases in a previously low-incidence district. Safe burials by trained teams with appropriate protective equipment are critical to interrupt transmission and control EVD in both low- and high-incidence, and rural and urban settings.

P1.6 Decreased Intended Duration of Breastfeeding Following Inadequate Hospital Support, Infant Feeding Practices Study II, 2005–2007

Authors: Jennifer Nelson, C.G. Perrine, K.S. Scanlon, R. Li

Background: Although previous studies suggest that a mother's breastfeeding intention strongly predicts her actual practices, and that the Baby-Friendly Hospital Initiative (BFHI) increases breastfeeding duration through improved maternity care practices/policies, there have been no studies examining the effect of BFHI practices on mothers' breastfeeding intentions. We examined the association of mothers' reported postpartum experiences of BFHI practices and change in intended duration of breastfeeding between the prenatal and neonatal periods.

Methods: Infant Feeding Practices Study II is a longitudinal survey of US mothers with 1 prenatal and 10 postpartum surveys. Change in intended duration was calculated as a difference in intention on neonatal (~1 month postpartum) and prenatal (~7 months gestation) surveys. Multivariable logistic regression was used to assess the relationship between shortened intended duration (reference: no change/longer intention) and maternal report on experiencing the 6 BFHI practices surveyed.

Results: Of 1,819 women, 43% had no change in intention between prenatal and neonatal survey, 35% a shorter intention, and 21% a longer intention. Among 6 BFHI practices, receiving food or drink other than breast milk (adjusted odds ratio [aOR]: 1.41, 95% confidence interval [CI]: 1.15, 1.73) and giving pacifiers (aOR: 1.22, 95% CI: 1.00, 1.49) increased the odds of shortened neonatal intention. Mothers who experience less than or equal to 1 BFHI practice had 1.59 times the odds of decreasing their intended duration of breastfeeding compared with those experiencing all 6 practices (95% CI: 1.00, 2.51).

Conclusions: Receiving food or drinks other than breast milk and pacifiers in the hospital may reduce mothers' intended breastfeeding duration. Maternity care facilities should provide hospital practices consistent with the BFHI to provide optimal support for breastfeeding.

P1.7 Referral to Specialty Care Among Persons with Chronic Hepatitis C Virus Infection — United States, 2006–2011

Authors: Monique Foster, J. Xing, A. Moorman, F. Xu, S. Holmberg, P. Spradling

Background: An estimated 3.2 million persons have hepatitis C virus (HCV) infection. Over the next four decades, untreated infections will result in 1 million deaths. CDC recommends that all HCV-infected persons be evaluated for severity of liver disease and treatment; however, little is known about the proportion, characteristics, and likelihood of treatment of persons referred for HCV specialty care.

Methods: We analyzed demographic and clinical electronic medical record data on all persons with newly diagnosed HCV infection during 2006–2011 among approximately 2 million persons receiving care from 4 US health care organizations. Adjusted odds ratios were derived from multivariate analysis.

Results: Among 2,400 patients with newly diagnosed HCV infection at the 4 sites, the mean age at diagnosis was 50 years; most were male (57%) and white (64%). At the time of diagnosis, 60% had elevated liver enzymes, and 30% had laboratory markers consistent with fibrosis/cirrhosis; 61% were referred for specialty care. Those more likely to be referred were black persons (adjusted odds ratio [aOR]: 1.4; 95% confidence interval [CI]: 1.1–1.8), persons of Asian descent (aOR: 2.5; 95% CI: 1.2–5.3), persons with elevated liver enzymes (aOR: 1.5; 95% CI: 1.2–1.8), and persons with laboratory markers suggesting fibrosis (aOR: 1.4; 95% CI: 1.1–1.8). Compared to patients not referred, those referred were more likely to be treated (aOR: 3.0; 95% CI: 2.3–3.8).

Conclusions: Sixty-one percent of HCV-infected persons with newly identified infections were referred for specialty care and were three times more likely to receive treatment than those not referred. Interventions are needed to improve linkage of HCV-infected persons to assessment and treatment to prevent substantial HCV-related morbidity and mortality.

P1.8 Ebola Infection in a Maternity Ward — Tonkolili, Sierra Leone, 2014

Authors: Angela Dunn, T. Walker, T. Singh, J. McFadden, D. Sugerman, J. Redd, J. Jasperse, C. Snider, B.O. Kamara, P. Kilmarx, J. McAuley

Background: On October 7, a 25 year-old full-term pregnant woman was transferred from a clinic to a general hospital for cesarean section. On October 18, she died in the maternity ward, and Ebola virus disease (EVD) was diagnosed postmortem. We initiated contact tracing and assessed risk factors for secondary infections to guide containment recommendations.

Methods: We reviewed medical records to establish the index patient's symptom onset. Contacts from October 7-18 were interviewed to determine exposures and personal protective equipment (PPE) use. Contacts were monitored twice daily for EVD symptoms. Those who experienced EVD symptoms were isolated and immediately tested.

Results: The index patient had fever, vomiting, and red eyes postoperatively. Twenty-five hospital staff were contacts: 1 doctor, 18 inpatient nurses, 1 laboratory technician, and 5 hospital cleaners. Four patients, 4 infants, 7 caregivers, 3 children, and 3 outpatient nurses also were exposed. Of these 46 contacts, 6 (1 hospital cleaner, 1 patient, 2 caregivers, 2 infants) became symptomatic and tested positive for EVD (attack rate: 13.0%). The hospital cleaner was exposed when he cleaned the operating room with only gloves. The index patient's caregiver and infant were exposed to her body fluids. The second infected patient shared the ward and latrine with the index patient. Hospital staff did not use adequate PPE. Caregivers were not offered PPE.

Conclusions: Delayed recognition of EVD and inadequate PPE likely led to exposures and secondary infections. Earlier recognition of EVD and adequate PPE might have reduced direct contact with body fluids. Limiting non-health care worker contact, improving access to PPE, and enhancing screening methods for pregnant women and inpatients may help decrease Ebola transmission in general health care settings.

P1.9 Nutrition and Physical Activity Recommendations for Cancer Prevention in National Comprehensive Cancer Control Program Plans, 2004–2014

Authors: Mary Puckett, A. Neri, M. Underwood, S.L. Stewart

Background: Obesity is a risk factor for breast, gynecologic, colorectal, kidney, and other cancers. However, increased physical activity has been linked to a lower risk of breast, colorectal, and some gynecologic cancers. CDC's National Comprehensive Cancer Control Program (NCCCP) funds the United States, as well as select tribes and territories, to develop plans that coordinate funding and activities for cancer prevention and control. Including information and goals for nutrition and physical activity (NPA) is a key opportunity for primary cancer prevention, and this study examines the extent to which they are included in cancer plans.

Methods: We reviewed 66 cancer plans created during 2004–2014. We searched plans for the following terms: nutrition; physical activity; exercise; healthy food(s), eating, or weight; obesity; walking; recreation; and physical education. Plans were coded for knowledge of the NPA and cancer link; goals to measure change in NPA behaviors; and strategies to increase healthy NPA behaviors, environments, or policies. Plans were also assessed for whether proposed NPA strategies were evidence-based.

Results: Content was consistently included in all cancer plans examined for all years. Fifty-nine plans (89%) contained goals or strategies related to NPA, and 53 (82%) included both. Only 4 (6%) demonstrated knowledge of the NPA and cancer relationship only. And 71% of plans contained evidence-based strategies for NPA changes for cancer prevention

Conclusions: All plans recognized that NPA changes were important for cancer prevention, and most included goals and strategies to address these areas. However, the amounts of goals, strategies, and the details provided varied widely. Increasing actionable goals and evidence-based strategies for NPA changes in plans without them could help NCCCP-funded programs could further help prevent cancer.

P1.10 Prevalence of High Fractionated Exhaled Nitric Oxide Among Children and Adolescents with Asthma — United States, 2007–2012

Authors: Duong Nguyen, B. Kit, D. Brody, L. Akinbami

Background: Asthma morbidity is high among minority populations and there are national efforts to reduce asthma disparities. High fractionated exhaled nitric oxide (FeNO) may be a marker of poor asthma control and has been suggested as a non-invasive assessment tool to guide asthma management. Our objective was to describe prevalence of high FeNO and race/ethnic differences in high FeNO among children and adolescents with asthma.

Methods: Data from 716 children and adolescents with asthma ages 6–19 years who participated in the 2007-2012 National Health and Nutrition Examination Survey (NHANES) were examined. High FeNO was defined as >50 ppb for adolescents ages 12–19 years and >35 ppb for those 6–11 years based on American Thoracic Society guidelines. Multivariable logistic regression analysis assessed the association between high FeNO and race/ethnicity with adjustment for sex, age, in-home smoke exposure, and recent corticosteroid use. Analyses used sample weights to obtain nationally representative estimates and design variables to account for the complex survey design.

Results: Overall, 16.5% of children and adolescents with asthma had high FeNO. The prevalence of high FeNO was higher among non-Hispanic black (27%, $p<0.001$) and Hispanic (20.1%, $p = 0.002$) children and adolescents than non-Hispanic white (9.7%) children and adolescents. In the adjusted logistic regression model, odds of high FeNO remained higher among non-Hispanic black (adjusted odds ratio (aOR): 3.3, 95% confidence interval (CI): 1.9–5.9) and Hispanic (aOR: 2.3, 95% CI: 1.3–4.0) children and adolescents compared to non-Hispanic white children and adolescents.

Conclusions: Approximately one in six children and adolescents with asthma had high FeNO values. Public health interventions addressing disparities in asthma may be informed by the significant race/ethnic differences in high FeNO observed in this study.

P1.11 Ebola Virus Disease in Pregnant Women at a Maternity Hospital — Freetown, Sierra Leone, 2014

Authors: Meghan Lyman, J. Johnson, A.P. Koroma, E. Koroma, G. Warren, D.F. Morof, J.D. McFadden

Background: Sierra Leone has one of the world's highest maternal mortality ratios, but it is unclear how maternal mortality has changed during the 2014 Ebola Virus Disease (EVD) epidemic. Our objective was to describe maternal and perinatal outcomes of pregnant women suspected of EVD at Sierra Leone's only maternity hospital with an EVD isolation unit.

Methods: During November 2014, we retrospectively reviewed the isolation unit line list and CDC case investigation forms to abstract outcome information about pregnant women suspected of EVD. Suspect cases were defined as pregnant women with symptoms suggestive of EVD admitted to the isolation unit or tested for EVD elsewhere in the hospital. Case frequency analyses were calculated using Epi-Info.

Results: From July 17–November 22, 90 pregnant women were suspected of EVD: 22 EVD-positive, 66 EVD-negative, and 2 untested. Seventeen (77.3%) of the 22 EVD-positive women died during admission or at a treatment center. Three (13.6%) of the EVD-positive women had spontaneous abortions and 5 (22.7%) delivered, all resulting in perinatal death (4 stillbirths, 1 neonatal death). One EVD-positive woman was discharged 5 months pregnant. Of the 66 EVD-negative women, 18 (27.3%) died; 2 (3.0%) had spontaneous abortions; and 22 (33.3%) delivered. Of these deliveries, 17 (77.3%) resulted in perinatal death (16 stillbirths, 1 neonatal death).

Conclusions: The maternal and perinatal mortality of EVD-positive women was expectedly very high; however, outcomes for EVD-negative women were much worse than expected, highlighting the need for increased attention and resources focused on maternal health issues during the EVD epidemic. Determining the causes of deaths and reviewing the medical care received are needed to design interventions to eliminate preventable maternal and perinatal deaths.

P1.12 Coccidioidomycosis: A Possibly Underreported Cause of Death — Arizona, 2008–2013

Authors: Jefferson Jones, S. Brady, L. Koski, M. Khan, N. Bishop, R. Sunenshine, K. Komatsu

Background: Coccidioidomycosis is a respiratory disease caused by inhalation of *Coccidioides* species spores from soil. In Arizona, despite increased reported coccidioidomycosis during 1990–2012 (from 5.2 to 198.8/100,000 persons), the age-adjusted mortality rate was unchanged at ~10.6 deaths/1,000,000 persons. We compared coccidioidomycosis-attributable deaths (CADs) derived from death certificates with hospital discharge data (HDD) to validate mortality surveillance.

Methods: Arizona death certificate CADs were defined as any coccidioidomycosis-related *International Classification of Diseases* (10th rev.) (ICD-10) codes/text that included "coccidioidomycosis" or "valley fever" listed in causes or conditions contributing to death. HDD CADs were defined as deceased during hospitalization with a coccidioidomycosis ICD-9 diagnostic code; if not included among death certificate CADs, a death certificate and coccidioidomycosis laboratory confirmation were required. We estimated total CADs for 2008–2013 among Arizona residents by capture-recapture analysis. HDD CADs with matching death certificates were compared with those without matching death certificates.

Results: During 2008–2013, a total of 530 reported death certificate CADs (incidence: 13.6 deaths/1,000,000 persons) were reported compared with 580 HDD CADs (incidence: 14.9 deaths/1,000,000 persons). Of these 580 HDD CADs, 251 (43%) were identified in death certificates. Capture-recapture estimated CADs at 1223 (incidence: 31.4 deaths/1,000,000). Comparing the HDD CADs with (n = 251) and without matching death certificates (n = 329), 159 (63%) and 205 (62%) were male; 114 (45%) and 159 (48%) were aged ≥65 years; 114 (45%) and 152 (46%) were immunocompromised; and 68 (27%) and 64 (19%) had disseminated coccidioidomycosis, respectively. No differences were significant ($p > .05$).

Conclusions: Although unreported and reported CADs did not differ significantly, CADs are underreported two-fold on Arizona death certificates, demonstrating a need for education of death certifiers to document coccidioidomycosis mortality.

CONCURRENT SESSION C1: Ebola Response in the United States

3:00–4:45 pm

Ravinia Ballroom

Moderators: Beth Bell and Dianna Blau

3:05 Active Monitoring of Individuals with Risk of Exposure to Ebola Virus Disease — United States, 2014

Authors: Tasha Stehling-Ariza, S. Vagi, M. Dott, R. Daley

Background: Between September 30 and October 24, 2014, two imported cases of Ebola Virus Disease (EVD) and two locally-acquired cases in healthcare workers were diagnosed in the U.S. Delays in isolation after symptom onset for three patients raised concerns about EVD transmission to the public. On October 27, CDC issued interim guidance identifying exposure risk categories and recommending monitoring of all individuals during the 21-day incubation period following potential exposure. We describe health departments' ability to conduct daily monitoring of individuals potentially exposed to EVD.

Methods: Complete active monitoring was defined as daily symptom reports to public health officials with no lapses ≥48 hours; complete direct active monitoring also required daily direct observation of the individual. State, local, and territorial jurisdictions submitted reports to CDC using an online survey and email. Between November 3 and December 7, monitoring completion, EVD-related symptoms, EVD testing, and information on incomplete monitoring were collected from all states.

Results: Forty-nine states and Puerto Rico monitored 1,724–2,118 individuals weekly. Over five weeks, the proportions initially contacted for monitoring and completing active monitoring increased from 96.9% and 95.8% and stabilized above 99.0% and 98.0%, respectively. Over 97.0% of individuals under direct active monitoring were observed directly every day. Ninety-one persons developed symptoms requiring additional evaluation; 19 were tested for EVD and all were negative. Challenges included incorrect contact information and population mobility.

Conclusions: U.S. health departments effectively monitored persons in the U.S. who were potentially exposed to EVD and monitoring completion improved over time. Pre-populated contact information forms to reduce data entry errors and providing inexpensive cell phones to individuals without functioning U.S. phones may help achieve 100% complete monitoring.

3:25 Assessing Domestic Readiness for the Treatment of Ebola Virus Disease Patients: Rapid Ebola Preparedness Teams — United States, 2014

Author: William Edens

Background: Potential importation of Ebola virus disease (Ebola) into the United States requires assurance of domestic Ebola preparedness. The CDC Rapid Ebola Preparedness (REP) strategy was created to assess and support potential Ebola Treatment Centers identified as part of state and regional planning efforts. Our objective was to assess the results of REP visits and quantify U.S. readiness to treat Ebola patients.

Methods: At the request of state/local health officials, REP teams visited hospitals developing Ebola preparedness plans. Teams consisted of CDC staff members, including NIOSH, state/local health officials, additional federal partners, and external hospital infection control experts. Tools created from guidance issued by CDC and other agencies were used to assess each facility's readiness to treat Ebola patients. Teams assessed and provided guidance on facility infrastructure and protocols in multiple domains, including staffing, patient transport and placement, personal protective equipment (PPE), training, laboratory safety, environmental infection control, and waste management.

Results: As of January 2, 2015, REP teams had visited 75 facilities in 20 states and the District of Columbia. The most common challenges identified included PPE supplies, PPE doffing procedures, infrastructure/facility design, laboratory procedures, and sustainable models for staffing and competency assessment. By January 2, 46 REP-assessed hospitals were considered prepared to care for Ebola patients, increasing national capacity from 6 treatment beds (located in the three previously designated national bio-containment facilities) to 67.

Conclusions: On-site REP team activities during the Ebola response have expanded U.S. Ebola treatment capacity and identified previously unrecognized barriers to preparedness. Obtaining sufficient PPE quantity and developing sustainable staffing models remain concerns at some facilities. CDC continues to provide assistance and issue guidance to improve Ebola treatment capacity.

3:45 Surveillance for Ebola Virus Disease — New York City, 2014

Authors: Isaac Benowitz, J. Ackelsberg, S. Balter, J. Baumgartner, C. Dentinger, A. Fine, S. Harper, L. Jones, F. Laraque, E. Lee, G. Merizalde, C. Quinn, S. Slavinski, A. Winters, D. Weiss, K. Yacisin

Background: The 2014 Ebola virus disease (Ebola) outbreak in West Africa has resulted in importation of persons with Ebola into the U.S. through travelers and returning healthcare workers. In August 2014, the New York City Department of Health and Mental Hygiene (DOHMH) established enhanced passive surveillance to rapidly detect and isolate persons with Ebola presenting to healthcare settings in order to stop transmission.

Methods: DOHMH defined persons under investigation (PUIs) as having temperature >101.5ºF plus severe headache, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained bleeding within 21 days of being in an Ebola-affected area: later guidance removed the fever requirement. Clinicians were asked to collect travel and exposure history and to isolate PUIs and report them to DOHMH immediately. Testing for other travel-related infections was recommended. Ebola testing was prioritized for PUIs with known exposures or with highly suggestive symptoms or laboratory results. Some persons with milder symptoms were monitored at home. One hospital was designated to manage potential cases.

Results: By October 26, 2014, providers had reported 173 persons: only 20 (12%) met PUI criteria. Providers cited concerns about Ebola when reporting non-PUIs. Of 20 PUIs, one had a known Ebola exposure and tested positive for Ebola. Of 19 PUIs without known exposures, one tested negative for Ebola and others were not tested: diagnoses included malaria (8 patients), diabetes (1 patient), and renal failure (1 patient); nine improved without an identified (or known) diagnosis.

Conclusions: DOHMH identified one person with Ebola. Most reported persons had not been in an Ebola-affected area or did not have Ebola-compatible symptoms, reflecting concerns about Ebola and the challenges of identifying a rare infection with non-specific presenting symptoms.

4:05 Off to a Flying Start: Active Post-Arrival Monitoring for Travelers from Ebola-Affected Countries — North Carolina, 2014

Authors: Sarah Rhea, S. Sullivan, M. Sanza, H. Dubendris, K. Sullivan, R. Pace, Z. Moore

Background: On October 27, 2014, CDC released guidance for post-arrival monitoring of travelers from Ebola-affected countries. Upon arrival to the United States, asymptomatic travelers are referred to state and local health departments (LHDs) at their declared destination for 21 days of monitoring following the last potential Ebola exposure. We describe the traveler monitoring system in North Carolina (NC) and results to date.

Methods: We developed a statewide relational database for traveler referrals. Referrals to the NC Division of Public Health (DPH) were transferred to the appropriate LHD. Within 24 hours of referral, the LHD arranged an initial in-person assessment. LHDs conducted active monitoring (AM) for travelers with low (but not zero) risk, including daily self-report of temperatures and symptoms, and direct active monitoring (DAM) for travelers with high or some risk, including AM with once-daily direct observation. LHDs maintained AM data and provided daily DAM reports to NC DPH. Statewide updates were provided to CDC and selected LHDs, emergency medical services organizations, emergency management, and hospitals.

Results: During October 27–December 11, 2014, 79 travelers were transferred to 15 LHDs in NC for monitoring. Exposure risk was low (but not zero) for 77 (97%) and some for 2 (3%); none were high risk. Sixty-seven (85%) underwent monitoring in NC, 10 (13%) were referred in error and monitored by other jurisdictions, and 2 (3%) were never reached. One traveler became symptomatic during AM but tested negative for Ebola by polymerase chain reaction.

Conclusions: Traveler monitoring in NC required multi-jurisdictional public health coordination. The system identified a symptomatic traveler and prompted further development of the relational database to accommodate case investigation and contact tracing in NC if needed.

4:25 Clinical Inquiries for Ebola Virus Disease Received by CDC — United States, July 9–November 15, 2014

Authors: Mateusz Karwowski, E. Meites, K.E. Fullerton, B. Knust, S.R. Bialek, P. Mead, A.M. Oster

Background: Early recognition is critical to controlling the spread of Ebola virus disease (Ebola) from West Africa, where more than 18,000 cases have been diagnosed. Domestic case finding relies on clinicians and health departments to identify persons with compatible clinical presentations and travel or exposure history, and to contact CDC regarding conducting Ebola testing. To improve case finding, we reviewed domestic clinical inquiries to CDC about testing for Ebola.

Methods: We performed a descriptive analysis of clinical inquiries received by CDC from Emergency Operations Center activation on July 9, 2014 through November 15. Inquiries originated from clinicians and health departments concerning persons in the United States in whom a diagnosis of Ebola was considered.

Results: CDC received inquiries about 650 persons in 49 states. Overall, 490 (75%) persons had no risk factor; of 138 (21%) who traveled to an affected country and 22 (3%) who had contact with a domestic Ebola case, 118 (74%) had at least one sign or symptom consistent with Ebola. Based on CDC recommendation or health department request, 61 persons were tested. Four Ebola cases were diagnosed between September 30 and October 24; two were travel-related. Number of weekly inquiries averaged 10 (range 1–25) through September and peaked at 227 in mid-October, decreasing to 32 in early November.

Conclusions: Coordinated, national surveillance facilitating early detection of Ebola is an important defense against transmission within the United States. All domestic Ebola cases thus far were identified through inquiries to CDC. Variability in inquiry volume highlights the need for a rapidly scalable system that meets fluctuating needs. Likelihood of Ebola, even among symptomatic travelers returning from affected countries, is very low.

CONCURRENT SESSION C2: Maternal and Child Health

3:00–4:45 PM

Dunwoody Suite

Moderators: Cheryl Broussard and Wanda Barfield

3:05 Cluster of Intrahepatic Cholestasis of Pregnancy — North Dakota, 2014

Authors: Dinorah Calles, T.K. Miller

Background: On July 30, 2014, the North Dakota Department of Health was notified of 5 patients with intrahepatic cholestasis of pregnancy (ICP) delivering in a birthing facility (Facility A) within the previous 12 months, representing a 15-fold increase above the expected Facility A annual ICP rate. ICP is characterized by generalized pruritus resulting from impaired bile flow and can result in preterm delivery and stillbirth. In the United States, ICP has been associated with intake of herbs or dietary supplements. We investigated to determine whether the reported ICP cases shared a common etiology.

Methods: A case was defined as pruritus without rash during the second or third trimester of pregnancy, with elevated aminotransferase and bile acid levels, occurring in a pregnant woman who delivered at Facility A between January 2012 and August 2014. We reviewed Facility A records to identify additional cases, abstracted medical charts, and interviewed patients.

Results: Seven cases were identified in total. All were residents of Facility A's surrounding counties. The median age was 31 (range: 24–33) years, and median gestational age at diagnosis was 33 (range: 23–36) weeks. Four patients reported consuming herbal supplements throughout their pregnancy, although no common drug, herb, or dietary supplement exposure was identified. One patient delivered preterm; all pregnancies resulted in live births. Four patients received diagnoses only after initial pruritus worsened during the third trimester or when seeking a second opinion for pruritus.

Conclusions: The reason for the increase in ICP occurrence at Facility A since 2013 remains unknown, and study of emerging common exposures is ongoing. This investigation led to heightened ICP awareness among Facility A clinicians. Vigilance for new cases continues.

3:25 Reproductive Health Counseling Offered to Women Receiving HIV Care in the United States — National HIV Provider Survey, 2013

Authors: Runa Gokhale, H. Bradley, J. Weiser, J. Skarbinski

Background: Current guidelines recommend discussing reproductive health with all women of reproductive age living with HIV, given potential HIV transmission to partners and infants. Although previous research indicates that women living with HIV have unmet needs for comprehensive reproductive health counseling (CRHC), there are no national data characterizing provider CRHC practices.

Methods: We estimated the percentage of HIV care providers who offered CRHC to female patients. Data were collected in 2013–2014 from 1,234 HIV care providers in facilities sampled for the Medical Monitoring Project (MMP), a national probability survey of HIV-infected adults in care. Data were weighted for unequal selection probabilities and nonresponse. Offering CRHC was defined as "almost always" or "always" offering the five components of CRHC: discussing antiretroviral therapy for preventing perinatal transmission, explaining perinatal transmission risk, providing contraception, assessing reproductive intentions, and referring for preconception care. To assess associations between provider characteristics and offering CRHC, we used chi-square tests followed by multivariate logistic regression analysis to estimate adjusted prevalence ratios (aPR) from predicted probabilities.

Results: Of 1,144 providers caring for female patients, 49% (95% confidence interval [CI]: 42%–55%) offered CRHC. Of providers delivering primary care as part of HIV care (83% of sample) 53% offered CRHC; of providers not delivering primary care, 33% offered CRHC (P <.01). After adjustment for gender, years of HIV care experience, and number of patients, providing primary care remained associated with offering CRHC (aPR: 1.48, CI 1.02–2.16).

Conclusions: Only half of HIV care providers reported consistently offering CRHC, even among those delivering primary care services to females living with HIV. Providers may benefit from interventions that facilitate provision of CRHC and increase adherence to guidelines.

3:45 Factors Associated with Postpartum Use of Long-Acting Reversible Contraceptives: Results from the Pregnancy Risk Assessment Monitoring System (PRAMS), Nine States, 2009–2011

Authors: Titilope Oduyebo, L. Zapata, M. Whiteman, N. Tepper, K. Curtis, D. D'Angelo, P. Marchbanks

Background: Use of contraception among postpartum women is important to prevent unintended pregnancies which can adversely affect maternal and infant health. Long-acting reversible contraceptives (LARCs), defined as intrauterine devices and implants, are highly effective, yet few US women use them. We sought to examine factors associated with LARC use among postpartum women.

Methods: We analyzed 2009-2011 data from the Pregnancy Risk Assessment Monitoring System, a population-based survey among women with recent live births. We included data from nine states (AR, CO, MI, NE, OH, OR, RI, TN, UT) that collected information on postpartum use of specific contraceptives. We estimated prevalence of LARC use among non-pregnant, sexually active women. Excluding women reporting female or male sterilization, we used multivariable logistic regression to examine associations between maternal characteristics and LARC use.

Results: The overall prevalence of postpartum LARC use was 18%, and state-specific estimates ranged from 13% in Ohio to 27% in Utah. Factors associated with postpartum LARC use included public insurance (adjusted odds ratio [AOR] = 2.98; 95% confidence interval [CI] = 1.72–5.16) or private insurance (AOR = 2.05; 95% CI = 1.19–3.54) versus no insurance at delivery; age <20 years (AOR = 2.20; 95% CI = 1.81–2.67), 20–24 years (AOR = 1.58; 95% CI = 1.39–1.79), or >35 years (AOR = 0.76; 95% CI = 0.63–0.91) versus 25–34 years; and black, non–Hispanic race/ethnicity (AOR = 0.72; 95% CI = 0.67–0.85) versus white, non-Hispanic race/ethnicity.

Conclusions: LARC use by postpartum women varies by factors, including state of residence, insurance status, age, and race/ethnicity. Strategies to increase LARC use may include facilitating consumer awareness, provider education and promoting access through insurance coverage, and public health initiatives.

4:05 Maternal and Neonatal Morbidity by Delivery Type Among HIV-Infected Women in Malawi: Results of the Breastfeeding, Antiretrovirals, and Nutrition (BAN) Study

Authors: Michelle Chevalier, C. King, S. Ellington, J. Wiener, D.J. Jamieson, C. Van der Horst, A. Kourtis

Background: In sub-Saharan Africa, women living with HIV (WLWH) have 8 times as high pregnancy-related mortality compared to HIV-uninfected women. However, the relationship between HIV infection, pregnancy, delivery type and maternal outcomes in resource-limited settings is underexplored. We assessed maternal and neonatal morbidity by delivery type among WLWH and their infants in Malawi.

Methods: Antiretroviral-naïve, pregnant WLWH with CD4 counts ≥200 cells/mm^3 were recruited from antenatal clinics in Lilongwe, Malawi (2004–2010). We examined postpartum and neonatal outcomes for delivered mothers (N = 2791) and their infants. Descriptive statistics were used to describe maternal and infant characteristics; complications, stratified by mode of delivery, were compared using chi-square tests.

Results: Median age at delivery was 25 years; 6% of women were delivered by cesarean delivery (CD); 91% were "emergency" CD. Women delivered by CD had a lower median HIV load (p = 0.023), and were more likely to be primigravidae (OR = 2.1, 95% CI: 1.44,3.08), have secondary education (OR = 1.5, 95% CI: 1.10,2.06) and hypertensive disorders (OR = 10.8, 95% CI: 4.36,26.8). Postpartum, these women were more likely to develop an infection by 2 weeks (OR = 3.5, 95% CI: 1.51,7.92) and severe anemia (hemoglobin <7.5 g/dL) by 6 weeks (OR = 4.6, 95% CI: 1.70,12.6). Their infants were more likely to be admitted to the NICU (OR = 5.4, 95% CI: 3.71,7.83), with low Apgar scores (OR = 6.6, 95% CI: 3.60,11.9), low-birth weight (OR = 2.6, 95% CI: 1.14,5.79), jaundice (OR = 13.5, 95% CI: 3.58,50.7) and clinical sepsis (OR = 3.7, 95% CI: 1.24,11.13).

Conclusions: WLWH delivered by CD, despite lower viral loads, have an increased risk of postpartum complications and neonatal morbidity compared with those delivered vaginally. As antenatal antiretroviral (ARV) therapy rolls out in Malawi, these data can provide useful background information for assessing effects of ARV and indicating other needed public health initiatives to address the pregnancy and obstetric needs of WLWH in resource-limited settings.

4:25 Perceptions of Ebola and Health Facility Use Among Pregnant and Lactating Women and Community-Level Health Workers in Kenema District — Sierra Leone, September 2014

Authors: Michelle Dynes, L. Miller, T. Sam, M.A. Vandi, B. Tomczyk

Background: From May to July 2014, one third of confirmed Ebola cases in Sierra Leone originated in Kenema district. During this period, routine maternal and newborn health (MNH) service use declined including a 29% reduction in the number of first antenatal care visits from 2,086 in May to 1,488 in July. The purpose of the assessment was to understand factors that contribute to facility use decline and explore approaches to increase use of MNH services.

Methods: In September 2014, five focus group discussions (FGD) were held with 22 health workers across six primary healthcare facilities and four FGDs were held with 27 pregnant and lactating women in Kenema district. Open-ended questions were asked about reasons for decreased facility use, perceptions of safety, and ideas for encouraging women to return to facilities. Content analysis was used to group responses into common themes.

Results: All 49 participants reported fear of contracting Ebola as the primary reason for MNH service use decline. Misconceptions were particularly common among pregnant/lactating women early in the epidemic. Ideas for encouraging women to return to facilities included spreading messages about recent healthcare worker infection prevention and control (IPC) trainings and sharing positive care experiences. All 22 healthcare workers reported reduced fear of Ebola following IPC training, but noted gaps remain in the availability of personal protective equipment.

Conclusions: Fear and misconceptions of Ebola contributed to decreased health facility use by pregnant and lactating women. IPC training reduced fear among healthcare workers and may be an important strategy to increase women's confidence in facility safety. This information is being used to create messaging to encourage uptake of MNH care across Sierra Leone.

CONCURRENT SESSION D1: Ebola Response in Heavily Affected Countries

8:30–10:15 AM

Ravinia Ballroom

Moderators: Brett Petersen and Inger Damon

8:35 Knowledge, Attitudes, and Practices Related to Burial Practices and Ebola Response in Bo District, Sierra Leone, 2014

Authors: Seung Hee Lee-Kwan, N. DeLuca, R. Bunnell, B. Knust, A. Anderson, Y. Mansaray

Background: The ongoing Ebola Virus Disease (Ebola) epidemic in West Africa is the largest in history. In Sierra Leone, 4,277 people were diagnosed with Ebola as of November 7, 2014. Ebola is transmitted through direct contact with body fluids of infected persons or corpses. Nearly one-third of cases, when information was available, attended a funeral or had contact with the corpse of a suspected Ebola patient. Safe burials reduce Ebola transmission. Information concerning community knowledge, attitudes, and practices (KAP) regarding safe burial in this population is limited.

Methods: During October 2014, CDC and the Bo District Social Mobilization team conducted 63 focus group discussions (FGDs) in 21 villages in 7 chiefdoms using a FGD guide. Field notes were used to create a coding scheme that captured emerging themes concerning KAP and a workshop was conducted to reach consensus emerging themes.

Results: Participants were knowledgeable of key Ebola messages, including "Isolate the sick person or dead body and call for help" and shared high acceptance towards safe burial because "Ebola time is special, similar to wartime." Perceived barriers to safe burial included, 1) disrespectful behaviors of burial teams, 2) family members not permitted to observe burials, and 3) fear of being quarantined when reporting an Ebola corpse. Participants' desires that could facilitate safe burials were components that dignify burial such as allowing family members to attend or participate in safe burial.

Conclusions: Ongoing training of burial teams on dignified components of safe burial procedures and community sensitization efforts on safe burial practices are needed. Achieving broad acceptance of safe and dignified burials is essential to interrupting Ebola transmission and ending the worst Ebola outbreak in history.

8:55 Geospatial Analysis of Household Spread of Ebola Virus in a Quarantined Village — Sierra Leone, 2014

Authors: Brigette Gleason, J. Redd, S. Foster, K. Cauthen, M. King, S. Kamara, F. Bayor, S. Conteh, T. Sesay, P. Kilmarx

Background: Village X, Sierra Leone, underwent village-wide quarantine because of its high incidence of Ebola virus disease (Ebola) despite household quarantines. The village-wide quarantine isolated Village X and offered the opportunity to investigate intra-community Ebola risk factors. We examined geospatial and household determinants of household-to-household Ebola transmission within this village to evaluate and tailor response efforts.

Methods: We defined a household as a family's shared living space and a case-household as a household in Village X with at least one resident who became a suspect, probable, or confirmed case of Ebola as defined by the Ministry of Health and Sanitation of Sierra Leone between August 1, 2014 and October 10, 2014. We collected household data through in-person interviews and assigned location data using Google Earth™. We used stepwise logistic regression modeling to calculate odds ratios of household Ebola acquisition associated with households' geospatial and demographic characteristics.

Results: The population of Village X at the beginning of the observation period was 863 persons living in 64 households (median household size, 10; IQR 6–18); 27/64 households became case-households (42% cumulative attack rate). Location within 10 meters of one case-household was the strongest predictor of becoming a case-household (unadjusted OR = 18.00; 95% CI 2.11, 153.30). Inclusion of variables describing household crowding and latrine access in logistic models did not substantially modify the models' goodness-of-fit.

Conclusions: Likelihood of household Ebola acquisition was highly associated with proximity to a case-household in Village X, a community that practiced quarantine of case-households. To decrease Ebola transmission, response efforts should include improving the effectiveness of household quarantine through rapid implementation, provision of basic household needs, and targeted outreach to households located near case-households.

9:15 Ebola Knowledge, Attitudes, and Practices Among Community Members in Three Low-Incidence Counties — Liberia, September 2014

Authors: Karlyn Beer, M. Kobayashi, A. Bjork, K. Chatham-Stephens, J. Sieka, O. Kumeh, W. Frank, J. Painter, B. Flannery, F. Mahoney

Background: Initial visits to southeastern Liberia identified gaps in Ebola preparedness. As preparedness activities scale up to fill these gaps, accompanying health messages should address local Ebola-related knowledge, attitudes and practices (KAP). To develop targeted messages, we conducted KAP surveys in three low-incidence counties with ongoing preparedness efforts.

Methods: We administered surveys in a nonprobability sample of residents within 20 districts across three counties, after initial <13 case reports per county but before Ebola Treatment Unit (ETU) construction. Selected districts already had or expected to have cases. Surveys assessed knowledge of Ebola transmission; perceptions of severity, treatment types, and survivors; and anticipated practices. We considered knowledge questions correct if consistent with the Liberia Ministry of Health Ebola messaging. We analyzed data using Chi-square tests.

Results: Of 271 total participants, 43.2% were female and 64.3% had a middle school education or higher. Half of participants correctly answered >15 of 17 questions regarding Ebola transmission (range = 2–17). Of these questions, the lowest proportion of correct answers involved whether Ebola can be transmitted by bushmeat (74.5%). Fears included Ebola patients (93.7%), people living with Ebola patients (93.3%), ETUs (58.3%), and Ebola survivors (47.6%). Among 158 participants afraid of ETUs, the main fear was that family visits would not be allowed (n = 111; 70.3%; P < 0.001). However, most respondents who feared ETUs would still seek treatment for themselves (89.9%) or family members (75.3%).

Conclusions: Our survey found that Ebola transmission knowledge was high and was accompanied by fear of Ebola patients and their families. Attitudes toward new ETUs and future survivors might be improved with preemptive treatment-related messaging that also acknowledges and validates community members' fears.

9:35 Evaluation of a District Level Ebola Response and Establishment of an Ebola Command Center — Tonkolili, Sierra Leone, 2014

Authors: Tushar Singh, A. Dunn, M. Reichler, J. Jasperse, D. Martin, I. Agaku, C. Snider, K. Joseph, J. McAuley, B.O. Kamara, I. Rolle, J. Redd

Background: Development of an efficient emergency response at the district level is essential in controlling an Ebola virus disease outbreak. We performed an emergency response system evaluation and needs assessment in a district in Sierra Leone.

Methods: The Centers for Disease Control and Prevention's Ebola team evaluated the existing structure for Ebola response in Tonkolili district from October 23-31, 2014. We assessed procedures for receiving and documenting suspected Ebola case alerts, case investigation, contact identification, contact tracing, transportation of patients and laboratory specimens, burial practices, and data entry.

Results: As of October 22, there were 165 confirmed Ebola cases and 42 Ebola deaths in Tonkolili. During the evaluation period, there were 57 Ebola case alerts, of which 15 were deaths. Evaluation indicated that there was no centralized system to capture alerts. Of the 57 alerts, only 17 were followed completely within 24 hours. Case investigation forms (CIFs) were completed only after patients' admission to the hospital. Contacts of suspected Ebola patients were not identified until laboratory results were received. Only immediate family members were followed as contacts. Of the 15 Ebola suspected deaths, seven were buried safely, and laboratory specimens and CIFs were obtained from only four. There were delays of up to seven days for transportation of patients and laboratory specimens. No data were being entered for patients or contacts.

Conclusions: The evaluation indicated that most emergency response systems were not functioning effectively. Based on our assessment, a District Ebola Command Center was established in November. Its staff included an Ebola coordinator, alerts coordinator, case investigators, and data entry clerks. Formal evaluation of emergency response systems, with feedback to local authorities, is essential for improvements in Ebola response.

9:55 Managing Contacts of Ebola Virus Disease — Firestone District, Liberia, 2014

Authors: Erik Reaves, L. Mabande, J. Montgomery

Background: The Firestone Company operates a 120,000 acre plantation with 80,000 healthcare beneficiaries located in Firestone District, Liberia, the country most affected by the Ebola outbreak. To mitigate the outbreak's effect on its plantation, Firestone implemented active surveillance, created an isolation and treatment unit for cases and quarantine facilities for contacts, and developed a triage system to actively monitor contacts depending on exposure risk. Our objective was to assess the effectiveness of Firestone's contact prioritization and monitoring process.

Methods: A suspected Ebola case was defined as signs of hemorrhage or an acute fever with ≥3 Ebola symptoms; laboratory testing confirmed the diagnosis. Unprotected exposure to the body fluids of an Ebola patient or corpse was considered a high-risk exposure prompting quarantine for 21 days. Other contacts remained in the general community but were actively monitored, defined as daily review of symptoms and temperature measurement by health officials. To determine effectiveness of contact prioritization and monitoring, Ebola incidence within the Firestone population was compared to that in the surrounding county.

Results: During August 1–September 23, 2014, there were 71 suspected Ebola cases in the Firestone population (80,000). This case rate was 0.4 times that of the surrounding county (population = 238,000) with 536 suspected cases during the same period (95% confidence interval for rate ratio = 0.3–0.5). Among 233 monitored contacts, 74 (32%) were quarantined on the basis of high-risk exposures; of these, 21 (28%) developed Ebola, compared to none of 159 non-quarantined, low-risk contacts actively monitored in the community.

Conclusions: Firestone effectively identified and quarantined high-risk contacts, and these interventions might have contributed to the lower rate of Ebola observed in the Firestone district.

CONCURRENT SESSION D2: STDs/HIV

8:30–10:15 AM

Dunwoody Suite

Moderators: Elizabeth Torrone and Linda Valleroy

8:35 Trends in HIV Viral Load Suppression During and After Pregnancy — United States, January 1996–March 2014

Authors: Monita Patel, C. Armon, S. Nesheim, E. Tedaldi, R. Novak, F. Palella, M. Lampe, M. Sutton, J.T. Brooks, K. Buchacz

Background: HIV plasma RNA viral load (VL) suppression with antiretroviral therapy (ART) reduces the risk of mother-to-child HIV transmission, protects women's health, and supports U.S. National HIV/AIDS Strategy and CDC Winnable Battles. To improve HIV prevention interventions for women and children, we examined trends in VL during and after pregnancy.

Methods: Using data from a convenience sample of 9 HIV clinics, we examined log10 VL (copies/mL), percentage with VL suppression (<200 copies/mL), and ART status at pregnancy start, end, and 6 months postpartum. Differences in medians and percentages were assessed by using Kruskal-Wallis and chi-square tests, respectively.

Results: Percentages of pregnancies (202 among 140 women), by race/ethnicity, were 65% (black), 15% (white), 13% (Hispanic/Latino), and 7% (other). Median age at pregnancy was 29 years (interquartile range [IQR]: 24–34). ART prescription was documented at pregnancy start (56%), end (79%), and postpartum (66%). Regardless of ART status, median VLs were 2.8 (IQR: 1.4–3.8) at pregnancy start, 2.1 (IQR: 1.4–2.9) end, and 2.5 (IQR: 1.4–3.9) postpartum (P = 002). Similarly, percentages with VL suppression were 36% at pregnancy start, 55% end, and 41% postpartum (P = .002). During 1996–2004 (n = 118), the percentages with VL suppression were 35% (pregnancy start), 49% (pregnancy end), and 39% (postpartum) (P = .017); during 2005–2014 (n = 84), corresponding percentages were 67%, 74%, and 76% (P = .022).

Conclusions: In a sample of HIV-infected pregnant women, VL suppression increased during pregnancy but was suboptimal postpartum, even during the past decade, when CDC began recommending routine HIV testing and treatment for pregnant women. Postpartum women may require additional interventions to support ART initiation and adherence.

8:55 Human Immunodeficiency Virus and Hepatitis C Coinfection in West Virginia, 2001–2013

Authors: Erica Thomasson, S. Blankenship, W. Hoffman, A. Hudson

Background: Human immunodeficiency virus (HIV) and hepatitis C virus (HCV) are bloodborne pathogens that share transmission routes. Approximately one-third of persons with HIV in the United States are coinfected with HCV. These persons have greater risk for chronic liver disease and liver-related death than persons infected with HIV alone. We sought to estimate the prevalence of HIV/HCV coinfection in West Virginia during 2001–2013 and to describe risk factor and demographic characteristics of coinfected persons.

Methods: We linked data from West Virginia's HIV/acquired immunodeficiency syndrome (AIDS) and HCV databases. Coinfection was defined as any HIV or AIDS case with acute or past or present HCV infection on the basis of CDC case definitions. Demographic and risk behavior information regarding coinfected persons was obtained from the HIV/AIDS database. The linked data set included persons who were West Virginia residents at the time of their HIV/AIDS diagnosis and were alive as of January 1, 2001 (n = 2,237) and persons with diagnosed HCV during 2001–2013 (n = 28,270).

Results: Among HIV/AIDS-positive persons, 9.7% (216) were coinfected with HCV. A higher proportion of coinfected persons were male (71.3%) and 60.2% (n = 130) were of the baby boomer generation (born during 1945–1965). Although the majority were white (71.3%), blacks were disproportionately affected (23.6% of coinfected persons but <4% of West Virginia's population). Injection-drug use was the most frequently reported risk factor among coinfected persons (43.5%), followed by male-to-male sexual contact (21.3%).

Conclusions: This analysis identified populations at highest risk for HIV/HCV coinfection. These findings can be used to improve integration and target delivery of comprehensive prevention services, including risk reduction programs, to prevent coinfection among these high risk populations.

9:15 The Performance of Quantitative HIV-1 RNA (Viral Load) Testing to Diagnose Acute HIV Infection in the New HIV Laboratory Testing Algorithm — United States, 2011–2013

Authors: Hsiu Wu, S. Cohen, E. Westheimer, C. Gay, L. Hall, C. Rose, L. Hightow-Weidman, J. Fu, P. Peters

Background: Acute HIV infection (AHI), a highly infectious stage, contributes disproportionately to further HIV transmissions (up to 50%). CDC introduced an HIV testing algorithm in 2014; the algorithm starts with an HIV antigen/antibody combination immunoassay that can also detect AHI. The qualitative HIV-1 RNA assay (qual-RNA) is the recommended test to confirm AHI detected by the screening immunoassay. However, qual-RNA is not widely available, leading to potential diagnostic delays. We evaluated the performance of an alternative to qual-RNA — the quantitative viral load (VL) test — for confirming AHI.

Methods: We used data from a prospective study to evaluate methods for detecting AHI. During September 2011–October 2013, participants at 12 HIV testing sites were screened for HIV with an immunoassay. Positive immunoassay results were confirmed with an antibody test. Discordant results (immunoassay, positive; antibody test, negative) were tested with qual-RNA or a VL test to detect AHI. We used McNemar's test to evaluate the concordance of qual-RNA and VL results.

Results: Of 86,929 participants tested for HIV, 191 (0.22%) had discordant results: immunoassay (positive) and antibody test (negative). AHI was diagnosed in 101 participants (52.9%) by qual-RNA or VL test. Of 70 participants tested with qual-RNA and VL, 69 (98.6%) had concordant results (49, both reactive; 20, both nonreactive; P = 1.00). The one discordant result (nonreactive qual-RNA, detectable VL) was consistent with AHI on repeat testing. Among HIV-negative participants tested with VL (n = 50), all VL results were undetectable.

Conclusions: In this study, the VL test performed as well as qual-RNA at detecting AHI. VL testing may facilitate prompt AHI diagnosis and enable early public health interventions.

9:35 Is Presumptive Treatment Presumptuous? The Association Between Presumptive Treatment for Gonorrhea and Patients' Receipt of Test Results — Maricopa County, Arizona, 2013–2014

Authors: Virginia Bowen, M. Taylor, D. Newman, E. Torrone, S. Sewell, T. Mickey, T. Peterman

Background: Partner notification is a key strategy for controlling gonorrhea, a sexually transmitted disease (STD) that may lead to infertility. Presumptive treatment — before the receipt of test results — ensures treatment for likely infections. However, presumptively treated patients may never receive test results and thus may not notify sex partners. We examined whether receipt of test results differed for presumptively treated patients compared with those who received standard care.

Methods: We examined electronic medical records (EMRs) of gonorrhea-positive patients at the Maricopa County STD Clinic during July 1, 2013–March 17, 2014. Presumptive treatment was defined as treatment administered at time of testing; all others were classified as standard care. Patients were classified as receiving test results if they called the clinic or returned for treatment after testing. To estimate the association between treatment type and receipt of results, we used a generalized estimating equation to account for repeat infections.

Results: Most of the 1,026 infections (61%) were treated presumptively. Presumptive treatment was more common among men (66%) than women (44%) (P <.01). Of the 403 persons receiving standard care, 72% returned for treatment (median time-to-treatment: 6 days); for 28%, the EMR did not contain treatment documentation. Receipt of test results was less likely among presumptively treated patients (46%) than among patients receiving standard care (83%) (prevalence ratio: 0.55; 95% CI: 0.50–0.61).

Conclusions: Although presumptive treatment facilitates early treatment of patients, partners are unlikely to be treated if patients do not receive test results and do not notify them of potential infection. Future studies might investigate how rates of partner notification and treatment differ by treatment type and how presumptive treatment influences transmission of STDs.

9:55 The Role of Internet Meet-Up Sites and Mobile Device Applications in Facilitating an Early Syphilis Outbreak — Multnomah County, Oregon, 2014

Authors: Malini DeSilva, K. Hedberg, B. Robinson, K. Toevs, S. Khormooji, E. Petrosky, L. Markowitz, S. Hariri, R. Neblett-Fanfair, S. Schafer

Background: Early syphilis (primary, secondary, early latent) in Multnomah County, Oregon increased from 1.9 cases/100,000 persons in 2007 to 31.3/100,000 in 2013. Most (95%) cases occurred among men who have sex with men (MSM); 55% were human immunodeficiency virus (HIV) co-infected. We conducted a case-control study of risk factors, including meeting sex partners through Internet meet-up sites or mobile telephone applications, together defined as "online."

Methods: We defined cases as Multnomah County resident MSM aged ≥18 years with laboratory-confirmed early syphilis, reported January 1–December 31, 2013. We recruited 2 control-participants (no syphilis during the previous 2 years) per case-participant, frequency-matched by HIV status and age, from MSM enrolled in the HIV Medical Monitoring Project, and MSM attending medical clinics. Participants completed self-administered questionnaires; information included demographics, venues for meeting partners, and sexual risk behaviors during a 3-month recall period. We performed multivariable logistic regression.

Results: We enrolled 57 case-participants and 119 control-participants. No significant differences existed in race/ethnicity or education; 70% (40/57) of case-participants and 42% (50/119) of control-participants reported meeting partners online (P <.001). Case-participants reported more partners (median: 5; range: 1–70) than control-participants (median: 2; range: 1–50; P <.001). Case-participants had higher odds of meeting partners online (adjusted odds ratio = 3.7; 95% confidence interval [95% CI]: 1.7–8.0), controlling for age, HIV status, race/ethnicity, education, income; this decreased to 1.4 (95% CI: 0.5–3.7) when including number of partners.

Conclusions: Early syphilis was associated with meeting partners online, an association explained by number of partners. The high percentage of participants reporting meeting partners online suggests future research is needed to determine the utility of online interventions for syphilis prevention.

CONCURRENT SESSION E1: TUBERCULOSIS

10:35 AM–12:00 PM

Ravinia Ballroom

Moderators: Jonathan Mermin and Michael Iademarco

10:40 EVALUATION OF DRUG-RESISTANT TUBERCULOSIS SURVEILLANCE — BOTSWANA, 2014

Authors: Hannah Kirking, R. Boyd, E. Kurbatova, B. Kgwaadira, T. Lere, T. Tsholofelo, D. Agegnehu, A. Finlay

Background: In 2008, 2.5% of new tuberculosis (TB) cases in Botswana were multidrug-resistant (MDR). The Botswana National TB Program uses paper registries and 2 electronic TB surveillance systems — Electronic TB Registry ("ETR.Net") for drug-susceptible TB and "OpenMRS" for drug-resistant TB — but plans to consolidate all TB surveillance into OpenMRS to reduce costs. We evaluated Botswana's drug-resistant TB surveillance system in order to suggest program improvements and inform future electronic consolidation.

Methods: We abstracted data from paper registers for 2011 and 2013 at 3 of 5 drug-resistant TB treatment facilities. We compared data from paper registers and OpenMRS to determine completeness of patient entry and selected TB indicators. We interviewed key stakeholders (program staff, TB controllers, and MDR TB clinicians) about surveillance system acceptance, simplicity, usefulness, flexibility, and timeliness.

Results: Data for 113 registered patients (100%) were abstracted from paper registers. Percentages for completeness of demographic variables were 95% (107/113) for birthdate, 98% (111/113) for gender, and 97% (110/113) for HIV status. Percentages for completeness of laboratory data were 20% (23/113) for smear, 23% (26/113) for culture, and 53% (60/113) for drug-susceptibility test results: OpenMRS contained data on only 47% (52/113) of patients, and percentages of completeness varied from 52% (27/52) for HIV status to 100% (52/52) for birthdate. Interviews with stakeholders elucidated differing opinions on whether to use OpenMRS as a surveillance database or as both a surveillance database and an electronic medical record.

Conclusions: Variability in complete reporting of drug-resistant TB indicates the need to give priority, before consolidation, to improving the completeness of reporting in OpenMRS. Additionally, the role of OpenMRS needs to be clearly defined, and agreement is needed from all stakeholders.

11:00 INCIDENCE AND PREDICTORS OF TUBERCULOSIS AMONG HIV-INFECTED ADULTS AFTER INITIATION OF ANTIRETROVIRAL THERAPY — NIGERIA, 2004–2012

Authors: Ishani Pathmanathan, K.E. Dokubo, R.W. Shiraishi, A.F. Auld, S. Agolory, M. Swaminathan, D. Onotu, S. Odafe, I. Dalhatu, O. Abiri, A. Bashorun, T. Ellerbrock

Background: Nigeria had the most AIDS-related deaths worldwide in 2013 (210,000); 39% were associated with tuberculosis (TB). The World Health Organization (WHO) recommends intensified TB case-finding and treatment before treating HIV with antiretroviral therapy (ART) to prevent TB-associated morbidity and mortality, yet TB diagnosis in immunocompromised patients is challenging. We aimed to estimate incidence and characterize factors associated with TB after ART initiation in Nigeria.

Methods: We analyzed retrospective cohort data from a nationally representative sample of adult (≥15 years) ART patients. Data were abstracted from 3,496 patient records at 35 sites selected using probability-proportional-to-size sampling. Analyses were weighted and controlled for complex survey design. Subgroup domain analyses were performed on patients without baseline TB disease. A Cox proportional hazard model was used to assess factors associated with TB incidence.

Results: At ART initiation, 3,350 patients (95.8%, 95% CI: 94.6%–96.9%) were not receiving TB treatment; of these, mean age was 34.9, 66% were female, and median CD4 count was 161/mL. TB incidence was 0.48 per 100 person-years (56 cases), significantly higher for patients with baseline CD4 <50/mL (adjusted hazard ratio [AHR]: 4.9, 95% CI: 1.5–15.8) compared with CD4 >200/mL, and marginally higher for patients bedridden at baseline (AHR: 4.8, 95% CI: 0.9–24.7) compared with being asymptomatic. No significant associations were observed for age, weight, employment, marital status, education, or WHO HIV clinical stage.

Conclusions: Incidence of TB after ART initiation was associated with markers of advanced HIV infection such as low CD4 and poor functional status. Study results reinforce the benefit of early ART initiation, and highlight the need for intensified TB case-finding in patients initiating ART at advanced stages of HIV disease.

11:20 Surveillance for Large Outbreaks of Tuberculosis — United States, 2014

Authors: Godwin Mindra, J. Wortham, A.M. France, T. Gardner, K. Powell, S. Kammerer, S. Althomsons, B. Silk, T. Navin

Background: Tuberculosis (TB) outbreaks continue to challenge control efforts in the United States. Outbreaks of TB persist within and across public health jurisdictions for years when epidemiologic linkages among patients and their contacts are unrecognized, delaying appropriate interventions to interrupt transmission. We established surveillance to find large TB outbreaks and initiate public health action sooner.

Methods: During April–October 2014, we searched the national TB registry for clusters of ≥10 culture-confirmed TB cases with matching genotypes reported within a 3-year period. Among these genotypically related clusters, we considered those with ≥5 epidemiologically linked patients (linkage confirmed by health department investigation) to be large outbreaks. We analyzed data routinely reported to the registry to describe epidemiologic and clinical risk factors of TB patients in the outbreaks.

Results: We found 9 TB clusters in 8 states, 2 of these clusters were already recognized by public health officials in their jurisdictions. Although investigations are ongoing for the 2 clusters, health departments investigated 7 clusters and classified 6 as large outbreaks. Of these 6, 3 involved multiple jurisdictions. In these large outbreaks, TB patients experienced homelessness (1 outbreak), used substances such as illicit drugs or alcohol (1 outbreak), or both experienced homelessness and used substances (3 outbreaks). Antimicrobial resistant *M. tuberculosis* circulated in one large outbreak.

Conclusions: This analysis of surveillance data revealed 6 large TB outbreaks that were previously unrecognized nationally. Prompt TB outbreak detection and public health response might require interjurisdictional coordination. Interventions that are designed specifically for homeless and substance-using patients are needed to respond effectively to TB outbreaks affecting these populations.

11:40 Tuberculosis Contact Investigation at an Island Resort — Michigan, 2014

Authors: Meghan Pearce Weinberg, J. Lipnitz, P. Davidson, X.Q. Wang, C. McNulty, J. McFadden, J. Finks, J. Collins, C. Miller

Background: During August 2014, a foreign-born hotel employee on an island in Michigan, with smear-positive, drug-susceptible, tuberculosis (TB), was reported to public health authorities and offered treatment. The resort island has a predominantly seasonal workforce, often foreign-born persons visiting on temporary work visas without TB-screening requirements. We investigated contacts at risk for *Mycobacterium tuberculosis* infection to prevent further cases.

Methods: We interviewed the index patient and employer to find contacts. Contacts at highest risk for disease (defined as employees who worked the same shift as the index patient, visited the patient ≥1 time/week in their dormitory, or had TB predisposing medical conditions) were screened by using an interferon-gamma release assay (IGRA). Persons with positive results were examined by chest radiograph.

Results: Among 102 contacts identified, 26 (25%) met ≥1 criterion for IGRA screening. Of those persons screened, 17 (65%) were female; median age was 24 (range: 21–63) years. Twenty-three (88%) of screened contacts were foreign-born. Of 14/26 (54%) persons with positive results, 11 (79%) were from South Africa; 2 (14%) were U.S.-born; and 1 (7%) was from Jamaica. Five/14 (36%) contacts reported having received a prior TB test, all with negative results, and 3 (21%) reported prior TB exposure. Chest radiographs did not reveal signs of active disease, and all 14 IGRA-positive contacts started treatment for latent TB infection (LTBI).

Conclusions: We identified 14 contacts with LTBI; however, we cannot distinguish between recent transmission and prior infection because the majority of infected contacts were from the high-TB-incidence country of South Africa. We recommended that island employers implement preemployment TB screening to prevent importation of TB disease among foreign-born seasonal employees.

CONCURRENT SESSION E2: Injuries and Illnesses Among Children and Adolescents

10:35 AM–12:00 PM

Dunwoody Suite

Moderators: Lara Akinbami and Debra Houry

10:40 Tickborne Relapsing Fever Outbreak at a High School Football Camp — Arizona, 2014

Authors: Jefferson Jones, M. Schumacher, M. Peoples, N. Souders, K. Komatsu, S. Brady, N. Nieto

Background: Tickborne relapsing fever (TBRF) is caused by *Borrelia* species spirochetes transmitted by *Ornithodoros* ticks. During 1982–2013, a total of 22 TBRF cases (0–3 cases annually) were reported in Arizona. In August, Coconino County Public Health Services District received a call that 5 high school students who had attended a football camp were hospitalized; several of these students had spirochetes identified on blood smears. We sought to confirm the outbreak, identify the cause, and prevent additional cases.

Methods: We interviewed camp staff and attendees, reviewed medical records of hospitalized patients, and inspected the campsite for evidence of rodent or tick infestation. A probable case was defined as fever, myalgias, and headache in a person attending the football camp during August 1–3, 2014; a confirmed case was spirochetemia identified in an attendee's blood smear or by isolation.

Results: Forty (95%) of 42 male camp attendees were interviewed. We identified 6 confirmed cases (5 [83%] by spirochetes detected on blood smear and 1 [17%] by isolation) and 5 probable cases (attack rate: 26.2%). Patients were ages 15–17 years (10 students) and 33 years (1 coach). All 10 (100%) students with known sleep locations slept in one cabin. A professional pest control company rodent-proofed the cabin in July 2014; no tick acaricides were applied. The cabin had evidence of rodents and ticks. Trapped rodents tested positive for *Borrelia hermsii*.

Conclusions: Health care providers should consider TBRF in febrile patients who have stayed in rustic cabins in endemic areas. By removing rodents from buildings, ticks might lose their primary food source and feed on persons; therefore, acaricide spraying should be concurrent with rodent-proofing.

11:00 Violent Experiences in Childhood and Men's Perpetration of Intimate Partner Violence as a Young Adult: A Multi-Stage Cluster Survey in Malawi

Authors: Kristin Vanderende, J. Mercy, M. Shawa, N. Maksud, B. Ross, J. Lee, S. Hillis

Background: Worldwide an estimated 22.6% of adults experienced physical abuse and 36.3% experienced emotional abuse as children. Abuse can have lifelong consequences, however, little is known about the association between exposure to violence in childhood and perpetrating intimate partner violence (IPV). The study objectives were to estimate the prevalence of lifetime IPV perpetration among young adults in Malawi and examine the association of experiencing or witnessing violence in childhood with young men's perpetration of IPV.

Methods: The Violence Against Children Survey is a nationally representative, multi-stage cluster survey of 2,162 13–24 year olds conducted September–October 2013 in Malawi. Interviews assessed respondents' exposure to violence as children (witnessing violence in their home and/or experiencing sexual, physical, or emotional violence prior to age 18) and their lifetime perpetration of physical and sexual IPV. We used logistic regression to test the association between childhood exposure to violence and perpetration of IPV, adjusted for demographic characteristics and potential confounders.

Results: Compared to women, men reported higher lifetime perpetration of sexual IPV (23.9% vs. 5.6%) and similar prevalence of perpetration of physical IPV (8.5% vs. 8.6%). We found a graded relationship between the number of exposures to violence in childhood and men's perpetration of physical and sexual IPV, with the adjusted odds highest among men reporting four or more forms of violence in childhood (physical IPV: aOR 6.2, CI 1.5–25.5; sexual IPV: aOR 4.3; CI 1.7–11.3).

Conclusions: Among young men in Malawi, exposure to violence in childhood is associated with an increased risk of perpetrating physical and sexual IPV, highlighting the need for programs and policies aimed at preventing violence against children in Malawi.

11:20 Skin Lesions Among High School Wrestlers — Arizona, 2014

Authors: Candice Williams, J. Wells, R. Klein, T. Sylvester, R. Sunenshine

Background: Skin infections are common among athletes; wrestlers have an increased risk because of extensive skin-to-skin contact. In February 2014, Maricopa County Department of Public Health was notified of increased reports of skin lesions among high school (HS) wrestlers after participating in a 2-day wrestling tournament (Tournament A). We sought to identify cases, determine etiology, identify risks factors, and prevent additional cases.

Methods: Surveys were distributed to all wrestlers on Tournament A-participating teams that reported ≥1 skin lesion among team members. Medical records were reviewed to verify lesion diagnosis. To capture persons infected pre and post tournament, probable cases were defined as a reported skin lesion during January 1–March 1 in a wrestler who participated in Tournament A on January 24–25. A confirmed case included a physician-diagnosed or laboratory-confirmed skin lesion.

Results: We identified 48 (23 confirmed) cases among male HS wrestlers who attended schools participating in Tournament A. Impetigo was the commonest diagnosis (18 cases, 38%), followed by herpes simplex virus (HSV) (11 cases, 23%). One wrestler with physician-diagnosed HSV reported onset 4 days before the tournament and wrestling with uncovered arm lesions. Seven wrestlers in Tournament A developed HSV afterward and 3 additional wrestlers developed HSV after contact with infected teammates. Another wrestler with physician-diagnosed impetigo reported wrestling with uncovered head and neck lesions; 8 Tournament A wrestlers subsequently developed impetigo, and 4 additional contacts of those wrestlers developed impetigo.

Conclusions: Herpes and impetigo were identified among HS wrestlers who participated in Tournament A, likely from wrestlers who competed with uncovered lesions. Wrestlers should follow CDC's and the National Federation of State High School Associations' guidelines to prevent skin infection spread.

11:40 Examination of Trends of Fatal and Non-Fatal Suicidal Behaviors Among Youth — Fairfax County, Virginia, 2011–2014

Authors: Erica Spies, K. VanderEnde, A. Ivey-Stephenson, B. Gleason, S. Lynch, D. Dean Jr., K. Vagi

Background: Between 2011 and 2014, there were 73 deaths from suicide and 1,509 emergency department (ED) visits for non-fatal suicidal behaviors among youths aged 10 to 24 in Fairfax County, Virginia, leading to concern about a possible suicide cluster or contagion among this age group. As suicide is the second leading cause of death for persons aged 10 to 24, understanding the trends of fatal and non-fatal suicidal behaviors is critical for informing future suicide prevention efforts.

Methods: Surveillance data from January 2013 to October 2014 from Fairfax County Virginia's Office of the Coroner/Medical Examiner and Virginia's syndromic surveillance were used to examine trends in suicidal behaviors and circumstances precipitating recent youth suicides.

Results: Over half (54.69%) of youth who died by suicide were white males. The two most common methods of suicide were hanging (36.99%) and gunshot wound (32.88%). Circumstance data preceding death by suicide were abstracted for 37 cases occurring since January 2013. The majority (95%) of deaths had at least one risk factor identified including history of mental illness, presence of alcohol or drugs, or history of previous hospitalization for suicide ideation/behavior. Nearly two-thirds (64.92%) of youth who visited the ED were female, and 69.16% were admitted to the ED with the chief complaint of "suicidal/suicidal ideation without behavior." Of those admitted for non-fatal suicidal behaviors, 69.46% had used a substance.

Conclusions: The high prevalence of mental health symptoms and substance use among these youth may indicate the need for greater utilization of mental health and drug treatment services in the community. Addressing access to these services will be vital in implementing a comprehensive suicide prevention strategy.

SPECIAL SESSION: Climate Change: Emerging Public Health Threats

12:05–1:25 PM

Ravinia Ballroom

Moderator: Suzanne Beavers

Sponsor: National Center for Environmental Health (NCEH), Division of Environmental Hazards and Health Effects (DEHHE)

This session will focus on the human health effect of climate change. In addition to a general overview (drawing from the recently published National Climate Assessment), this session will include presentations on recent CDC research on health risks of extreme heat and aeroallergens.

Relevance and Appropriateness for the EIS conference

The health effects of climate change is an emerging field of public health. Many emerging threats, such as vector- and waterborne diseases, are of interest to EIS officers. Researching the health effects of climate change draws on multiple disciplines, ranging from environmental health to zoonotic disease to mental health. Because climate can impact so many aspects of health and the public health infrastructure, it should be of interest to many EIS officers and public health practitioners.

Speakers:

- Climate Change and Human Health. *George Luber*
  George Luber, Associate Director for Climate Change at the National Center for Environmental Health, will serve as moderator and presenter. He will give an overview of the health effects of climate change, outlining the various impacts ranging from shifts in vectorborne disease distribution to worsening air quality. He will also describe CDC's activities in preparing for these impacts.
- Climate Change and Extreme Heat. *Shubhayu Saha*
  Predictions of more frequent, more intense, and longer lasting heatwaves for most of the United States produce an urgent need for public health plans to reduce heat-related mortality and morbidity. To be effective, these plans must be based on locally available health and meteorologic data. This presentation will give an overview of our current understanding of spatial variation in heat-related health risk for the United States.
- Climate Change and Pollen. *Paul Schramm*
  Changes in temperatures and precipitation are expected to affect the amount of pollen that plants produce and the seasonal timing of pollen release. Some of these effects have already been observed, with resulting impacts on respiratory diseases. This presentation will provide an overview of the impact of climate change on aeroallergens, such as pollen, and a summary of recent CDC research by using Internet search query data as a proxy for pollen counts and analyzing the effect of seasonal temperatures on pollen season timing and amount.

POSTER SYMPOSIUM II

1:30–2:45 PM

Dunwoody Suite

Moderators: Joseph McLaughlin and Antonio Neri

During the first 30 minutes of the Poster Symposium, the following authors will each give a 2-minute oral presentation at the podium in front of a seated audience. Afterward, the authors will stand with their posters for the remaining session time. The audience is encouraged to view the individual posters and engage in direct discussion with the author.

P2.1 Acellular Pertussis Vaccine Effectiveness Among Children in the Setting of Pertactin-Deficient *Bordetella pertussis*, Vermont, 2011–2013

Authors: Lucy Breakwell, C. Finley, B. Goode, S. Schoenfeld, P. Kelso, L. Misegades, S.W. Martin, A.M. Acosta

Background: During 2010–2012, the reported incidence of pertussis in Vermont increased from 2.9 to 103.0 cases per 100,000 persons. While waning immunity is a major contributing factor to this rising incidence, newly identified strains of *Bordetella pertussis* contain mutations that result in the loss of pertactin (Prn) production which may also attenuate vaccine effectiveness (VE). Acellular pertussis vaccines currently used in the US include only 3–5 antigens, but all contain Prn. In Vermont, 92% of tested isolates from 2012 were Prn-deficient.

Methods: To assess VE, we conducted an unmatched case-control evaluation in Vermont. Children aged 4–10 years with confirmed or probable pertussis reported from January 1, 2011 to December 31, 2013 were included. Controls were identified at provider offices reporting the cases. Diphtheria, tetanus, and pertussis vaccine (DTaP) history was obtained through provider records and parent interviews. Logistic regression accounting for clustering was used to determine overall and age-specific VE (estimated as (1 - OR) × 100%).

Results: A total of 362 cases and 1064 controls were included in the analysis. An on-schedule 5-dose DTaP series was verified in 76% of cases and 78% of controls. Preliminary VE estimate across all ages for 5 DTaP doses compared to 0 doses was 84% (95% confidence interval: 59–94%). The preliminary VE estimate for 5 doses compared to 0 doses decreased from 92% in 4–5 year olds to 88% in 6–7 year olds, and to 72% in 8–10 year olds.

Conclusions: Preliminary DTaP VE estimates and duration of protection are consistent with previous findings. This suggests that the vaccine continues to work well, despite genetic variations leading to loss of Prn.

P2.2 Epidemiologic Features of Human Anaplasmosis — Wisconsin, 2009–2013

Authors: Lina Elbadawi, D.H. Johnson, J. Kazmierczak, S. Gibbons-Burgener, K. Bisgard, J.P. Davis

Background: Human anaplasmosis (HA) is an acute febrile illness caused by *Anaplasma phagocytophilum*, an intracellular bacterium transmitted by *Ixodes scapularis* ticks. Initially recognized in 1993, ~5,000 HA cases have been reported mostly from northwestern Wisconsin residents. To understand distribution, we reviewed HA cases reported in Wisconsin during 2009–2013 and *I. scapularis* tick surveillance data during 2011–2013.

Methods: Anaplasmosis with onsets during 2009–2013 were classified using the 2008 Council of State and Territorial Epidemiologists/CDC ehrlichiosis and anaplasmosis case definitions. Confirmed HA is clinically compatible illness (acute fever and ≥1 of the following: headache, myalgia, malaise, anemia, leukopenia, thrombocytopenia, or elevated liver enzymes), in a patient with laboratory confirmation (≥4-fold change in anti-*A. phagocytophilum* IgG levels, *A. phagocytophilum* isolation, or polymerase chain reaction [PCR]). Probable HA is clinically compatible illness with supportive laboratory results. Surveillance for *I. scapularis* conducted during 2011–2013 included PCR testing for *A. phagocytophilum*.

Results: Of 2,621 confirmed and probable reported HA cases, 83% occurred among residents of northwestern Wisconsin. Reported HA increased 2.2-fold from 2009 (282 cases; 30% PCR-confirmed) to 2013 (626 cases; 52% PCR-confirmed). Among 2,621 patients, 1,528 (58%) were male; median age was 56 (range: 1–110) years; 211/1,700 cases (12.4%) had immunosuppressive conditions; 518/2,098 cases (25%) were hospitalized; and 4/2,074 cases (0.2%) died. During 2011–2013, 542 out of 1,742 *I. scapularis* collected from mammals at sites throughout Wisconsin were tested for *A. phagocytophilum*. The average positivity rate was 12.7% (range by collection sites throughout Wisconsin: 4.1%–33%).

Conclusions: Substantial increases in HA were reported during 2009–2013; based on tick surveillance *A. phagocytophilum*-infected *I. scapularis* can be found throughout Wisconsin.

P2.3 Group A Streptococcal Necrotizing Fasciitis in Oregon: What Are We Missing?

Authors: Emily Fisher, P. Cieslak, T. Poissant

Background: Necrotizing fasciitis (NF) is a serious complication of invasive group A Streptococcus (GAS) infection. Oregon's Active Bacterial Core Surveillance (ABCs) tracks invasive GAS infections, defined as GAS isolation from a sterile body site, including muscle or fascia, within the Portland tri-county area. Hospital laboratories flag GAS isolates from sterile sites, usually blood, but GAS NF patients infrequently have bacteremia. We evaluated ABCs sensitivity for detecting GAS NF.

Methods: We reviewed medical records of Oregon hospital discharges during 2009–2013 with *International Classification of Diseases*, Ninth Revision, (ICD-9) codes for both GAS and NF. Cases were defined as isolation of GAS and physician-diagnosed NF during a patient's same hospitalization. We documented whether NF appeared in surgical and pathology reports. Sensitivity was estimated by comparing catchment-area GAS NF cases identified through ABCs surveillance with GAS NF cases identified by hospital records.

Results: Twenty-four discharges with ICD-9 codes for GAS and NF were identified. Of 23 records available for review, 20 (87%) met the case definition. All 20 had surgery; 16 (80%) had repeated surgical debridement; and 1 (5%) had an amputation. NF was specified in 19/19 operative reports but in only 3/8 pathology reports. GAS was cultured from a sterile site in 4/18 cases (22%). Among the 10 patients who were residents of ABCs' catchment area, only 3 had been ascertained by ABCs yielding a sensitivity of 30%.

Methods: Current ABC surveillance appears insensitivity (30%) for GAS NF. Sensitivity may be improved through case finding using ICD-9 discharge codes, followed by a review of surgical and microbiologic reports.

P2.4 A Systematic Review of Pertussis in Latin America: 1980–2014

Authors: Temitope Folaranmi, F. Coronado, M. Griffith, V. Pinell-McNamara, E. Briere

Background: In Latin America (LA) pertussis disease incidence has reportedly increased since 2000 despite high vaccination coverage. However, a limited number of published reports exist about the burden of pertussis disease in LA. A systematic review of pertussis epidemiology and vaccine coverage in LA will guide regional prevention and control strategies.

Methods: We conducted a systematic literature review using relevant search terms and identified original articles describing pertussis epidemiology and vaccination coverage in LA published during January 1980–September 2014. Two reviewers independently screened articles using specific eligibility criteria and abstracted relevant data. Outcomes included incidence in the general population, prevalence among contacts, mortality rates, and coverage with three (DTP3) and four (DTP4) vaccine doses. Pooled estimates and corresponding 95% confidence intervals (CI) were calculated using random-effects logistic regression models, accounting for between- and within-report variability.

Results: Preliminary review of published data during 1980–2010 identified 38 reports(13 reports with epidemiology data representing 6 countries and 28 with vaccine coverage data representing 10 countries). Thirteen pertussis cases/100,000 person-years were reported for the period; ~8% of cases resulted in death. Approximately 30% of contacts of confirmed cases evaluated had pertussis. Pooled estimates for DTP3 coverage was 88.5% (CI: 81.1, 93.2). Estimates for DTP4 coverage produced a simple mean of 63.0% (range: 64.0–95.9).

Conclusions: Incidence in this review is 12 times greater than reported surveillance-based incidence of 1.1cases/100,000 person-years for 1990-2008 in LA, indicating the true burden of disease might be underestimated. This review suggests the need for strengthened surveillance and improved DTP4 vaccine coverage. As LA countries consider introducing acellular vaccines this review provides historical data to evaluate the impact of these new prevention strategies.

P2.5 *Mycoplasma pneumoniae* Disease Outbreak Associated with an Extended Care Facility — Nebraska, 2014

Authors: Deborah Hastings, K. Harrington, P. Kutty, R. Rayman, D. Spindola, M. Diaz, K. Thurman, J. Winchell, T. Safranek

Background: Pneumonia is a major cause of morbidity and mortality among older persons. On June 20, 2014, an extended care facility notified public health authorities of a cluster of a respiratory illnesses cluster among residents and staff that resulted in 3 deaths. A variety of pathogens, with different prevention measures, cause nursing-home–acquired pneumonia outbreaks. We investigated to determine illnesses etiology and implement control measures.

Methods: We assessed infection control practices, sent a health alert to local providers to identify additional patients, collected nasopharyngeal and oral pharyngeal swabs or autopsy specimens for multiplex real-time polymerase chain reaction (PCR) testing at CDC, and collected clinical and demographic information on patients. Cases were defined as acute respiratory illness with cough and fever ≥ 100.4°F, or radiographic-confirmed pneumonia, during June 1-August 16 in persons linked to the facility.

Results: A total of 50 persons met the case definition: 18 (13%) of 143 residents, 20 (15%) of 132 staff, and 12 community members. Median age was 45 (range 2-96) years; 37 (74%) were female. Eight (44%) residents were hospitalized and 6 (33%) died; 2 (17%) community members were hospitalized and 1 died. None of the staff were hospitalized or died. We sampled 30 persons; 14 (47%) were PCR-positive for *Mycoplasma pneumoniae*. Laboratory results guided antibiotic recommendations. We implemented droplet precautions; isolated ill residents; prevented ill staff from working; and stopped new admissions until September 14.

Conclusions: We demonstrated *M. pneumoniae* was the cause of this life-threatening outbreak of respiratory illnesses among older persons in a non-typical setting. *M. pneumoniae* should be considered as an etiologic agent during pneumonia outbreaks at extended-care facilities; prompt diagnosis could decrease morbidity and mortality.

P2.6 Description of Nosocomial *Legionella* Infections — Los Angeles County, October 2005–August 2014

Authors: Amanda Kamali, P. Marquez, T. Motala, M. Tormey, B. Schwartz, D. Terashita, L. Mascola

Background: Quarterly environmental culturing of water systems for *Legionella* is required in European hospitals; however, CDC requires US hospitals to test only during an outbreak (≥2 cases) or after one transplant unit case. We reviewed nosocomial cases in Los Angeles County (LAC) to determine whether CDC guidelines should be changed to include culturing of water in high risk areas (sinks, fountains, showers) after a single nosocomial case.

Methods: Data from LAC legionellosis surveillance for October 2005–August 2014 were imported into Epi Info™ 7 and reviewed. All cases are confirmed per CDC/CSTE definition. Nosocomial cases were designated as possible nosocomial (2–9 days in hospital before diagnosis) or definite nosocomial (≥10 days). The incubation period is 2–10 days.

Results: Of 743 confirmed *Legionella* cases, 55 (7.4%) were nosocomial from 42 facilities. Of these, 40 (72.8%) were definite and 15 (27.2%) possible. Fourteen (25.5%) were linked to 6 outbreaks. Five of 6 index cases were definite (83%); of 33 definite initial cases, 5 (15%) had subsequent cases at the same facility. Water culture identified 2 outbreaks where environmental cultures matched clinical isolates, 2 where cultures demonstrated other *Legionella* strains, and 2 with negative testing. In the 2 outbreaks where environmental testing revealed the same strain as the clinical isolates, subsequent cases occurred 1 and 22 days after the index case; when other *Legionella* strains were identified, they occurred 188 and 269 days later.

Conclusions: Because 15% of definite cases were followed by subsequent cases, preventative environmental testing might be considered after one case. When environmental testing reveals other *Legionella* strains, those water systems might still benefit from intervention, as these systems still support *Legionella* growth.

P2.7 Back to Basics: Outbreak of Diarrheal Illness Caused by *Shigella flexneri* — American Samoa, May–June, 2014

Authors: Julia Painter, A.T. Walker, J. Pytell, M.T. Nua, S. Soliai-Lemusu, E. Mintz, I. Ali, M. Parsons, H. Martin, M. Beach, J. Cope

Background: On May 22, 2014, the American Samoa Department of Health requested CDC assistance to investigate a widespread outbreak of bloody diarrhea. *Entamoeba histolytica* was suspected as the primary etiologic agent, based on microscopy. We aimed to establish the presence of an outbreak, characterize its epidemiology and etiology, and recommend control measures.

Methods: We reviewed emergency department and laboratory log books for diarrheal illnesses at American Samoa's only hospital; interviewed families of 13 case-patients; tested fecal specimens; and characterized isolates.

Results: From April 15–June 13, 280 cases of diarrheal illness were recorded — double the baseline for this period. Illnesses peaked on May 10. The highest number of cases occurred in children 0–9 years old. Cases were similarly distributed among males and females. No common water, food, sewage, or event exposures were reported. Eight case-patients reported household contacts that became ill within 1–3 days after exposure to the ill case-patient. Six stool specimens sent to CDC were negative for *E. histolytica* and other parasites; four contained genetic evidence of *Shigella*. Seven shigellosis cases were identified in hospital records. Corresponding isolates were sent to CDC; all were confirmed as *Shigella flexneri* and five shared an indistinguishable pulsed-field gel electrophoresis pattern.

Conclusions: Together, epidemiologic and laboratory data suggest this was a shigellosis outbreak with person-to-person transmission. Illness patterns were not consistent with disease caused by *E. histolytica*, which predominantly affects males of all age groups. CDC provided recommendations to improve diarrheal illness surveillance and laboratory diagnostic procedures. This investigation highlights the importance of building epidemiologic and laboratory capacity and strengthening public health infrastructure to ensure health protection in the United States territories.

P2.8 Antibody Levels 20 Years After Receipt of Hepatitis A Vaccine

Authors: Ian Plumb, L. Bulkow, M. Bruce, T. Hennessy, J. Morris, P. Spradling, M. Snowball, B. McMahon

Background: CDC recommends hepatitis A virus (HAV) vaccination for children ≥ 1 year, and for high-risk adults. HAV vaccine is effective; however, the duration of protection is unknown.

Methods: We evaluated a cohort of Alaska Native persons 20 years after HAV vaccination. Previously, children aged 3–6 years were randomized to receive 3 doses of HAV vaccine (360 ELISA units/dose) at: A) 0,1,2 months; B) 0,1,6 months; and C) 0,1,12 months. We measured anti-HAV antibody concentrations every 2–3 years and described geometric mean concentrations (GMC), and the proportion with protective antibody (≥20 mIU/ml), over time. We modelled change in GMC for the entire cohort using fractional polynomial regression.

Results: Of 144 participants, 52 (36.1%) were available for follow-up (17, 18, 17 children in Groups A, B and C, respectively). Overall, 88.5% (95% confidence interval (CI): 76.6–95.6%) of participants had protective antibody levels, including 76.5% (CI: 50.1–93.2%) in Group A, 94.4% (CI: 72.7–99.9%) in Group B, and 94.1% (CI: 71.3 –99.9%) in Group C. GMC levels were lower in Group A (60; CI 34–104) than in Group B (110; CI 68–177), or Group C (184; CI 98–345) (B versus C: p = 0.168; A versus B/C: p = 0.011). There was no difference between groups after adjusting for peak antibody levels post vaccination (p = 0.579). Overall GMC at 20 years was 107 mIU/mL (CI: 77–147 mIU/ml); we predicted a GMC of 97 mIU/ml after 25 years.

Conclusions: HAV vaccine provides protective antibody levels 20 years after childhood vaccination. Lower antibody levels in Group A may be explained by a lower initial peak response. Our results indicate a booster vaccine dose is unnecessary for at least 25 years.

P2.9 Ebola Virus Disease outbreak and the role of Hospital Acquired Infections in Lagos, Nigeria

Authors: Ugochukwu Osigwe, N. Endie, A. Oyemakinde, G. Poggensee, A. Olayinka

Background: On 23rd July 2014, a case of Ebola virus disease (EVD) was confirmed in Lagos, Nigeria. In the following 4 weeks, there were further cases most occurring among healthcare workers (HCWs) and those who shared the same hospital as a confirmed case. We investigated to identify all contacts, identify cases early, and assess nosocomial transmission.

Methods: We adopted the WHO case definitions for a contact, suspected, probable and confirmed case. All contacts were identified, assessed for exposure to the index case, and followed up for 21 days for development of EVD symptoms. We interviewed HCWs at the health facility (HF) and assessed infection prevention and control (IPC) practices. We describe the outbreak in person, place and time.

Results: We identified 40 HCWs as contacts of the index case while 15 patients were on admission during the period. 10 HCWs developed EVD (9 confirmed, 1 probable) and a caregiver of an infant. Attack rate (AR) was 25% and 6.7% respectively. EVD occurred only among doctors and nurses/ nursing aides who attended to the index case (doctors AR 100%, CFR 33.3%; nurses 25%, CFR 12.5%). The most common type of contact was with blood and body fluids of index case (50%) CFR 50% while incidence was highest among HCWs who had direct physical contact with the body of the case (42.9%) CFR 25%. Average incubation period among the cases (HCWs) survived was 10.9±5.2 days among those that died was 8.75±1.5days. Average duration of illness 15.7±5.2 days.

Conclusions: Most of the infections in this outbreak were nosocomially acquired with most deaths occurring among HCWs. We recommended training of HCWs in the affected local government areas on IPC during the outbreak.

P2.10 Outbreak of *Rhizopus* Surgical Site Infections — Argentina, 2005–2014

Authors: Tiffany Walker, N. Refojo, R. Abrante, A. Hevia, G. Morrel, G. Daval, R. Smith, T. Chiller, J. Santandar, D. Stamboulian, C. Dignani

Background: Post-surgical mold infections are rare. Between 2005–2014, Argentine health authorities identified a cluster of mold osteomyelitis caused by *Rhizopus* spp. occurring after anterior cruciate ligament (ACL) surgeries in multiple facilities. An investigation into the source of this outbreak was initiated.

Methods: Cases were defined as suspected or culture-confirmed *Rhizopus* surgical site infections identified during 2005–2014 in Argentina. Isolates received by the Argentine National Reference Mycology Laboratory underwent genetic sequencing for species identification; other isolates were identified locally. Infection control practices were evaluated via survey of operating room (OR) nurses and visits to three hospitals reporting cases. Two sterile ACL surgical instrument sets were evaluated for contamination.

Results: Fifty-two cases were identified; 17 suspected, 35 confirmed. Of the confirmed cases, 28 (80%) were identified as *Rhizopus microsporus*; 7(20%) were only identified as *Rhizopus* spp. Thirty-five cases occurred following ACL surgeries, nine following renal transplant, four following other orthopedic surgeries, and four following other surgeries. All cases following ACL surgery resulted in osteomyelitis. Infections following the other surgeries resulted in soft tissue infections, except a thoracic surgery leading to sternal osteomyelitis. Twenty-eight cases clustered between 2010–2011; the most recent occurred in April 2014. Cases occurred at 35 institutions in 11 provinces. Survey results revealed several sterilization lapses in some ORs, including inadequate sterilization of surgical instruments. Hospital site visits revealed issues including lack of positive pressure and HEPA filtration in some ORs. Instrument cultures were negative.

Conclusions: Argentina has an ongoing outbreak of post-surgical *Rhizopus* infections; most caused by the rare mold, *R. microsporus*. Given this outbreak's source remains unknown, further investigations are warranted, including whole genomic sequencing to determine relatedness of isolates.

P2.11 Evaluation of a Routine Health Management Information System for Monitoring Progress Toward Malaria Pre-elimination — Rwanda, 2014

Authors: Ruth Namuyinga, G. Umutoni, J. Tongren, P. McElroy, M. Chang, K. Munguti, A. Rukundo, J.P. Habimana, C. Karema

Background: Rwanda's Health Management Information System (HMIS) reported an 86% reduction in malaria cases and 74% decline in malaria mortality between 2006 and 2011. Rwanda has set a national goal of malaria pre-elimination (<5% slide positivity rate during peak season) by 2017. An evaluation of HMIS was conducted to assess its validity as a tool for malaria surveillance in a pre-elimination setting.

Methods: We initiated an on-site review of HMIS infrastructure and data in October 2014. Following interviews of HMIS and National Malaria Control Program (NMCP) staff, we evaluated attributes including usefulness, flexibility, acceptability, completeness, simplicity, timeliness, representativeness, and positive predictive value of reported malaria cases. To assess data quality, we visited four sites and calculated percent agreement between aggregate data abstracted from patient and laboratory registers and HMIS electronic records for January and August 2014.

Results: Between July 2013 and August 2014, 99.5% of 469 public health centers reported monthly aggregate data to HMIS and 95% reported by the monthly deadline. Twenty-five malaria indicators categorized by age, sex and pregnancy status resulted in 125 malaria-related data fields with monthly completeness rates of 99%. The highest monthly slide positivity rates were reported for November 2013 and May 2014 (45% and 34%, respectively). In January and August 2014, data sampled from facility registers agreed with data reported in HMIS 67% to 100% of the time.

Conclusions: Rwanda's HMIS structure for malaria surveillance demonstrates moderate to high performance. The NMCP is challenged with national slide positivity rates exceeding the <5% target for pre-elimination. Stratification of slide positivity rates by reporting site will identify foci for targeting intensive control efforts. Streamlining the number of malaria indicators will improve efficiency of the system.

P2.12 Multicounty Community Mumps Outbreak — Ohio, January–September 2014

Authors: Carolyn McCarty, J. Budd, N. Fisher, E. Koch, N. Tucker, B. Berger, B. DeJesus, C. Stasko, S. Brewer, T. Irvan, K. Husek, A.P. Fiebelkorn, G. Wallace, B. Fowler, M. DiOrio

Background: On March 6, 2014, the Ohio Department of Health (ODH) received a report of a mumps outbreak involving 9 university students. During the following weeks, ODH detected increased mumps incidence in three counties surrounding the university. Widespread community mumps transmission is rare in the postvaccine era. We investigated to identify and prevent additional cases.

Methods: A probable case was defined as parotitis lasting ≥2 days or unexplained orchitis or oophoritis, with onset on or after January 1, 2014, and an epidemiologic link (e.g., residence or employment) with one of three affected counties. Case confirmation required positive reverse transcription-polymerase chain reaction or culture for mumps. Mumps is a reportable condition in Ohio. For each reported case, local health officials conducted patient interviews and reviewed medical charts, laboratory findings, and vaccination records.

Results: We identified 484 cases, 34 (7%) laboratory-confirmed, from January 1–September 20. Illness onset primarily occurred during March–May. Median patient age was 23 (range: 0.3–80) years. Thirty-three patients (6.8%) experienced complications; 14 were hospitalized. Overall, 195 patients (40.3%) reported they were students or employees at the university, 59 more had an epidemiologic link to the university, and 20 additional patients shared an employer or school with a university-linked patient. Of 243 patients with known vaccination status, 200 (82.3%) had received ≥1 and 149 (61.3%) had received ≥2 mumps vaccinations; 43 (17.7%) were unvaccinated. To prevent further transmission, 1,346 mumps-containing vaccine doses were given throughout the affected counties.

Conclusions: This was the largest U.S. mumps outbreak since 2010 and was unique because of widespread community transmission. Integration between the university and surrounding community likely contributed to the substantial number of community cases.

CONCURRENT SESSION F1: Global Health
3:00–5:05 pm
Ravinia Ballroom
Moderators: Wences Arvelo and Vik Kapil

3:05 Soap Is Not Enough: Hand Hygiene Knowledge and Practice Among Refugees Following a Large Hepatitis E Outbreak — South Sudan, 2013

Authors: Raina Phillips, J. Vujcic, A. Boscoe, T. Handzel, M. Aninyasi, L. Blum, P.K. Ram

Background: Infectious disease outbreaks cause increased morbidity and mortality among refugees who lack safe water, improved sanitation, and hygiene. In 2012, an outbreak of hepatitis E virus among 125,000 refugees in Maban County, South Sudan reportedly caused >11,000 cases and 238 deaths. In response, humanitarian agencies intensified handwashing promotion, increased soap distribution, and created communal handwashing stations. One year later, we assessed soap access and handwashing practices among these refugees.

Methods: In December 2013, we conducted a randomized cross-sectional survey of 600 households in three refugee camps. Respondents from randomly selected households were interviewed about handwashing practices and exposure to handwashing with soap (HWWS) messages. We also conducted 2-hour structured observations among a subset of 128 households to assess handwashing behavior.

Results: Of 600 households surveyed, respondents' median age was 31 years, mean household size was seven, 85% reported receiving HWWS messages and 97% were observed to have soap at the household at the time of the survey. At the latrine, 54% of households had both soap and water at handwashing stations. Although three-quarters (74%) of respondents reported HWWS after defecation and 80% reported HWWS before eating, only 46% and 7%, respectively, were observed doing so. Thirty-eight percent were rinsing with water alone after defecation and 80% only rinsed before eating.

Conclusions: Despite soap availability and exposure to extensive hygiene promotion among Maban refugees, observed HWWS following critical times was infrequent. Soap access and HWWS messaging is not enough as many households did not prioritize soap use for handwashing. We recommended investigating additional handwashing technologies and conducting qualitative studies to better understand relevant motivators and barriers to HWWS to strengthen the behavior change communication strategies used for displaced populations.

3:25 Impact of Cholera Vaccine Campaign on Knowledge and Practices Regarding Cholera, Safe Water, Sanitation, and Hygiene in a Stable Refugee Camp in Thailand

Authors: Edith Nyangoma, H. Scobie, K. Date, K.A. Wannemuehler, E. Taylor, N. Wongjindanon, P. Rattanadilok Na Bhuket, W. Zhou, C. Phares

Background: Mae La camp, established in 1984, houses ~50,000 refugees along the Thailand-Burma border. Four outbreaks of cholera occurred from 2005 through 2012. An oral cholera vaccine (OCV) and education campaign was conducted in the camp in 2013. We evaluated the impact of the campaign on community knowledge, attitudes, and practices (KAPs) regarding cholera and safe water, sanitation, and hygiene (WASH).

Methods: We used structured questionnaires to conduct cross-sectional household-level surveys to assess cholera and WASH KAPs among participants in randomly selected households one month before (baseline) and one year after (follow-up) OCV campaign. We observed household characteristics and tested drinking water for fecal contamination. Differences in baseline and follow-up survey outcomes were analyzed by using Pearson's chi-square (or Fisher's exact) and Wilcoxon two-sample tests for categorical and continuous variables, respectively.

Results: We interviewed respondents in 271 (baseline) and 199 (follow-up) households (response rates: 77% and 85%, respectively). Socio-demographic characteristics were similar across surveys. Compared with baseline, increased proportions of follow-up respondents had heard of cholera (82% versus 91%, $p = 0.008$), knew ≥2 vehicles of transmission (61% versus 82%, $p < 0.001$), and ≥2 means of prevention (62% versus 81%, $p < 0.001$). Significantly increased ($p < 0.001$) proportions of respondents in the follow-up survey reported washing hands with soap (66% versus 86%), washing hands on ≥3 key occasions (49% versus 68%), and had soap at hand washing stations (80% versus 97%). Fecal contamination of stored drinking water was similar in both surveys (39% vs. 34%, $p = 0.273$).

Conclusions: Respondents' knowledge and practices regarding cholera and WASH were improved one year after an OCV campaign. OCV campaigns provide an opportunity to reinforce comprehensive cholera prevention and control measures.

3:45 Concurrent Diarrhea and Acute Respiratory Illness Among Children <5 Years Old in Rural and Urban, Kenya, 2009–2012

Authors: Almea Matanock, V. Nguyen, X. Lu, E. Scallan, C.E. O'Reilly, L. Kim, C. Hazim, L. Cosmas, S. Muema, B. Aura, A. Audi, D.R. Feikin, E.D. Mintz, C.G. Whitney, R.F. Breiman, P.M. Griffin, J.M. Montgomery

Background: Diarrhea and acute respiratory infection (ARI), two leading cause of childhood illnesses and mortality, have overlapping risk factors including malnutrition and unsanitary environments. The incidence of these syndromes occurring concurrently is poorly understood, making disease burden estimation and etiologic attribution difficult. Our objective was to describe concurrent diarrhea and ARI.

Methods: We estimated rates of diarrhea and ARI among children <5 years from longitudinal (2009–2012) population-based surveillance data in an informal urban settlement in Nairobi and rural western Kenya. Diarrhea was ≥3 loose stools reported in a 24-hour period during the past 3 days. ARI was reported cough or difficulty breathing during the past 3 days. Data were collected at home visits. Concurrent disease was identified when diarrhea and ARI were reported at the same visit. We used rate ratios (RR) to compare incidence rates.

Results: Compared to the rural site, urban site participants reported diarrhea more frequently (1.93 versus 1.20 episodes/person-year, RR: 1.60, CI: 1.56–1.65) and ARI less frequently (4.30 versus 6.36 episodes/person-year, RR: 0.72, 0.71–0.73). Concurrent disease was higher in the urban site (1.01 and 0.47 episodes/person-year, RR:1.60, CI 1.56–1.65) where 52% of diarrheal episodes included ARI symptoms. Concurrent disease was highest among 12–23 month olds (urban 1.62 and rural 0.78 episodes/person-year, RR: 1.40, CI: 1.34–1.47).

Conclusions: Diarrhea and ARI frequently occurred concurrently, especially in younger children who are at greater risk for both diseases and in the urban site where environmental risks may be more pronounced. Analysis of clinic-based laboratory data could help explain the pathogenesis. Further study of risk factors and timing of symptoms is needed to optimize prevention efforts for these common diseases.

4:05 2014 Outbreak of MERS Coronavirus in Jeddah: A Link to Healthcare Facilities

Authors: Ikwo Oboho, S.M. Tomcyzk, A.M. Al-Asmari, A.A. Banjar, H. Al-Mugti, M.S. Aloraini, K.Z. Alkhaldi, E.L. Almohammadi, B.M. Alraddadi, S.I. Gerber, D.L. Swerdlow, J.T. Watson, T.A. Madani

Background: MERS-CoV has caused severe respiratory illness and death in the Arabian Peninsula since 2012. Transmission has been associated with exposure to camels (primary cases) and human-to-human transmission (secondary cases). A marked increase in cases of MERS-CoV occurred in Jeddah, Saudi Arabia in early 2014. We evaluated MERS-CoV cases in Jeddah to determine in what setting transmission was occurring.

Methods: A confirmed case was defined as laboratory confirmation of MERS-CoV infection, irrespective of clinical signs and symptoms. All laboratory-confirmed MERS-CoV cases reported to the Ministry of Health from Jeddah during January 1st–May 16th, 2014 were identified. We conducted telephone interviews and reviewed hospital records of symptomatic cases in non-healthcare personnel (non-HCP).

Results: We identified 255 laboratory-confirmed MERS-CoV cases in Jeddah; 93 resulted in death (case fatality proportion 36.5%). Median age was 45 years (interquartile range: 30–59 years), and 174 (68.2%) were in males. Sixty-four (25%) were reported as asymptomatic. Of the remaining 191 symptomatic cases, 40 (20.9%) occurred in healthcare personnel. Among the 151 symptomatic non-HCP with MERS-CoV, 112 (74.2%) were available for assessment, and 109 (97.2%) of these had contact with a healthcare facility (97/109, 89%), a confirmed case (22/109, 20%), or someone with a severe respiratory illness (4/109, 4%) in the 14 days prior to illness onset (categories not mutually exclusive). Only 3 (2.7%) denied any of these contacts.

Conclusions: The majority of MERS-CoV patients in the Jeddah outbreak had contact with healthcare settings and/or other MERS-CoV cases, suggesting their illnesses were not primary cases but rather acquired in healthcare settings. Therefore control measures should focus on adherence to infection control precautions in healthcare settings.

4:25 Increase in Crimean-Congo Hemorrhagic Fever Case Detection — Georgia, 2014

Authors: Ashley Greiner, N. Mamuchishvili, S.J. Salyer, K. Stauffer, M. Geleishvili, K. Zakhashvili, J. Morgan

Background: From January to September 2014, the country of Georgia's National Centers for Disease Control and Public Health (NCDC) identified 22 cases of Crimean-Congo hemorrhagic fever (CCHF), a high-priority bioterrorism agent naturally transmitted by infected ticks and animal blood. Although endemic, the highest annual case count previously reported was 13, suggesting transmission above baseline since surveillance initiation in 2009. We conducted an investigation to identify the source, mode of transmission, and risk factors for each case.

Methods: We extracted 22 cases from NCDC's Electronic Disease Surveillance System. Cases were defined as temperature >38°C, at least one hemorrhagic sign (petechial or purpural rash, bleeding, and/or thrombocytopenia), and positive polymerase chain reaction or anti-CCHF IgM titer. We interviewed NCDC and national reference laboratory staff to elucidate modifications potentially affecting the system's sensitivity.

Results: Mean patient age was 45 years (range: 4–77 years); 13 (59%) were male. Most (91%) cases occurred from May to August; 18 (82%) occurred in rural villages. Fourteen (64%) patients reported a tick bite or removal, and three (14%) animal blood exposure, before illness. The mean incubation period was 4 days (range: 1–17). Patients presented with fever (90%), thrombocytopenia (77%), and bleeding (59%). The case fatality rate was 14%. Staff interviews revealed that a 2013 nationwide CCHF educational campaign for physicians was conducted. Additionally in 2013 and 2014, two studies conducted CCHF testing for acute febrile illness workup.

Conclusions: The increase in 2014 CCHF cases may be an artifact of improved surveillance system sensitivity. As most patients reported a known CCHF risk factor, future public health interventions in Georgia should target these exposures.

4:45 Measles Outbreak Among a Highly Vaccinated Population — Federated States of Micronesia, 2014

Authors: Edna Moturi, L. Breakwell, S. Gopalani, E. Lam, C. Hales, M. Patel, P. Rota, J. Seward, G. Wallace, M. Papania

Background: Measles-containing vaccine (MCV) has been included in the routine childhood vaccination schedule in the Federated States of Micronesia (FSM) since 1963; 2 MCV doses administered at ages 12 and 13 months have been recommended since 1992. In 2014, FSM had the largest measles outbreak in >20 years, although the national coverage for MCV1 and MCV2 was 90% and 75% respectively.

Methods: Measles patients were identified through retrospective review of hospital medical and mortality records, contact investigations, and enhanced surveillance. A case-patient was defined as a patient with fever, maculopapular rash, and either cough, coryza or conjunctivitis, with rash onset during February–July. Vaccination status was verified by cross-checking vaccination documents. The FSM census data were used to calculate state-specific incidence.

Results: Three FSM states had reported measles cases: Kosrae State (139 cases; cumulative incidence = 21.2 cases/1000); Pohnpei State (247 cases; cumulative incidence = 6.7 cases/1000); and Chuuk State (3 cases; cumulative incidence = 0.1/1000). In Kosrae and Pohnpei States, 71% and 60% of cases, respectively, occurred among adults >19 years. Among adults with cases in the two states, respectively, 82% and 65% had received ≥1 MCV dose; 58% and 50% had received ≥2 doses. The lowest attack rates in Kosrae (4/1000) and Pohnpei (0.2/1000) States were among children aged 5–9 years, all of whom had received ≥2 doses. Identical measles genotype was detected in all three states.

Conclusions: Vaccine failure among adults was a major cause of this outbreak. A common genotype among reported cases suggested transmission among the islands. Timely mass vaccination campaigns that included adults effectively controlled the outbreak. High 2-dose measles vaccination coverage should be maintained to sustain measles elimination.

CONCURRENT SESSION F2: Health Care–Associated Infections

3:00–5:05 pm

Dunwoody Suite

Moderators: Matthew Wise and Clifford McDonald

3:05 National Estimates of Incidence, Recurrence, Hospitalization, and Death of Nursing Home-Onset of *Clostridium difficile* Infections — United States, 2012

Authors: Jennifer Hunter, Y. Mu, G.K. Dumyati, M.M. Farley, L.G. Winston, H.L. Johnston, J.I. Meek, L.E. Wilson, S.M. Holzbauer, Z.G. Beldavs, E.C. Phipps, J.R. Dunn, J.A. Cohen, J. Avillan, N. Stone, L.C. McDonald, F.C. Lessa

Background: In the United States, 1.4 million individuals receive nursing homes (NH) care annually, where residents are frequently advanced in age and have antibiotic exposures, increasing their risk of *Clostridium difficile* infection (CDI). We analyzed population-based surveillance data to estimate national incidence, recurrence, hospitalization, and death among patients with onset of CDI in NHs.

Methods: Surveillance data were used to identify NH-onset (NHO) CDI cases, defined as *C. difficile*-positive stool collected in a NH (or within 4 days after NH stay) in 2012 from a surveillance area resident without a positive test in the prior 8 weeks. Medical records were reviewed on a random sample of cases. A regression model accounting for age and diagnostic testing methods was used to calculate incidence; sampling weights were applied to estimate hospitalizations, recurrences and deaths.

Results: A total of 3,506 NHO-CDI cases were identified. Among 262 cases with medical record review, median age was 82 years, 60% were female, 77% received antibiotics in the 12 weeks prior to *C. difficile*-positive specimen, and 57% were discharged from a hospital in the month prior. The estimate for national NHO-CDI incidence was 114,547 cases in 2012 (95% CI: 96,696–132,055). Among NHO-CDI cases nationwide, we estimated that 31,362 (27%) were hospitalized within 7 days of positive specimen (95% CI: 25,487–37,236), 21,246 (19%) recurred within 14–60 days (95% CI: 14,787–27,705), and 8,948 (8%) died within 30 days (95% CI: 6,750–11,147).

Conclusions: NHO-CDI is associated with substantial morbidity and mortality. Strategies that focus on reducing unnecessary antibiotic use in NH residents, particularly during hospitalizations and the weeks following transfer from hospitals to NHs, may lead to marked decreases in NHO-CDI.

3:25 Legionnaires' Disease Outbreak at a Long-Term Care Facility: Persistence of Low-Level *Legionella* Contamination in a Water System — North Carolina, 2014

Authors: Sarah Rhea, T. Morrison, L. Kearney, J. McDaniel, S. Sullivan, J. MacFarquhar, P. Kutty, J. Kunz, Z. Moore

Background: During June 5-6, 2014, the North Carolina Division of Public Health was notified of 3 positive *Legionella* urine antigen tests (LUATs) from persons with radiologic-confirmed pneumonia and exposure to the same long-term care facility (LTCF) within the 10-day incubation period. We investigated to identify the source and prevent additional cases.

Methods: A Legionnaires' disease (LD) outbreak case was defined as a positive LUAT in a person with radiologic-confirmed pneumonia on or after December 1, 2013 (6 months before index case onset) and facility exposure 2-10 days before onset. We collected urine for LUAT from each resident with pneumonia onset on or after December 1, 2013. We conducted an environmental assessment and collected representative bulk water and swab samples for *Legionella* culture. We identified 8 cases among 5 residents, 2 visitors, and 1 contractor. Onsets were May 25–June 22, 2014. Seven (88%) patients required hospitalization; no legionellosis-related deaths occurred.

Results: We identified water system conditions favorable for *Legionella* amplification, including areas of stagnation and suboptimal hot water temperatures. A recommended healthcare facility *Legionella* prevention plan was not in place. *Legionella pneumophila* serogroup 1 was isolated from 26 (60%) of 43 environmental samples initially collected. Despite remediation including short-term water system superheating and hyperchlorination, increasing hot water temperatures, and minimizing stagnation, *Legionella* has been persistently isolated from subsequent environmental samples. Control measures, including 0.2 micron point-of-use filter installation, remain in place until complete *Legionella* eradication is achieved.

Conclusions: An LD outbreak at a LTCF was associated with *Legionella* in the water system. This investigation demonstrates that low-level contamination can persist despite multiple remediation efforts. Complete *Legionella* eradication might require secondary disinfection or other protracted remediation efforts.

3:45 Trends in Central Line-Associated Bloodstream Infections in US Neonatal Intensive Care Units: Are We Making Progress?

Authors: Nora Chea, F.C. Lessa, J.R. Edwards, K. Peterson, S.N. Hocevar

Background: Neonatal intensive care unit (NICU) patients are vulnerable to central line-associated bloodstream infections (CLABSI) due to their immature immune system and invasive-procedure exposures. Declines in CLABSI incidence in adult and pediatric intensive care unit populations have been demonstrated. We assessed trends in CLABSI incidence across US NICUs.

Methods: NICU CLABSIs reported to the National Healthcare Safety Network (2006–2013) were stratified into 1) methicillin-resistant *Staphylococcus aureus* (MRSA), 2) methicillin-susceptible *S. aureus* (MSSA), 3) *Candida* spp., 4) Coagulase-negative *Staphylococcus* (CNS), 5) polymicrobial, and 6) others. Each stratum was pooled across NICUs by birthweight (BWT) category (≤750g [A], 751g–1000g [B], 1001g–1500g [C], 1501g–2500g [D], >2500g [E]) and year. Log-linear regression was used to estimate incidence changes for MRSA, MSSA, *Candida* spp., and CNS. To confirm trends we performed sensitivity analyses.

Results: From 2006–2013, 1027 NICUs reported 6,879,571 central-line days and 11,247 CLABSIs (6.6% MRSA, 13.3% MSSA, 8.8% *Candida* spp., 27.4% CNS, 7.3% polymicrobial, and 36.8% others). BWT A had the highest pooled mean CLABSI incidence per 10,000 central-line days of MRSA (1.8), MSSA (3.2), *Candida* spp. (2.9), and CNS (7.6). Overall yearly incidence rates decreased for MRSA, MSSA, *Candida* spp., and CNS by 9.2% ($P<0.0001$), 9.3% ($P<0.0001$), 7.6% ($P<0.0001$), and 8.4% ($P<0.0001$) respectively. Decreases occurred across all BWT categories for *Candida* spp. and CNS but were only significant for BWT C for MRSA and BWT B, C, and D for MSSA. Overall trends were confirmed by sensitivity analyses.

Conclusions: US NICUs have made substantial progress in CLABSI prevention. Additional prevention effort should focus on infants in the lowest BWT category with attention to *S. aureus*.

4:05 Gram-Negative Bloodstream Infections Among Hemodialysis Outpatients — California, 2013–2014

Authors: Jacklyn Wong, W. Edens, M. Lyman, K. Rizzo, D. Nguyen, H. Moulton-Meissner, M. Blain, P. Ayscue, S. Horwich-Scholefield, E. Epson, J. Rosenberg, P. Patel

Background: Approximately 24% of the >6,000 hemodialysis centers nationwide reuse dialyzers, reprocessing (cleaning and disinfecting) them between treatments. During August 2014, CDC became aware of gram-negative bloodstream infections (BSIs) among outpatients at multiple Company A hemodialysis facilities. We investigated to identify additional BSIs, assess risk factors, and recommend control measures.

Methods: A case was a blood culture positive for *Burkholderia cepacia* or *Stenotrophomonas maltophilia* in a patient ≤1 week after hemodialysis at any Company A facility, during September 2013–September 2014. We used Company A's microbiology database and local hospital records to identify cases. We performed a 1:3 case-control study, matching on facility and dialysis date. Data were analyzed by using conditional logistic regression. We visited 6 facilities to observe practices and collect environmental samples, which were compared with patient isolates by using pulsed-field gel electrophoresis.

Results: We identified 17 cases among 16 patients at 5 facilities. More case-patients participated in dialyzer reuse compared with control subjects (94% versus 76%), but the difference was not significant (matched odds ratio [mOR]: 4.4; 95% confidence interval [CI]: 0.6–35.4). Compared with control subjects, case-patients more often had a high (>6) number of reuses (mOR: 7.0; 95% CI: 1.5–33.8). We observed nonstandardized cleaning of dialyzer headers and caps, presenting opportunity for contamination during reprocessing. We isolated *B. cepacia* and *S. maltophilia* from reprocessing equipment or purified water at 3 facilities. Within 1 facility, a *B. cepacia* environmental isolate was indistinguishable from a patient isolate. Company A voluntarily stopped reuse in 1 facility.

Conclusions: BSIs were associated with frequent dialyzer reuse. Less frequent reuse or nonreuse might improve patient safety. Facilities practicing reuse should standardize reprocessing procedures to avoid contamination.

4:25 *Candida* Co-Infection Among Patients with *Clostridium difficile* Infection in Metropolitan Atlanta, 2009–2013

Authors: Snigdha Vallabhaneni, O. Almendares, M.M. Farley, B. Stein, W. Baughman, J. Reno, S. Magill, R. Smith, A. Cleveland, F. Lessa

Background: *Candida* and *Clostridium difficile* are common causes of health care-associated infections. *C. difficile* infection (CDI) damages the intestinal epithelium, which may facilitate *Candida* overgrowth in the gut and translocation into the bloodstream. We describe the prevalence and characteristics of patients developing candidemia after CDI.

Methods: We conducted a matched case-control study. A case was defined as candidemia occurring within 120 days after CDI in a resident, age≥18 years, of the Atlanta metro area during 2009–2013. For each case, up to 3 controls (CDI without candidemia) matched on age and location of disease onset (hospital versus community), were identified. Conditional logistic regression was performed to identify factors associated with co-infection.

Results: Of 13,205 adult patients with CDI, 103 (0.8%) had candidemia. A total of 251 matched controls were identified. Median time from CDI to candidemia-onset was 19 (IQR: 7–46) days. Median age among cases was 62 (range:20–98) years, 53% were female, 52% were black, 48% had diabetes, 15% had CDI complications (ileus, toxic megacolon, colectomy), 40% were treated with vancomycin plus metronidazole, and 36% died. Compared with controls, cases had higher odds of being black (matched OR (mOR) = 1.8; 95%CI = 1.1–3.0), diabetic (mOR = 2.0; 95%CI = 1.2–3.3), having CDI complications (mOR = 9.8; 95%CI = 3.1–40.7), and receiving steroids (mOR = 1.95; 95%CI = 1.1–3.6), proton pump inhibitors (mOR = 1.9; 95%CI = 1.2–3.2), broad spectrum antibiotics (mOR = 4.1; 95%CI = 2.3–7.4), and vancomycin plus metronidazole for CDI treatment (mOR = 3.21; 95%CI = 1.7–6.1 vs. metronidazole alone).

Conclusions: Prevalence of candidemia and CDI co-infection is low. However, clinicians should be vigilant for candidemia among CDI patients who have CDI complications or exposure to certain CDI treatment regimens, in addition to those with previously recognized candidemia risk factors.

4:45 *Pseudomonas aeruginosa* in a Neonatal Intensive Care Unit — California, 2013–2014

Authors: Cara Bicking Kinsey, S. Koirala, B. Solomon, J. Rosenberg, A. Neri, B.F. Robinson, H. Moulton-Meissner, J. Noble-Wang, N. Chea, A.S. Laufer, C.V. Gould

Background: In 2013, a neonatal intensive care unit (NICU) experienced a *Pseudomonas aeruginosa* outbreak with 2 deaths. Infection control measures, water remediation, and intermittent use of point-of-use water filters followed. In September 2014, CDC was notified of additional cases. We investigated to identify risk factors and prevent further cases.

Methods: We defined a case as the first positive *P. aeruginosa* culture from an NICU patient during June 2013–September 2014. We reviewed medical records from the study period, and matched 1:1 by birth weight, NICU case-patients to control-patients. We performed a case-control analysis by using conditional logistic regression with pooled matched strata adjusted for age at culture. In September 2014, we observed infection control procedures, obtained environmental cultures, and typed isolates by using pulsed-field gel electrophoresis (PFGE).

Results: We identified 31 cases. Case-patients were more likely to have had a peripherally inserted central catheter (adjusted odds ratio [aOR] = 7.65; 95% confidence interval [CI] = 2.03–28.76), invasive ventilation (aOR = 8.26; 95% CI = 1.80–37.83), or exposure to water without point-of-use filters (aOR = 48.14; 95% CI = 9.49–∞) ≤7 days before culture. We observed deficiencies in hand hygiene. Of 45 environmental samples, 31 (69%) produced *P. aeruginosa*; 94% of these were water-related. Isolates from the 2 most recent case-patients were indistinguishable by PFGE from water-related samples obtained from the case-patients' rooms.

Conclusions: This *P. aeruginosa* outbreak was attributed to contaminated water. Inadequate hand hygiene might have contributed to higher risk for transmission to neonates with invasive devices. Point-of-use filters might be effective in preventing *P. aeruginosa* cases. Further water-system remediation, continuous use of point-of-use filters, and optimal hand hygiene were recommended.

CONCURRENT SESSION G1: Vectorborne and Zoonotic Diseases

8:30–10:15 AM

Ravinia Ballroom

Moderators: Jennifer Wright and Erin Staples

8:35 Heartland Virus Disease — Missouri, 2012–2014

Authors: Daniel Pastula, G. Turabelidze, K. Yates, A. Lambert, A. Panella, O. Kosoy, R. Lanciotti, M. Fischer, E. Staples

Background: Heartland virus (HRTV) is a newly identified phlebovirus that was first isolated from two Missouri farmers hospitalized with fever, leukopenia, thrombocytopenia, and recent tick bite exposure in 2009. In 2012, we initiated a prospective study in Missouri to identify additional cases, describe epidemiologic and clinical findings, and define the modes of transmission for this novel disease.

Methods: We enrolled patients with fever, leukopenia, and thrombocytopenia at seven healthcare facilities in Missouri from 2012–2014. A case of acute HRTV disease had evidence of recent HRTV infection confirmed by RT-PCR or ≥4-fold rise in neutralizing antibodies. We used standardized forms to collect epidemiologic and clinical data. We described dichotomous variables as counts and frequencies and continuous variables as medians and ranges.

Results: Of 101 patients enrolled, 10 (10%) cases of acute HRTV disease were identified. The median age of cases was 60 years (range: 29–73) and 9 (90%) were male. Case-patients had illness onset from May through September. Commonly reported symptoms included fatigue (N = 10), anorexia (N = 9), headache (N = 8), myalgia (N = 8), and arthralgia (N = 8); one patient had a rash. The median lowest white blood cell count was 1,900 cells/mm3 (range: 1,300–2,800); median lowest platelet count was 68,500/mm3 (range: 12,000–121,000). Eight (80%) cases were hospitalized; all survived. Eight (80%) cases reported recent tick exposure and nine (90%) reported spending ≥1 hour per day outside.

Conclusions: We identified ten additional HRTV disease cases; most case-patients reported recent tick exposures or outdoor activities. HRTV testing should be considered in Missouri patients with fever, leukopenia, and thrombocytopenia during tick season. Additional data are needed to describe the spectrum of clinical illness and identify risk factors for disease.

8:55 Chikungunya Fever Cases Identified in the Veterans Health Administration System, 2014

Authors: Tara Perti, C. Lucero-Obusan, P. Schirmer, M. Holodniy

Background: In December 2013, the first local transmissions of the mosquito-borne chikungunya virus (CHIKV) in the Americas were identified in the Caribbean. CHIKV infection causes chikungunya fever (CHIK), characterized by acute onset of fever and polyarthralgia. Although rarely fatal, adults aged ≥60 years and those with chronic medical conditions are among those at highest risk for severe disease. We describe laboratory-confirmed CHIK among Veterans treated through the Veterans Health Administration (VHA) system.

Methods: We queried VHA's national electronic medical records (EMRs) to identify Veterans who underwent laboratory testing for CHIKV infection during January–November 2014. We reviewed EMRs for demographics, clinical history, travel history, and laboratory results.

Results: Among 132 Veterans with CHIKV laboratory results, 74 had laboratory-confirmed infection: 54/79 (68%) with detectable CHIKV RNA by reverse transcriptase-polymerase chain reaction and 21/63 (33%) with a positive CHIKV IgM antibody result. Median age of Veterans with laboratory-confirmed CHIKV infection was 65 (range: 23–90) years; fever was recorded for 86%, polyarthralgia for 88%, myalgia for 76%, rash for 45%, and headache for 41%. Of the Veterans with laboratory-confirmed infection, 68% were tested in Puerto Rico and 32% were tested after returning to the continental United States from the Caribbean (including Puerto Rico) or South America, with symptom onset a median of 2 days before the Veteran's return (range: 18 days before–2 days after return).

Conclusions: CHIK is an emerging and evolving problem among Veterans who reside in or who travel to the Caribbean or South America. When Veterans with one of these risk factors present with compatible symptoms, clinicians should include CHIK in the differential diagnosis and consider CHIKV testing.

9:15 Q Fever Outbreak at a Large-Scale Goat and Cattle Dairy — Missouri, 2013

Authors: Holly Biggs, G. Turabelidze, D. Pratt, S. Todd, K.J. Slifka, N. Drexler, G. McCurdy, J. Lloyd, C. Evavold, K. Fitzpatrick, R. Priestley, J. Singleton, D. Sun, M. Tang, C. Kato, G. Kersh, A. Anderson

Background: Q fever, caused by *Coxiella burnetii*, is a zoonotic disease transmitted to humans primarily via infected ruminants (goats, cattle, sheep). In Missouri, typically <5 Q fever cases are reported annually. Between 06/2013–11/2013, 12 Q fever cases were reported among persons associated with a Missouri goat and cattle dairy, Operation A. We aimed to determine the extent and epidemiology of Q fever cases associated with Operation A.

Methods: Persons residing in the community surrounding Operation A were offered *C. burnetii* serologic testing and completed a standardized questionnaire as part of a retrospective cohort study. Cases were persons with a *C. burnetii* phase II IgG titer ≥1:128 linked to Operation A or the surrounding community between 06/01/2013–12/17/2013. Risk ratios and 95% confidence intervals were calculated. Animal and environmental samples were tested using *C. burnetii* PCR.

Results: Of 135 persons tested, 47 (35%) human Q fever cases were identified; 38(80%) were male, and the median age was 38(range 10–74) years. Q fever was associated with goat contact (RR = 1.9;95%CI:1.2–2.9) and working with ruminant manure (RR = 1.9;95%CI:1.3–2.8). Among persons without ruminant contact, having a household member with regular ruminant contact was associated with Q fever (RR = 4.8;95%CI:1.1–20.7). Of goat specimens, 17% of milk and 26% of vaginal swabs were positive; of cow specimens, 2% of milk and 7% of vaginal swabs were positive. Goat birthing areas contained the highest detected levels of *C. burnetii*.

Conclusions: Contact with goats and ruminant manure were significantly associated with Q fever. Indirect transmission to household members was identified as a potential risk. Husbandry practices, including routines that could place household members at risk, such as bringing work boots home, should be modified to prevent *C. burnetii* transmission associated with Operation A.

9:35 Dengue Knowledge and Practices Among Clinicians — Texas, 2014

Authors: Jessica Adam, R. Abeyta, T. Sharp, D. Thomas, K. Tomashek, S. Waterman

Background: Dengue, a mosquitoborne viral disease endemic throughout the tropics, is increasingly being identified among travelers returning to the United States. During July–December 2013, three south Texas counties reported 53 cases with laboratory evidence of dengue; 26 were locally acquired, the largest number of travel-associated and locally acquired dengue cases in south Texas since 2005. Because early identification and timely treatment reduces medical complications and mortality, we administered a survey to characterize Texas clinicians' knowledge and clinical management of dengue patients.

Methods: We targeted clinicians practicing in specialties likely to encounter dengue patients (i.e., internal medicine, pediatrics). Patient chart reviews and key informant interviews aided survey development. Optimal practices were based on the World Health Organization 2009 dengue guidelines. We partnered with local clinical societies to distribute the online survey and collect descriptive data.

Results: A survey invitation was sent to 2,375 clinicians; of those, 217 (9%) completed the survey. Six percent of clinicians correctly identified all prevention messages. Half (56%) of participants correctly identified 4 clinical scenarios of dengue; 55% correctly managed fluid replacement among dengue patients with elevated hematocrit. Half (56%) of respondents correctly identified all symptoms of dengue and early indicators of shock, warning signs, or circumstances requiring a patient to return for care. Less than half (45%) of respondents correctly identified indications for blood transfusion. Deficits in knowledge were seen across all specialties.

Conclusions: Despite low response rate, this survey identified deficiencies in knowledge and clinical management of dengue among providers in Texas. These findings will be used to tailor dengue education for south Texas clinicians to reduce morbidity and mortality.

9:55 Chikungunya and Dengue Virus Infections Among United States Community Service Volunteers Returning From the Dominican Republic, 2014

Authors: Alexander Millman, D.H. Esposito, H. Biggs, J.L. Munoz-Jordan, R. Lanciotti, O.I. Kosoy, M.J. Sotir, G. Brunette, M. Fischer, T.M. Sharp, E.S. Jentes

Background: Chikungunya has rapidly spread throughout the Dominican Republic (DR) since it was first reported in March 2014. In June 2014, a US-based volunteer service organization operating in the DR reported chikungunya-like illnesses among its staff. We sought to determine chikungunya virus (CHIKV) and dengue virus (DENV) infection prevalence and consequent illness among volunteers/staff deployed on 4–8 week assignments in the DR and to evaluate adherence to recommended mosquito avoidance measures.

Methods: Service organization volunteers/staff returning to the United States in July and August were offered participation. Consenting participants completed a questionnaire surveying information on mosquito exposures and avoidance behaviors and febrile illness episodes; and provided serum for CHIKV and DENV diagnostic testing.

Results: Of the 147 volunteers/staff, 127 volunteers were eligible; 102 participated. Most (76%) were female; median age was 17 years. All attended the service organization's health trainings, and 89 (87%) sought pre-travel medical consultation. Ninety-six (94%) wore insect repellent and ninety-eight (96%) used bed nets; however, <5% stayed in domiciles with window/door screens. In total, 47 (46%) were CHIKV infected; two (1%) were DENV infected. Forty (85%) of 47 infected with CHIKV reported ≥1 febrile illness; 38 (95%) of 40 reported rash and joint pain. All DENV infected individuals reported ≥1 febrile illness; one (50%) of two reported rash and one (50%) reported joint pain. Forty-two (71%) of 59 reported febrile illnesses were associated with CHIKV or DENV infection.

Conclusions: CHIKV infections were common among these volunteers working in the DR during a large chikungunya outbreak. Clinicians should discuss chikungunya with travelers visiting areas with ongoing CHIKV outbreaks and should consider chikungunya when diagnosing febrile illnesses in travelers returning from those areas.

CONCURRENT SESSION G2: Occupational Health and Safety

8:30–10:15 AM

Dunwoody Suite

Moderators: Cammie Chaumont Menendez and Bruce Bernard

8:35 Cluster of Ebola Cases Among Liberian and U.S. Health Care Workers in an Ebola Treatment Unit and Adjacent Hospital — Liberia, 2014

Authors: Joseph Forrester, J.C. Hunter, S.K. Pillai, M.A. Arwady, P. Ayscue, A. Matanock, B. Monroe, I.J. Schafer, T.G. Nyenswah, K.K. De Cock

Background: Ebola treatment units (ETUs) are designed to optimize Ebola virus disease (Ebola) patient care while maintaining strict infection control procedures to prevent transmission of Ebola virus to health care workers (HCW). Ebola infections among HCWs can signal infection control deficits at healthcare facilities which may be amenable to intervention. On July 26, 2014, a laboratory-confirmed case of Ebola was reported in a HCW at an ETU adjacent to hospital A in Monrovia, Liberia; in the following 24 hours CDC was informed of two additional HCW cases at the same ETU. CDC conducted a rapid evaluation to identify additional cases and possible sources of exposure at these facilities.

Methods: Evaluation methods included interviews with infected HCWs, uninfected coworkers, administrators, onsite visits, and review of work schedules. Exposure risks to HCWs outside of the work environment were assessed through interview when possible.

Results: Five HCWs (three Liberian nationals and two U.S. nationals) who worked at the ETU, hospital A, or both, were identified as being infected during July 14–July 29; two died. No common source of exposure or chain of transmission was identified. Opportunities existed for transmission of Ebola virus to these HCWs, including: unprotected exposure to patients with undetected Ebola in hospital A, inadequate personal protective equipment (PPE) use during cleaning and disinfection activities in hospital A, and unprotected exposure of HCWs to ill colleagues.

Conclusions: Prompt identification and safe isolation of Ebola patients, effective PPE use by HCWs, separation of ETUs from hospitals, designation of trained HCWs to provide healthcare only at ETUs, and daily monitoring of HCWs for signs and symptoms of Ebola were identified as action items for public health intervention.

8:55 Elevated Blood Lead Levels in Adults — Missouri, 2012

Authors: Kerton Victory, C. Braun, W. Alarcon, M. de Perio

Background: Overexposure to lead, which is entirely preventable, may result in acute and chronic adverse health effects in multiple organ systems. Over 90% of adults with elevated blood lead levels (BLLs) in the United States are exposed occupationally. We characterized cases of elevated BLLs among Missouri adults because Missouri has historically had one of the highest prevalences of elevated adult BLLs. This information is useful to target interventions to prevent lead exposures.

Methods: We reviewed 2012 data on Missouri residents ≥16 years from the Missouri Adult Blood Lead Epidemiology and Surveillance system, which receives reports of all BLLs from testing laboratories. We defined an elevated BLL as ≥10 µg/dL, the CDC reference level for adults, and used the highest reported value for residents tested more than once. We analyzed characteristics of those with elevated BLLs and calculated the prevalence of elevated BLLs among Missouri adults.

Results: Of the 15,286 residents with a BLL in 2012 (median: 2µg/dL, range: 0–178µg/dL), 2,973 (19.5%) had BLLs ≥10µg/dL. Most residents with an elevated BLL were > 35 years (70%), male (88%), and worked in Johnson, Jefferson, Dent, or Iron counties (55%). The majority of residents (78%) with an elevated BLL reported work-related exposures, most commonly from manufacturing (including storage battery manufacturing and smelting/refining [64%]) and mining industries (including lead and zinc ore mining [26%]). The prevalence of elevated BLLs among Missouri was 106 per 100,000 persons, markedly higher than the U.S. national average of 22 per 100,000 persons in 2012.

Conclusions: Interventions to prevent occupational exposure to lead should target high-risk industries like manufacturing and mining and should ultimately reduce the prevalence of elevated adult BLLs in Missouri.

9:15 Readying the Responders — Infection Control Training for US Clinicians Bound for West Africa

Authors: Rupa Narra, M. Dott, A. Fiore, P. Griffin, C. Piper, J. Sobel, R. Tauxe, M. Jhung

Background: The 2014 Ebola epidemic in West Africa overwhelmed local healthcare infrastructure and created an urgent need for international clinicians to treat patients in Ebola Treatment Units (ETUs). Because no US-based training existed, we developed a 3-day course to train clinicians responding to the outbreak how to work safely in African ETUs.

Methods: CDC developed the course in 29 days with WHO and Médecins Sans Frontières personnel who had experience working in ETUs. The weekly course included lectures, table-top exercises, and exercises wherein participants simulated patient-care activities while wearing personal protective equipment in a mock ETU. For sustainability, early trainees included future course trainers as well as persons deploying immediately.

Results: Between September 22 and November 19, 2014, we received >700 trainee applications; 249 students were trained in eight course sessions, including participants from 27 non-governmental organizations (n = 115), the US Public Health Service (n = 83), the US military (n = 9), and CDC (n = 10). Among 160 participants reporting deployment to West Africa, none are known to have acquired Ebola virus disease (EVD). Ninety-eight different instructors taught at eight course sessions; each required approximately 20 instructors. Course graduates working in ETUs reported being well-prepared after training; 85% of students agreed that training objectives for course sections were fully met. Training is scheduled to continue into 2015.

Conclusions: Reducing community transmission by isolating EVD patients and providing care in ETUs is an important component of the public health response to the Ebola epidemic in West Africa. The CDC Ebola Safety Training Course has increased the number of clinicians who can provide care in African ETUs and serves as a model for prompt, focused training in response to public health emergencies.

9:35 *Cryptosporidium parvum* Outbreak at an Academic Animal Research Facility — Colorado, 2014

Authors: Jessica Hancock Allen, N. Alden, A. Cronquist

Background: Animal research laboratory workers are at risk for zoonoses, including cryptosporidiosis through fecal-oral transmission. Pre-weaned calves are common reservoirs. After cryptosporidiosis was reported in 3 workers caring for calves at academic research Facility A, we sought to identify additional cases, determine risk factors, and implement control measures.

Methods: The entire cohort, 28 animal husbandry staff, were interviewed regarding illness, potential exposures, training, and personal protective equipment (PPE) procedures. Ill persons were offered stool testing. A probable case of cryptosporidiosis had any diarrhea with duration ≥72 hours, abdominal cramps, or vomiting in a person who worked at Facility A during July 14–31; confirmed cases had illness meeting the probable case definition and laboratory evidence of *Cryptosporidium* infection.

Results: The response rate was 100% (28/28); 1 worker could not be classified as well or ill and was excluded. The cryptosporidiosis attack rate was 78% (21/27); 24% (5/21) were confirmed cases, and 1 worker was hospitalized. All 27 (100%) staff performed animal care tasks (e.g., power-washing feces) leading to substantial fecal exposure. Median job training was 2 hours, including 1 hour dedicated to respiratory-fit testing. No standard operating procedure existed for doffing PPE; the disease attack rate for workers who removed their gloves first was 84% (16/19), compared with 33% (2/6) for workers who removed gloves last (risk ratio = 2.53; P = .03). Fifty-nine percent (16/27) of workers reported removing their masks when performing animal care. Anecdotally, 3 staff stated that, pre-outbreak, facility leadership had informed them that cryptosporidiosis was guaranteed.

Conclusions: This outbreak highlights the importance of adequate training, enforced proper PPE procedures, and promotion of a culture of safety when working with animals.

9:55 Long Term Prophylaxis After Possible Anthrax Exposure

Authors: Leisha Nolen, P. Kache, G. Kharod, S. Katharios-Lanwermeyer, S. Shadomy, R. Traxler, K. Hendrix, H. Walke, W.A. Bower

Background: A laboratory incident occurred at CDC on June 6, 2014 that resulted in possible aerosolization of *Bacillus anthracis* spores. Post exposure prophylaxis (PEP) consists of 60 days of antibiotic administration and three vaccination doses. Previous studies suggest that PEP compliance is low, however it is unclear what influences peoples' choice to discontinue PEP.

Methods: Individuals were identified who were in the affected areas through self-report, card reader data and visitor logs. Forty-two people were identified who were considered potentially at risk for inhalation anthrax. A mid-treatment and an end-of-treatment survey were conducted that evaluated patient adherence and side effects of PEP.

Results: Side effects that were reported were consistent with previous side effect profiles. Of the 42 people for whom PEP was recommended, 31 (74%) people did not complete the full vaccination series and at least 24 (57%) did not complete the full antibiotic course. The most frequently stated reason for stopping PEP was a low perceived risk, with the second most common being the side effects of medication. While the number of people who reported side effects on doxycycline and ciprofloxacin were not significantly different, those on ciprofloxacin were at a 2 times higher risk of stopping antibiotic treatment (95% CI 1.1-3.6).

Conclusions: The low adherence rate observed during this event raises the concern that PEP adherence may be low after an intentional release of *B. anthracis* spores, leaving many at risk of infection. Public health messaging describing risk of anthrax and benefits of PEP needs to be improved to increase adherence. A shorter duration of PEP would be expected to improve adherence and is an area of active research.

CONCURRENT SESSION H1: Foodborne Diseases

10:30–11:55 AM

Ravinia Ballroom

Moderators: Stacey Bosch and John Dunn

10:35 Multistate Outbreak of Multiple *Salmonella* Serotype Infections Linked to Sprouted Chia Seed Powder — United States, 2014

Authors: Robert Harvey, K. Heiman, J. Kohl, M. Needham, A. Barnes, P. Penell-Huth, D. Nicholas, E. Traphagen, K. Soto, L. Mank, B. Melius, M. Wise, I. Williams, T. Kuntz, H. Lambert, S. Lance

Background: *Salmonella* causes 1.2 million infections and 380 deaths annually in the United States. On 5/6/2014, PulseNet, the national molecular subtyping network for foodborne disease surveillance, identified a cluster of *Salmonella* Newport infections with the same novel outbreak strain. US states, FDA, Canada, and CDC investigated to identify the source and prevent additional illnesses.

Methods: We defined a case as infection with an outbreak strain with onset 1/1/2014–7/22/2014. We conducted open-ended interviews to identify common exposures in the week prior to onset, administered supplemental questionnaires to refine hypotheses, collected products for testing, and performed traceback investigations.

Results: We identified 31 case-patients in 16 states; 22% (5/23) were hospitalized. Ninety percent (19/21) of case-patients reported consuming chia seeds or powder; 79% (15/19) of those specifically reported consuming chia seed powder of variable brand names. Traceback identified a Canadian firm as the common supplier for the sprouted chia seed powder. Multiple products containing sprouted chia seed powder from this firm were recalled and FDA denied admission of these products into the US until testing could confirm the products were no longer contaminated. During the investigation, testing of chia-containing products yielded two more *Salmonella* strains (Hartford and Oranienburg) that also caused illnesses; these were included in the outbreak.

Conclusions: Epidemiologic, traceback, and laboratory evidence identified sprouted chia seed powder processed at a single firm as the outbreak source. Although sprouted chia seeds are a novel *Salmonella* outbreak vehicle, this investigation highlights the well-documented risks for foodborne illness associated with the sprouting process. Firms choosing to produce sprouted seed products should follow available guidance to reduce the risk of bacterial contamination.

10:55 Cryptosporidiosis Associated with Consumption of Raw Goat Milk — Idaho, 2014

Authors: Mariana Rosenthal, R. Pedersen, S. Leibsle, V. Hill, D. Roellig, C. Hahn, K. Carter

Background: Raw milk consumption is an infrequently reported cryptosporidiosis risk. On August 27, 2014, Idaho Division of Public Health (DPH) was notified of 2 cases of cryptosporidiosis in siblings who had consumed raw (unpasteurized) goat milk produced at Idaho-licensed Dairy A and purchased at a retail store. Southwest District Health (SWDH) and the Idaho State Department of Agriculture (ISDA) investigated to identify the outbreak source and prevent further illness.

Methods: SWDH interviewed ill persons, reported per Idaho law, by using a standard questionnaire and CDC cryptosporidiosis case definitions. DPH coordinated testing of stool specimens from ill persons and milk samples for *Cryptosporidium* by real-time polymerase chain reaction (PCR). Public health districts and ISDA implemented regulatory controls.

Results: During August 27–September 3, primary cryptosporidiosis cases were reported among 5 children aged ≤5 years and an immunocompromised adult aged >75 years who had all consumed raw goat milk from Dairy A; 5 secondary cases were detected among household members. No other common risk factors were identified. Stool specimens obtained from 3 primary and 3 secondary cases were positive for *Cryptosporidium parvum* subtype IIaA16G3R1. Packaged raw goat milk produced August 18–28 and milk from the production line tested PCR-positive for *Cryptosporidium* at a commercial laboratory. ISDA issued a hold order on raw milk from Dairy A on August 30. Subsequently, at CDC, all milk samples tested PCR-negative for *Cryptosporidium*. Interlaboratory collaboration confirmed negative results by using DNA sequencing. ISDA released the hold order September 18. No further cases were identified.

Conclusions: Epidemiologic evidence implicated raw goat milk as the outbreak source. Milk pasteurization is recommended to reduce cryptosporidiosis risk, especially among young children and immunocompromised persons.

11:15 Toxigenic *Vibrio cholerae* Serogroup non-O1, non-O139 Infections in the United States, 1984–2014

Authors: Samuel Crowe, A. Newton, M. Parsons, S. Stroika, C. Bopp, M. Freeman, H. Gould, B. Mahon

Background: Toxigenic *Vibrio cholerae* can cause life-threatening watery diarrhea. Serogroups O1 and O139 have been responsible for cholera epidemics, but other serogroups—such as O75 or O141—are also toxigenic and can cause severe illness and death. We describe 30 years of surveillance for non-O1, non-O139 infections in the United States.

Methods: Since 1984, local and state public health departments have conducted surveillance for suspected *V. cholerae* cases and submitted isolates to CDC for confirmation, serogrouping, toxin testing, pulsed-field gel electrophoresis (PFGE), and antimicrobial susceptibility testing.

Results: Between 1984 and 2014, 52 cases of non-O1, non-O139 *V. cholerae* infection were reported to CDC, including 30 of serogroup O75, 21 of O141, and one untypeable. Nearly half of the cases (25/52) were among women. Median age was 49 years (range 12 to 86). Few underlying conditions were reported, but included immunodeficiency syndromes and gastric diseases. Symptoms included diarrhea (46/46), abdominal cramps (33/35), and nausea (28/33). Fourteen patients were hospitalized, and one died. Most patients ate seafood (38/43), especially raw oysters (23/38); a few had recreational contact with water (9/27). Twenty-one states—predominantly coastal—reported cases, including Florida (8), Louisiana (8), and Georgia (5). Most isolates (47/52) were susceptible to all antimicrobials tested. Yearly case counts are typically low (1.7 average), but PFGE identified one outbreak, which occurred in 2011 involving O75 infections in 11 patients who ate raw oysters harvested from Apalachicola Bay, Florida.

Conclusions: Toxigenic *V. cholerae* non-O1, non-O139 infections are rare in the United States, but can cause severe illness and are associated with raw oyster consumption. Additional oyster bed monitoring and messaging regarding the risks of eating raw oysters may be warranted.

11:35 *Campylobacter jejuni* Infection Associated with Raw Milk Consumption — Utah, 2014

Authors: Angela Dunn, K. Davis, L. McCullough, C. Burnett, C. Huft, T. Waller, A. Carter, D. Patton, S. Willardson, W. Garcia, J. Wagner, L. Smith, M. Stevens, A. Nakashima

Background: In Utah, raw milk sales are legal from farm to consumer. Despite routine bacterial and coliform counts by the Utah Department of Agriculture and Food (UDAF), raw milk-related illnesses occur. In May 2014, the Utah Department of Health (UDOH) identified a cluster of 3 *Campylobacter jejuni* infections with indistinguishable pulsed-field gel electrophoresis (PFGE) patterns. All patients reported consuming Dairy A's raw milk. Routine testing of UDAF-licensed Dairy A's raw milk was acceptable. We investigated to identify a source and prevent additional infections.

Methods: UDAF used onsite milk neutralization technique to preserve *C. jejuni* during testing. Utah's electronic disease surveillance system identified cases. Confirmed illness was defined as diarrhea caused by *C. jejuni* matching the cluster PFGE pattern. Probable illness was diarrhea and contact with a confirmed patient or raw milk purchased from Dairy A. Confirmed patients were interviewed by using a standardized questionnaire.

Results: During May 9–July 31, a total of 89 (52 confirmed and 37 probable) cases were identified. Eleven (21.2%) confirmed patients were hospitalized; 1 died. Twenty-five (48.1%) confirmed patients reported having consumed Dairy A raw milk. Fifteen (28.8%) confirmed patients reported having eaten queso fresco. Dairy A's raw milk yielded *C. jejuni* with the cluster PFGE pattern. UDAF suspended Dairy A's raw milk permit on August 4 for 2 months. Additional cases occurred in November; UDAF revoked Dairy A's raw milk permit on December 1.

Conclusions: Routine testing of raw milk does not ensure its safety. Mandatory reporting, timely sample collection, pathogen testing, and onsite milk neutralization likely led to *C. jejuni* detection. Linking case and raw milk PFGE patterns might identify the source and allow implementation of control measures.

CONCURRENT SESSION H2: Environmental Health

10:30–11:55 AM

Dunwoody Suite

Moderators: Suzanne Beavers and Patrick Breysse

10:35 Calls to U.S. Poison Centers Regarding Electronic Cigarettes — United States, September 2010–October 2014

Authors: Kevin Chatham-Stephens, R. Law, E. Taylor, S. Kieszak, P. Melstrom, B. Apelberg, B. Wang, J. Schier

Background: Electronic cigarettes (e-cigarettes) are battery-powered devices that deliver an inhalable aerosol that typically contains nicotine and flavorings. E-cigarette use doubled among U.S. adults from 2010 to 2011 and U.S. adolescents from 2011 to 2012, but the impact on public health remains unclear. To characterize exposures and acute health effects from e-cigarettes, we compared exposure calls to poison centers (PCs) related to e-cigarettes with exposure calls related to conventional tobacco cigarettes, a product with known toxicity.

Methods: We analyzed calls to U.S. PCs from September 1, 2010, through October 31, 2014. We compared the demographics of the exposed individuals and adverse health effects reported for e-cigarettes with those reported for cigarettes using Chi-square tests.

Results: PCs reported 5,247 calls for e-cigarettes and 19,597 for cigarettes. E-cigarette calls increased from 1 in September 2010 to a peak of 401 in April 2014, then decreased to 285 in October 2014. Monthly cigarette calls ranged from 302 to 514. E-cigarette calls were mostly for the 0–5 year (60%) and >20 year (32%) age groups; cigarette calls were primarily for the 0–5 year age group (96%). Among calls with outcome information (n = 13,309), e-cigarette calls were more likely to report an adverse health effect than cigarette calls (51.6% versus 35.9%) (P<.001). Among e-cigarette calls reporting a health effect (n = 1,575), the most common effects were vomiting (40%), eye irritation (20%), and nausea (17%).

Conclusions: E-cigarette calls to PCs increased from 2010 through early 2014 and then decreased through late 2014, while, overall, conventional cigarette calls remained stable. Given the overall increase in e-cigarette exposure calls, developing strategies to monitor and prevent future poisonings from these novel devices is critical.

10:55 Assessing Injuries, Chronic Disease Exacerbations, and Mental Health Problems After the South Napa Earthquake — California, 2014

Authors: Kathleen Attfield, C. Dobson, J. Wilken, S. Smorodinsky, J. Henn, K. Foster, T. Barreau, G. Windham, B. Materna, R. Roisman

Background: On August 24, a magnitude 6.0 earthquake struck South Napa in California. Napa County reported 280 injuries, 1 death, and substantial damage to infrastructure. The California Department of Public Health assisted Napa County Public Health (NCPH) in conducting a Community Assessment for Public Health Emergency Response (CASPER) survey to assess earthquake-associated injuries, chronic disease exacerbations, and mental health problems.

Methods: We used a 2-stage cluster sampling design to select a target of 210 representative households in the City of Napa representing 30,005 household units. During September 16–18, we conducted household interviews with questions adapted from prior CASPERs and PsyStart (University of California), a psychological triage screener. Frequencies and confidence intervals (CI) were weighted to account for the sampling design.

Results: Of the 201 participating households, 19% (95% CI: 10–27%) reported an injury of at least 1 household member, including broken bones, deep cuts, and sprains, with 43% (95% CI: 19–67%) of these resulting from cleanup activities. Sixty-four percent (95% CI: 55–72%) of households reported a chronic health condition; 26% (95% CI: 18–34%) of these indicated worsening of their conditions, most commonly mental health conditions, asthma, and diabetes. Twenty-seven percent (95% CI: 21–33) reported that at least 1 household member had experienced an earthquake-associated traumatic event or loss, e.g., observing a direct threat to a family member's life or being trapped during evacuation.

Conclusions: Napa residents might require sustained postdisaster mental health services because of the high proportion of traumatic experiences reported, and NCPH has reported using these CASPER results to plan expanded mental health services. NCPH communications should emphasize the injury risk from cleanup and risks for chronic disease exacerbation after earthquakes.

11:15 Parking Prices and Walking and Bicycling to Work in U.S. Cities

Authors: Geoffrey Whitfield, A. Wendel

Background: Physical activity reduces the risk of developing several of the leading causes of death in the U.S. Commuting by walking or bicycling is less common in the U.S. than other developed countries and is a potential source of physical activity. Environmental and policy determinants of active commuting are not well understood. The purpose of this city-level ecological study was to determine if daily parking prices are associated with active commuting in a sample of U.S. cities.

Methods: We obtained average daily off-street parking prices (2009, n = 90 cities) from the Drexel University Parking Study. We obtained the prevalence of past-week active commuting to work from the American Community Survey (ACS). The 2010 Census and the 2009 ACS provided relevant covariates. We assessed the association between parking prices and walking and bicycling using weighted linear regression models to account for differences in the precision of commuting estimates. Walking and bicycling were modeled separately, with unique covariates selected by stepwise elimination.

Results: Daily off-street parking prices varied from $3 to $35. The prevalence of walking to work varied from 1% to 16%, and bicycling to work varied from 0% to 12%. After adjusting for age, household size, and an interaction with population density, the proportion walking to work was 3.4% higher ($p<0.0001$) for every additional dollar charged in more-dense (≥3550 people/mi^2) but not less-dense cities. After adjusting for population density, household size, and income, there was no association between parking prices and bicycling to work.

Conclusions: At the city level, daily parking prices were significantly associated with walking to work in more-densely populated cities. Additional individual-level research is needed to determine causality, but parking price may influence walking behaviors.

11:35 Assessment of Impact and Recovery Needs in Communities Affected by the Elk River Chemical Spill — West Virginia, April 2014

Authors: Ethan Fechter-Leggett, S. Burrer, A. Wolkin, T. Bayleyegn, R. Noe, J. Hsu, N. Nakata, L. Lewis, M.P. Mark-Carew, C.A. Thomas, D. Bixler, E.R. Thomasson, L. Haddy

Background: On January 9, 2014, 4-methylcyclohexanemethanol and a mixture of propylene glycol phenyl ethers spilled into Elk River near Charleston, West Virginia, contaminating water supplies for approximately 120,000 households. A "Do Not Use" water order covered nine counties for up to 10 days. In April 2014 a Community Assessment for Public Health Emergency Response (CASPER) was conducted to assess the communities' perceived health effects of the chemical spill, alternative sources of water, information sources, and public water supply use.

Methods: A representative sample of households within the affected area was selected using two-stage cluster sampling (30 clusters, 7 households per cluster). Interview teams administered a questionnaire to each household. We used Epi Info™ 7 to generate weighted percentages of households within the affected area.

Results: We enrolled 171 households (81% completion rate). Of those, 22% (95% confidence interval = 14%–29%) in the three months following the spill had at least one person with health issues they thought were related to the spill, 74% (64%–85%) did not have 3-day alternative water supplies for each household member and pet, and 58% (49%–67%) considered television the most reliable source of information about the spill. At the time of the CASPER, only 36% (28%–44%) believed their water supply was safe, compared to 86% (80%–91%) before the spill, and 34% (27%–40%) reported drinking their household's water.

Conclusions: To assist recovery efforts and improve future responses, recommendations included promoting availability of health and mental health services to aid affected communities, encouraging households to maintain Federal Emergency Management Agency–recommended 3-day water supplies, and increasing community education, especially through television, to address the public's water concerns.

SPECIAL SESSION: Prevention and Control of Ebola Virus Disease at Home and Abroad

12:10–1:30 PM

Dunwoody Suite

Moderator: Barbara Knust

SPONSOR: National Center for Emerging and Zoonotic Infectious Diseases (NCEZID)

The focus of this session will be to provide an overview for EIS officers, state participants, and other attendees on efforts by CDC and state/local health departments to contain the largest known Ebola virus disease (EVD) outbreak. This includes activities undertaken domestically to mitigate the risk of transmission in the United States as well as internationally to control the ongoing outbreak in West Africa.

Relevance and Appropriateness for the EIS conference

Many EIS officers and conference attendees have been on the front lines of the Ebola response, but may not have a comprehensive view of efforts to prevent and control Ebola virus transmission. This session will not only provide an overview of a broad array of public health activities related to EVD, but will highlight how early experiences in the outbreak affected the prevention and control strategy

Speakers:

- Training Responders to "Keep Safe, Keep Serving." *Michael Jhung* and *Neil Gupta*
- Reducing the Risk of Ebola Spread Across Borders — West Africa and United States, 2014–2015. *Tai-Ho Chen*
- Dallas and Beyond: A Tiered Approach to Hospital Readiness and Response Through CDC Rapid Ebola Preparedness Teams. *John Jernigan*
- Ebola Virus Disease in New York City: Preparing and Responding. *Jay Varma*

CONCURRENT SESSION 11: Ebola Response in Less-Affected Countries

1:35–3:20 PM

Ravinia Ballroom

Moderators: Frederick Angulo and Mary Reynolds

1:40 Challenges in Detecting Ebola Virus Disease in an Unaffected Country — Guinea-Bissau, 2014

Authors: Amelia Kasper, J. Marcinkevage, P. Cardoso, C. Manjuba, I. Alvarenga, S. Biai, I. Grovas, F. Luef, A. Macedo de Oliveira, F. Angulo

Background: Early detection of Ebola virus disease (EVD) cases is essential to stop transmission of this often fatal disease. Guinea-Bissau is at high-risk for Ebola because it borders Guinea, a country with widespread transmission. We evaluated the ability of the EVD reporting system in Guinea-Bissau, which started in July 2014, to detect cases.

Methods: A suspect patient is a person who travelled to an EVD-affected country ≤21 days prior with (1) fever (>38ºC) and ≥3 of the following: headache, vomiting, anorexia, diarrhea, lethargy, joint/muscle pain, difficulties swallowing/breathing, hiccups; (2) unexplained bleeding; or (3) sudden/unexplained death. Health-care workers should alert regional health authorities about suspected cases, who then alert the national authorities. Laboratory testing is necessary to confirm cases. We interviewed local stakeholders and health-care workers in four high-risk border villages to evaluate their awareness of the reporting system. We also interviewed national epidemiologists to review alerts to the national reporting system.

Results: One out of six health-care workers from border regions interviewed knew the EVD case definition. Sixteen alerts were made during July 1–November 30, 2014, all in the capital. One (6%) alert matched the case definition; the others lacked travel history to an affected country. This patient, who was never tested for EVD, improved with anti-malarials. Stakeholders reported laboratory testing is hampered by limited local infrastructure and options to ship samples abroad.

Conclusions: Despite a broad case definition, there has been one reported suspect EVD case, without associated laboratory testing, reported in Guinea-Bissau. Additional training of health-care workers will improve ability to recognize and report suspect cases. Rapid laboratory confirmation of suspect cases is necessary to detect outbreaks and trigger a timely response.

2:00 Preparedness for Ebola Virus Disease (EVD) — Western Côte d'Ivoire, October 2014

Authors: Prathit Kulkarni, R.L. Lobognon, F. Diomande, L.I. Elbadawi, A.S. Gueye, S. Dagnan, F. Angulo, E.M. Ahoussoy, D. Coulibaly

Background: Côte d'Ivoire (CI) has 9 health districts on its western border with Liberia and Guinea; intense transmission of EVD is reported in both countries near the CI border. Given the continued movement of people across the border, CI is at high risk for introduction of EVD. We evaluated border health facilities in CI for preparedness in detecting and responding to suspect EVD cases.

Methods: We visited 6 secondary- and tertiary-care health facilities, each in a different city, spanning 4/9 health districts on the western CI border. The 6 facilities were selected randomly from a total of 60 similar facilities along the border. Information was obtained through open-ended interviews and direct observation. Preparedness elements examined included: detecting and isolating cases, implementing infection control measures, alerting the national public health authority, and initiating contact tracing.

Results: Five of six facilities had investigated patients with Ebola-compatible symptoms since March 2014; the median number of such patients was 3. Five facilities had teams in place to manage EVD cases; only 1 facility had an area for donning and doffing personal protective equipment. Public health officials at all 6 facilities had a plan for notifying the national public health authority about suspect cases. Only one facility had a plan for collecting and transporting specimens for Ebola testing and for initiating contact tracing.

Conclusions: Preparedness for EVD varied widely within 6 border health facilities in western CI; specific recommendations for improvement were made for each facility. Based upon this work, a larger study assessing a wider range of communities and facilities is planned to provide comprehensive, national-level preparedness recommendations to the national public health authority in CI.

2:20 Rapid Containment of Ebola Using Contact Tracing Following an Imported Case of Ebola Virus Disease — Senegal, 2014

Authors: Kelsey Mirkovic, J. Thwing, P.A. Diack

Background: Ebola Virus Disease (EVD) is currently plaguing West Africa, where the majority of cases have been reported from Guinea, Liberia, and Sierra Leone. Neighboring countries are especially at risk for virus importation given the frequency and ease of cross-border travel. On August 29th Senegal was the fifth country to confirm an EVD case in a Guinean student (Patient X) who recently arrived in Senegal. The study objective was to assess effectiveness of contact tracing in disrupting EVD transmission.

Methods: At the request of the Senegalese Ministry of Health, 4 CDC personnel were rapidly deployed to assist with the containment of EVD including contact tracing.

Results: Sixty-seven contacts were initially identified (34 residents of the household where Patient X stayed and 33 healthcare workers); an additional 7 healthcare workers self-identified as contacts during an infection control training 13 days later totaling 74 contacts. Contacts were requested to submit to in-home voluntary quarantine, with twice daily temperature monitoring. On Day 1 of monitoring, 51% (34/67) of initially identified contacts were seen, which increased to 90% (60/67) by Day 5. Compliance was observed from household contacts at all visits. However, some physicians contacts resisted in-home voluntary isolation and temperature monitoring by non-medical volunteers. During monitoring, 4 contacts developed symptoms consistent with EVD; laboratory testing was negative for all. All 74 contacts completed the 21-day monitoring with no further cases of EVD.

Conclusions: Rapid implementation of contact tracing was successfully established and Senegal was declared Ebola-free on October 17. Neighboring countries are at high risk for virus importation and must be prepared to quickly identify imported cases and rapidly implement contact tracing to prevent EVD spread.

2:40 Pivoting from Preparedness to Response: Containment of the First Outbreak of Ebola Virus Disease in a Previously Unaffected Country — Mali, 2014

Authors: Magdalena Paczkowski, A. N'Dir, A. Berthé, M.B. Sylla, F.C. Haidara, M. Sacko, I.S. Fall, S. Sow, T. Novak

Background: On October 25, 2014, an acutely ill person arrived at a private clinic in Bamako, Mali from Kourémalé, Guinea. The patient had symptoms consistent with Ebola virus disease (Ebola) and died on October 27. Public health authorities were notified on November 10 after the patient's son tested positive for Ebola and a cluster of contacts with Ebola symptoms was subsequently identified. We immediately initiated an outbreak investigation and implemented strategies to contain transmission.

Methods: Strategies included case investigations using a standard case report form and contact monitoring. Contacts lived in the same house as or had direct physical contact with case-patients or their body fluids. Case status was probable in persons with known contact prior to symptom onset with a probable or confirmed Ebola case, and confirmed when Ebola virus was detected in a specimen by reverse transcription-polymerase chain reaction.

Results: Case investigation and contact monitoring began November 10 and 11, respectively. Eight Ebola cases (6 confirmed, 2 probable), 6 deaths (case fatality rate 75.0%), and 332 contacts were identified. Among contacts of the imported case, the primary attack rate was 20.0% (5/25). The secondary attack rate among 33 contacts with known exposure to bodily fluids was 3.0% (1/33). On December 16, the remaining contacts exited 21 days of monitoring; no additional cases were identified.

Conclusions: This Ebola outbreak in Mali was the result of an imported case from a highly affected country. Once public health authorities were notified, transmission was interrupted within 2 weeks. The successful implementation of containment strategies in Mali serves as a model for unaffected country preparedness. Maintaining this preparedness is critical until the epidemic in West Africa is controlled.

3:00 Public Health Response to an Imported Case of Ebola Virus Disease — New York City, 2014

Author: Kari Yacisin for the New York City Department of Health and Mental Hygiene Ebola Response Team

Background: After the first U.S. case of Ebola virus disease (Ebola) was diagnosed in Texas, the New York City (NYC) Department of Health and Mental Hygiene (DOHMH) activated its incident command system to direct Ebola surveillance resources and increase collaboration with nongovernmental organizations (NGO), Emergency Medical Services (EMS), and hospitals. On October 23, an NGO notified DOHMH that one of its medical volunteers had a 100.3°F oral temperature 9 days after returning from treating Ebola patients in Guinea. DOHMH coordinated with EMS to transport the volunteer to the designated NYC Ebola hospital within 2 hours of notification; Ebola testing was positive within 8 hours of admission. DOHMH sought to prevent disease transmission in NYC.

Methods: DOHMH interviewed the patient regarding community contacts and places visited. DOHMH dispatched field teams to evaluate possible contacts that might need monitoring, established monitoring of community contacts, and assessed the patient's home. DOHMH and the designated Ebola hospital established systems to identify and monitor healthcare workers with potential exposure.

Results: Of 5 possible community contacts, 3 were categorized as close contacts, issued quarantine orders, and required to undergo daily in-person evaluation and telephone call to document symptoms. DOHMH oversaw cleaning of the patient's home by a professional contractor. Active monitoring (daily telephone call to document symptoms) for 21 days was conducted for 114 healthcare workers, including EMS (7), hospital (64), hospital laboratory (42), and DOHMH laboratory (1) personnel. No contacts developed Ebola. The response to this single case involved more than 500 DOHMH employees and cost over $4,300,000.

Conclusions: Local public health response to a single Ebola case was resource intensive and required close coordination of multiple agencies and partners.

CONCURRENT SESSION I2: Respiratory Diseases

1:35–3:20 PM

Dunwoody Suite

Moderators: Michael Jhung and David Swerdlow

1:40 Middle East Respiratory Syndrome–Coronavirus in an Extended Family: Risk Factors for Household Transmission — Saudi Arabia, 2014

Authors: M. Allison Arwady, B. Alraddadi, C. Basler, S. Gerber, D. Feikin, T. Madani

Background: Risk factors for human-to-human transmission of Middle East respiratory syndrome–coronavirus (MERS–CoV) are unknown. When MERS–CoV infections occurred in 4 households of one Saudi extended family within 1 week, we aimed to identify undiagnosed cases and determine transmission risk factors.

Methods: We tested relatives who lived in or visited affected households for MERS–CoV by using reverse-transcriptase–polymerase chain reaction (RT–PCR) for viral RNA and serologic tests for MERS–CoV antibodies. We assessed demographic characteristics and exposures to each household's index patient and compared these exposures in the MERS–CoV-positive and -negative adults by calculating risk ratios.

Results: Among 79 relatives, 19 (24%) were MERS–CoV-positive (11 by RT–PCR, 8 by serology). The attack rate among adults living in the 4 affected households ranged from 14% to 64%; no visiting relatives acquired MERS–CoV. Sixteen (84%) of the MERS–CoV-positive family members, including all 4 index patients, were male; 8 (42%) had comorbidities; 11 (58%) were hospitalized; and 2 (11%) died. Risk factors for household transmission included sleeping in an index patient's room (risk ratio [RR]: 4.1; 95% confidence interval [CI]: 1.5–11.2), changing patient's clothes or sheets (RR: 2.9; CI: 1.0–8.4), and removing patient's waste (RR: 3.2; CI: 1.2–8.4). Casual contact (e.g., shaking hands) and simple proximity (e.g., being within 1 m of the patient) were not significant risk factors for transmission.

Conclusions: In this MERS–CoV family cluster, the largest identified, the highest risk for household transmission was among those who provided direct care to ill relatives. The finding that casual contact did not increase transmission risk can guide resource allocation in future MERS–CoV investigations.

2:00 The Benefit of Early Influenza Antiviral Treatment of Pregnant Women Hospitalized with Laboratory-Confirmed Influenza

Authors: Ikwo Oboho, C. Reed, M. Leon, G. Rothrock, D. Aragon, J. Meek, M.M. Farley, P. Ryan, S. Peters, R. Lynfield, C. Morin, M. Bargsten, S. Zansky, B. Fowler, A. Thomas, E. Mermel

Background: Pregnancy is a risk factor for seasonal and pandemic influenza-related complications. We describe demographics, clinical outcomes and the effect of early antiviral treatment among pregnant women hospitalized with laboratory-confirmed influenza in the post-2009 pandemic era.

Methods: We used national surveillance data on pregnant women aged 15–44 years hospitalized from 2010–14. Severe influenza was defined as intensive care unit admission, mechanical ventilation, respiratory failure, acute respiratory distress syndrome, pulmonary embolism, sepsis, or death. Among patients hospitalized for >1 day, within each severity stratum, we used parametric survival analysis to compare hospital length of stay (LOS) by timing of antiviral treatment, adjusting for vaccination, pregnancy trimester, and presence of comorbidity.

Results: Among 865 pregnant women, median age was 27 years (interquartile range [IQR], 23–31). The majority of women (68%) had no underlying medical conditions. Overall, 478 (57%) were in their third trimester; 188 (22%) delivered during hospitalization, with 41/188(22%) delivering <37 weeks gestation. A minority of women (26%) had received seasonal influenza vaccine, and 85% were treated with antiviral agents. Sixty-three (7%) women had severe influenza, including 4 deaths. Severe influenza was associated with preterm delivery and fetal loss. Comparing those treated with antivirals ≤2 days with those treated >2 days from illness onset, median LOS in days was 3.0 (IQR 1.9–4.9; n = 31) vs. 9.5 (IQR 4.6–19.6; n = 11) for severe cases ($p<0.01$), and 2.6 (IQR 2.5–2.7; n = 357) vs. 3.2 (IQR 2.9–3.5; n = 86) for non-severe cases ($p<0.01$), respectively.

Conclusions: Our findings suggest that prompt influenza antiviral treatment for pregnant women hospitalized with influenza may reduce LOS, especially among severe cases. Influenza during pregnancy is associated with maternal and infant morbidity and annual influenza vaccination is warranted.

2:20 Penicillin Nonsusceptibility Among Cases of Invasive Pneumococcal Disease — New York State, January 2013–March 2014

Authors: Misha Robyn, S. Zansky, D. Blog, A. Newman

Background: Antimicrobial-resistant *Streptococcus pneumoniae* (pneumococcus) causes 1.2 million U.S. illnesses annually, resulting in $96 million in medical costs. Invasive pneumococcal disease (IPD), which occurs when pneumococcus is identified in normally sterile body sites (e.g., blood), is reportable in New York State (NYS), using the Communicable Disease Electronic Surveillance System (CDESS). Because high-quality surveillance is crucial for controlling antimicrobial resistance, we evaluated CDESS reporting of penicillin-resistant IPD cases.

Methods: Clinical microbiology laboratories report penicillin susceptibility results to county health departments (CHDs); CHDs enter results into CDESS preliminarily as sensitive, intermediate, resistant, or unknown. After case investigation, CHDs enter final results. If final results differ from preliminary results, reports must be deleted and reentered. To assess quality, we compared preliminary with final results for all IPD cases reported for January 2013–March 2014. We also compared final results entered from 15 counties that send IPD isolates to CDC for confirmatory susceptibility testing. Agreement between CDESS and CDC results was assessed by using Cicchetti-Allison kappa weights.

Results: Of 1,295 IPD reports in CDESS, 459 (35%) were missing final penicillin susceptibility results. Of 836 remaining reports, preliminary and final results differed in 32 (3.8%). Of these, 10 (31.3%) preliminary results indicated susceptibility when final result indicated nonsusceptibility. Of the 203 isolates submitted to CDC for confirmatory testing, 45 (22%) had final results in CDESS that differed from results obtained at CDC. Penicillin-susceptibility results from the 15 counties and CDC had a 31% agreement.

Conclusions: Usefulness of NYS IPD penicillin-susceptibility data is limited because of missing results and only fair agreement with CDC results. CDESS efficiency might be improved if susceptibility results were entered only after confirmation.

2:40 Influenza Testing and Antiviral Prescriptions During Acute Respiratory Hospitalizations — Yale–New Haven Hospital, Connecticut, October 2009–April 2013

Authors: Melissa Rolfes, K.M Yousey-Hindes, J.I. Meek, A.M. Fry, S.S. Chaves

Background: Prompt, empiric influenza antiviral treatment is recommended for hospitalized patients with suspected influenza. However, data on antiviral use are limited. We describe influenza testing and antiviral prescribing practices over time and by patient characteristics for persons hospitalized during four influenza seasons (October 1–April 30) at Yale–New Haven Hospital.

Methods: We reviewed administrative records from 2009–2013 for acute respiratory infection (ARI) hospitalizations. We compared influenza testing within 7 days of admission and antiviral prescribing within 2 days of admission by influenza season, age group, and presence of pre-existing medical conditions. We used Poisson regression to calculate season- and age-adjusted rates.

Results: The overall, age-adjusted rate of influenza testing among ARI hospitalizations was 33% (95% Confidence Interval [CI] 31, 34%). At seasonal peaks, 10–30% of influenza tests were positive. Most testing (95%) was ordered within 2 days of admission. Testing was more common among those <2 years (64%; 95% CI 54, 76%) than those ≥65 years (32%; 95% CI 29, 36%) and did not vary by presence of medical conditions. Testing increased significantly over time among those ≥65 years (p-value<0.001). Antiviral prescription occurred in 4.0% (95% CI 3.6, 4.4%) of hospitalizations in 2009–2010, with lower rates in subsequent seasons. Children had fewer prescriptions compared to older inpatients. Antiviral prescription was 25-times higher for those tested for influenza (4.6 vs. 0.2%; p-value<0.001), but did not vary by presence of medical conditions (4.1 vs. 4.5%).

Conclusions: Our results suggest that few clinicians considered influenza diagnosis among ARI hospitalizations during influenza seasons and rarely used empiric antiviral treatment. Efforts to educate clinicians and understand barriers to antiviral use are needed.

3:00 Getting Under the Skin: Socioeconomic Disparities in Invasive Pneumococcal Disease Among Children <5 Years Old, Selected States, 2013

Authors: Matthew Westercamp, N. Bennett, M. Farley, R. Gierke, L. Harrison, C. Holtzman, L. Miller, M. Nichols, S. Petit, A. Reingold, W. Schaffner, A. Thomas, S. Zansky, M. Moore

Background: *Streptococcus pneumoniae* (pneumococcus) is the most common vaccine-preventable bacterial cause of death in the U.S. Rates of invasive pneumococcal disease (IPD) among black children are double that of whites but little is known regarding the interplay of race and poverty in determining risk.

Methods: Geocoding was performed on IPD cases in 7 Active Bacterial Core (ABCs) sites in 2013 identifying a total of 107 cases with geocoding successful for 104 (97%) of these. IPD cases had pneumococcus isolated from normally sterile sites in a resident of an ABCs area. We used denominators from the 2010 U.S. census and the 2009 American Community Survey to estimate annual incidence by census tract-level poverty.

Results: In this population we did not observe significant association between community poverty level and IPD (Rate/100,000: <5% community below poverty level = 8.1; 5%to<10% = 7.4; 10%to<20% = 12.9; >20% = 6.8; MHχ2: p = 0.93). In communities with <5% of household in poverty, however, blacks had approximately five times the incidence compared to other race/ethnicities (Rate/100,000: 25.4 vs 5.9; χ2: p = 0.02). This relationship was attenuated but remained significant as poverty level increased. Further, while IPD incidence did slightly increase with increased poverty in other race/ethnic groups, rates decreased in black children from over 25 to less than 13 per 100,000.

Conclusions: In children <5 years of age we did not observe the expected increased incidence of IPD in communities with increased poverty. Black children had consistently higher incidence than other racial/ethnic groups, which community poverty did not fully explain. Our findings are unexpected and will need verification. If confirmed, further investigation to understand underlying care/prevention patterns is warranted.

SESSION J: Alexander D. Langmuir Memorial Lecture

3:45–5:15 PM

Ravinia Ballroom

Moderator: Patricia Simone

Presentation of the Alexander D. Languir Prize Manuscript Award and the Distinguished Friend of EIS Award

Large-Scale Machine Learning and Its Application to Public Health

Speaker: Jeff Dean

Abstract:

Over the past few years, we have built large-scale computer systems for training artificial neural networks, and then applied these systems to a wide variety of problems that have traditionally been very difficult for computers. We have made significant improvements in the state-of-the-art in many of these areas, and our software systems and algorithms have been used by dozens of different groups at Google to train state-of-the-art computer models for speech recognition, image recognition, various visual detection tasks, language modeling, language translation, and many other tasks. Much of this work relies on automatically learning interesting models from large data sets. During this talk, I will highlight some of our results and describe why I think this general approach could be applied to specific domains, such as health care and public health. This talk describes joint work among many persons at Google.

Bio:

Jeff Dean, PhD, co-developed the first six versions of Epi Info™ as a high school and college student during internships at CDC and with the World Health Organization. He has had a long-term interest in the use of large-scale analysis of data to improve people's lives. He joined Google in 1999 and is currently a Google Senior Fellow in their Knowledge Group, where he leads Google's deep learning research team in Mountain View, California. He has co-designed or implemented five generations of Google's crawling, indexing, and query serving systems and co-designed or implemented major pieces of Google's initial advertising and AdSense for Content systems. He is also a co-designer and co-implementor of Google's distributed computing infrastructure, including the MapReduce, BigTable and Spanner systems, protocol buffers, LevelDB, systems infrastructure for statistical machine translation, and other internal and external libraries and developer tools. He is currently working on large-scale distributed systems for machine learning. He received his PhD in Computer Science from the University of Washington in 1996. He is an Association for Computing Machinery (ACM) fellow, an American Association for the Advancement of Science (AAAS) fellow, a member of the U.S. National Academy of Engineering, and a recipient of the Mark Weiser Award and the ACM-Infosys Foundation Award in the Computing Sciences. Additional information about Dr. Dean is available at http://research.google.com/people/jeff.

SESSION K: FETP International Night

5:30–10:30 PM

5:30 Poster Presentations

6:45 Photo Contest

7:30–10:30 Oral Presentations and Awards

Ravinia Ballroom

See supplement for complete list of presenters and abstracts.

7:40 Elevated Lead Exposure Among Children Aged 1 to 5 Years — Philadelphia, 2014

Authors: Rebecca Merrill, K. Chatham-Stephens, O. Olaiya, J. Nielsen, T. Dignam, L. Werner, J. Kelly, A. Pomales, C. Newbern, K. Scruton, M.J. Brown

Background: Elevated blood lead levels (BLLs) can adversely affect neurodevelopment and growth. We investigated the prevalence and risk factors for elevated BLLs among children living near a former lead-emitting facility in Philadelphia.

Methods: We conducted a cross-sectional survey of systematically random sampled households ≤2.7 kilometers from the former facility. A household visit for children aged 9 to 71 months included a standardized interview of a legal guardian and collection of the following for lead analysis: a venous blood sample from the child, household dust, soil, and tap water. We used logistic regression to find associations between environmental lead and elevated BLLs (≥ 5 µg/L).

Results: Among 97 children tested, 13.4% had elevated BLLs (range: 0.15-11.00 µg/L). One-third of households had soil with elevated lead (>400 µg/g, 33.0%). Twenty-seven (22.3%) front door and 21 (17.9%) child play area dust floor samples exceeded HUD action levels (40 µg/ft^2). None of the 121 tap water samples was above the EPA action level (15 µg/L). Compared with children in households with <2 elevated environmental samples, those in households with ≥2 (25.8%) had higher odds of elevated BLLs (OR: 4.3; 95% CI: 1.8-14.3).

Conclusions: The prevalence of elevated BLLs among children aged 1 to 5 years in a formerly industrialized area in Philadelphia is similar to that in the overall Philadelphia lead surveillance system (10.4%, <7 year-old children, 2012), but more than the current US prevalence (2.5%). Our findings support the previously published correlation between elevated lead in environmental samples and BLLs. The possible sources of elevated BLLs could be soil and dust, although the contribution from residential lead paint or former industrial lead emissions is unknown.

SESSION L: Donald C. Mackel Memorial Award Finalists

8:30–10:15 AM

Ravinia Ballroom

Moderators: Kate Glynn and Beth Skaggs

8:35 Molecular Epidemiology of *Mycoplasma pneumoniae* (Mp) During an Outbreak of Mp-Associated Stevens-Johnson Syndrome — Colorado, 2013

Authors: Louise Francois Watkins, X. Lin, A. Demirjian, D. Olson, M.H. Diaz, A.J. Benitez, T.A. Foo, S.R. Dominguez, L.A. Miller, J.M. Winchell, P.K. Kutty

Background: *Mycoplasma pneumoniae* (Mp) is a common cause of community-acquired pneumonia, and rarely triggers Stevens-Johnson syndrome (SJS), a potentially-fatal mucocutaneous disorder, in children and young adults. During fall 2013, an outbreak of Mp-associated SJS occurred in Colorado in the setting of a community Mp epidemic, providing the first opportunity to compare Mp molecular characteristics in SJS patients, their household contacts, and other Colorado patients with Mp infections.

Methods: We contacted five Colorado hospitals and four referral laboratories and obtained all available respiratory specimens that were positive for Mp by polymerase chain reaction (PCR) from patients with SJS (case-patients, n = 5, collected September–November 2013) and without SJS (non-case-patients, n = 69, collected January 2013–January 2014). We subjected these specimens to confirmatory real-time PCR testing at CDC. Naso/oropharyngeal swabs were obtained from 15 household contacts of three case-patients for Mp PCR testing in December 2013. Subtyping was performed by multilocus variable-number tandem-repeat analysis (MLVA) at four genomic loci.

Results: All 74 specimens were confirmed Mp-positive by PCR. Three MLVA types predominated, including closely-related types 3-5-6-2 and 3-6-6-2 (3 [60%] case-patients; 20 [29%] non-case-patients) and 4-5-7-2 (2 [40%] case-patients; 40 [58%] non-case-patients). These MLVA types are the 3 most common in CDC's 50-year collection. Five (33%) household contacts tested Mp-positive, including ≥1 contact from each household; all contact MLVA types were identical to those of the associated case-patient.

Conclusions: In this unusual Mp-associated SJS outbreak, the predominant MLVA patterns detected among patients with and without SJS represent commonly identified types, suggesting that host and/or pathogen factors beyond MLVA type likely influence the development of SJS. In addition, MLVA typing provided novel molecular evidence of household transmission of Mp.

8:55 Case-Control Evaluation of Ebola Viral Disease Versus Co-Infection with Malaria — Guinea, 2014

Authors: Meredith Dixon, M. Kinzer, M. Swaminathan, S. Gutreuter, J.E. Tongren, J. Albouhab, S. Keita

Background: Guinea reported over 2,000 Ebola Viral Disease (EVD) cases and 1,200 deaths by November 20, 2014. Malaria is hyperendemic in Guinea; 4.4 million malaria cases resulted in 12,000 deaths in 2012. Malaria-EVD co-infection is likely in Guinea; however, few studies describe co-infection. We performed a case-control study to describe demographics, symptoms and outcomes among malaria-EVD co-infected patients.

Methods: We analyzed data from confirmed EVD patients from March 24–November 20, 2014. Patients with EVD were eligible for inclusion if rapid-tested for malaria. Cases were Malaria-EVD co-infected; controls were singularly EVD-infected. Dichotomous variables were created: age less than 15 years and residence in Nzerekore region. Thermal cycle, a continuous variable representing the necessary number of PCR cycles to detect virus, was created; this inversely correlates to viremia. Bivariate analyses spawned inferences.

Results: Of 1,686 confirmed EVD patients, 633 (37.5%) were tested for malaria. Of those, 442 (69.8%) were EVD-infected only; 191 (30.2%) were Malaria-EVD co-infected. Cases were more likely to be age 15 or younger (Odds Ratio (OR) 3.66; 95% confidence interval (CI) 2.44–5.49), and less likely to present with abdominal pain (OR 0.58; CI 0.35–0.95). No differences existed between cases and controls by gender or region. Cases were more likely to present (OR 0.93; CI 0.88–0.99), die (OR 1.55; CI1.04–2.32) and die sooner (OR 0.89; CI 0.84–0.95) after symptom onset. Being a case (OR 1.55; CI 1.04–2.32) and having fewer thermal cycles (OR 0.71; CI 0.65–0.77) were associated with death.

Conclusions: The high prevalence of malaria co-infection among EVD patients and increased case fatality rate underscores the need for malaria control in populations at risk for Ebola.

9:15 Severe Respiratory Illness Associated with a Nationwide Outbreak of Enterovirus D68 — United States, 2014

Authors: Claire Midgley, J.T. Watson, W.A. Nix, A.T. Curns, S.L. Rogers, B.A. Brown, C. Conover, S.R. Dominguez, D.R. Feikin, S. Gray, F. Hassan, S. Hoferka, M.A. Jackson, D. Johnson, E. Leshem, L. Miller, J.B. Nichols

Background: Enterovirus D68 (EV-D68) has been infrequently reported historically, and is typically associated with isolated cases or small clusters of respiratory illness. Epidemiologic information and clinical characteristics have been limited. Beginning in August 2014, increases in severe respiratory illness associated with EV-D68 were reported.

Methods: We collected regional syndromic surveillance data from Missouri, Illinois and Colorado, and hospital admissions data from one hospital in each of these states. Respiratory specimens from hospitalized patients nationwide, most of whom were identified as rhinovirus- or enterovirus-positive in hospitals, were submitted and typed by molecular sequencing. We collected clinical and epidemiologic characteristics of EV-D68 cases using a standard patient form submitted with each specimen. We used Mantel-Haenszel chi-square tests to compare patients requiring intensive care with those who did not.

Results: During August– September, 2014, syndromic surveillance and hospital-level data from Missouri, Illinois and Colorado demonstrated increases in respiratory illness compared to the previous two years. EV-D68 was detected in 45% (707/1568) respiratory specimens collected nationwide. Patient forms were available for 484 hospitalized patients; 92% were under 18 years. Reported symptoms included dyspnea (83%), cough (79%), wheezing (68%), and fever (47%). Most patients (64%) required intensive care. Forty eight percent had a history of asthma or reactive airway disease (asthma/RAD); 70% of patients with an asthma/RAD history required intensive care, compared to 58% of those with no asthma/RAD history ($p = 0.013$).

Conclusions: EV-D68 may cause widespread, severe respiratory illness. Increased disease severity in asthmatics highlights the importance of regular assessment of asthma management plans. Maintaining preparedness for emerging respiratory diseases requires clinician awareness, robust, flexible surveillance systems and laboratory and epidemiology capacity at all levels of public health.

9:35 Investigation of an Outbreak of Infections with Rare *Salmonella* Serotypes Linked to Pet Bearded Dragon Lizards, 2012–2014

Authors: Craig Kiebler, L. Bottichio, L. Simmons, R. Klos, N. Gurfield, E. Roberts, P. Ayscue, A. Kimura, L. Lewis, K. Bird, F. Stiles, L. Schlater, K. Lantz, T. Edling, J. Tataryn, C. Bopp

Background: Reptiles are the fastest growing sector in the U.S. pet industry, with bearded dragons (BD) among the most popular. Reptile-associated salmonellosis is an important public health problem, especially among children, senior citizens, and immunocompromised persons. In 2014, we investigated an outbreak of infections with *Salmonella* Cotham and Kisarawe linked to pet BD exposure.

Methods: A case was defined as illness in a person infected with *Salmonella* Cotham or Kisarawe between 01/01/2012–06/21/2014. A binomial probability distribution compared exposure and questionnaire data results to a U.S. reptile ownership survey. Reptile traceback was conducted in collaboration with the pet industry, resulting in sampling at reptile breeders in two countries and several U.S. pet stores.

Results: *Salmonella* Cotham and Kisarawe account for ≤0.01% of all serotypes in CDC's *Salmonella* database. A total of 166 cases in 36 states were identified with onset dates between 02/2012—07/2014. The median patient age was three years (range <1–79) and 56% were ≤5 years. Thirty-seven percent (37%) were hospitalized. Patients reported significantly higher exposure to any reptile (83%, $p<0.001$) than reported on the reptile ownership survey; 96% of 74 patients with lizard contact specifically reported BD. Sampling of BD and their environments resulted in isolation of outbreak serotypes at each sampled facility; isolation proportions ranged from 9–24%.

Conclusions: Epidemiologic, microbiologic, and traceback evidence linked an outbreak of rare *Salmonella* serotypes to contact with pet BD and their environments. Owners should be aware of the potential for household contamination by pet reptiles and strategies should be developed to improve breeder practices, biosecurity, and monitoring protocols. This outbreak highlights the need for a comprehensive One Health approach to zoonoses prevention.

9:55 Outbreak of Severe Respiratory Infections Among Unaccompanied Children — Multiple States, June–July 2014

Authors: Sara Tomczyk, L.F. Watkins, J. Hagan, M. Kobayashi, E. Nyangoma, C. Socias, C. Arriola, M. Westercamp, B. Beall, A. Benitez,S. Benoit, L. Berman, J. Bresee, M. da Gloria Carvalho, A. Cohn, K. Cross, M. Diaz

Background: In 2014, >57,000 unaccompanied children (UC) from Central America crossed the US-Mexico border. In June–July 2014, 16 UC aged 13–17 years in five shelters were hospitalized with acute respiratory illness. An investigation was conducted in four states to evaluate disease transmission.

Methods: Medical charts were abstracted for hospitalized UC. Nasopharyngeal (NP) and oropharyngeal (OP) swabs were collected from UC with influenza-like illnesses (ILI) for real-time PCR detection of respiratory pathogens. To detect pneumococcal carriage, NP swabs were collected among ILI and asymptomatic assenting UC at four shelters. *Streptococcus pneumoniae* was identified by optochin susceptibility and bile solubility. Pneumococcal blood isolates and NP swabs were characterized by serotyping (Quellung) and whole-genome sequencing (WGS).

Results: Among 16 UC hospitalized for respiratory infections, 6 (43%) of 14 with blood cultures had *S. pneumoniae* detected, all serotype 5 multilocus sequence type 289, and 4 (44%) of 9 tested were positive for influenza viruses. Among 48 non-hospitalized UC with ILI, 46 (96%) had ≥1 respiratory pathogen including *Haemophilus influenzae* (n = 29), rhinoviruses (n = 21), enteroviruses (n = 19; none were EV-D68), and influenza viruses (n = 13). Among 812 UC with NP swabs collected to detect carriage, 774 (95%) had adequate culture growth. Of these, 181 (23%) yielded pneumococcus; 68 (38%) were serotype 5. WGS detected two related clusters, differing by a resistance-conferring recombination event within the folA gene.

Conclusions: A comprehensive investigation showed that *S. pneumoniae* serotype 5, rarely a cause of disease or colonization in US adolescents, and influenza were primary etiologies of this severe disease outbreak among UC. Other respiratory agents might have contributed to milder disease and facilitated transmission. Pneumococcal and influenza vaccinations were used to prevent further transmission.

SESSION M: J. Virgil Peavy Memorial Award Finalists

10:30–11:55 AM

Ravinia Ballroom

Moderators: Danice Eaton and Chad Heilig

10:35 Mortality Among Patients Treated for Multidrug-Resistant Tuberculosis — 9 Countries, 2005–2010

Authors: Hannah Kirking, E. Kurbatova, J. Ershova, C. Heilig, T. Dalton, J.P.Cegielski

Background: Worldwide, an estimated 5% of tuberculosis cases are multidrug-resistant tuberculosis (MDR TB), which is associated with increased mortality and can be treated only with prolonged, poorly tolerated regimens. To identify opportunities to reduce MDR TB-related mortality, we investigated predictors of mortality in a multinational prospective observational cohort study of patients undergoing treatment.

Methods: During 2005–2008, adults (≥18 years) were enrolled at the start of treatment for MDR TB in Estonia, Latvia, Peru, Philippines, Russia, South Africa, South Korea, Thailand, and Taiwan. Patients were followed up until end of treatment or end of observation on June 30, 2010. Patients who did not follow study protocol and those without data on outcome or time until outcome were excluded. The survival distribution was estimated using the Kaplan Meier method. Predictors of death were ascertained by using multivariate Cox proportional hazards regression modeling.

Results: In total, 1550/1761 (88%) patients were included. An estimated 84.7% of patients survived past two years (95% CI 82.6%–86.9%). Predictors of mortality included HIV infection (adjusted hazard ratio [aHR]: 2.1; 95% confidence interval [CI]: 1.3–3.4), immunocompromising conditions other than HIV (aHR: 2.1; 95% CI: 1.1–3.9), body mass index of <18.5 kg/m2 (aHR: 2.8; 95% CI: 1.9–4.1), extrapulmonary TB (aHR: 2.6; 95% CI: 1.3–5.4), bilateral pulmonary TB (aHR: 2.1; 95% CI: 1.1–3.8), and baseline resistance to ≥1 second-line injectable drugs (aHR: 2.7; 95% CI 1.7–4.4) or fluoroquinolones (aHR 2.4, 95% CI 1.1–5.7).

Conclusions: Among patients with MDR TB, 2 treatable conditions—impaired immunity and low BMI—were associated with mortality. Data from future investigations of interventions for these conditions may help to increase survival rates.

10:55 Lifetime Risk of Symptomatic Hand Osteoarthritis

Authors: Jin Qin, K. Barbour, L. Murphy, N. Baker, C. Helmick, K. Theis, T. Schwartz, J. Renner, A. Nelson, K. Allen, J. Jordan

Background: Osteoarthritis is a debilitating joint condition affecting 27 million adults in the United States. The lifetime risk of symptomatic hand osteoarthritis (SHOA) and whether the risk is different by potential risk factors are unknown; however, this data help explain the overall burden of the condition, as well as to guide targeted interventions. We estimated the lifetime risk of SHOA, a painful condition that affects hand strength and function.

Methods: We analyzed data from the Johnston County Osteoarthritis Project, a longitudinal population-based study in North Carolina. Data were collected among 2,219 adults at the first (1999-2004) and second (2005-2010) follow-up periods. The presence of SHOA was defined by a Kellgren-Lawrence grade ≥2 in at least one distal interphalangeal joint and at least three total hand joints, plus self-reported symptoms in the hand. Lifetime risk, defined as the proportion who developed SHOA in at least one hand by age 85, was estimated from logistic regression models by using generalized estimating evvations. The overall and stratified lifetime risk by sex and race are presented.

Results: The lifetime risk of SHOA was 37.3% (95% confidence intervals 31.7–43.2) overall. Nearly one of two women (45.9%; 38.8–53.1) developed SHOA by age 85 compared with approximately one of four men (22.6%; 17.4–28.8). Race-specific estimates were 39.4% (33.2–46.0) among white and 24.1% (15.4–35.8) among African-American adults.

Conclusions: The burden of SHOA is substantial—more than one-third of people develop this condition by age 85. The risk is particularly high among women and white adults. These findings underscore the need for increased use of public health and clinical interventions to address the impact of osteoarthritis on individuals and society.

11:15 Predicting Gun Violence Perpetration Through Administrative Data — Wilmington, Delaware, 2014

Authors: Steven Sumner, M. Maenner, C. Socias, P. Silverman, J. Mercy, S. Hillis

Background: In 2012, there were over 70,000 interpersonal firearm-related injuries in the United States. Although perpetrators of firearm violence represent a small proportion of the population, they are responsible for a disproportionate share of deaths and injuries. Identifying perpetrators before they commit gun violence would advance prevention strategies, yet such an approach remains to be demonstrated in a real-world setting. Our objective was to create a predictive model for future gun violence perpetration using administrative data covering life events prior to commission of a gun crime.

Methods: From a police database we identified all individuals born 1980 or after who were arrested for homicide, attempted homicide, aggravated assault, or robbery with a firearm, committed in Wilmington from January 1, 2009, to May 21, 2014. These 421 individuals were matched 1:3 to a population-representative control sample of 1,259 Wilmington residents on birth year and sex. Using data on emergency department visits for violence victimization, child welfare encounters, unemployment records, school-system events, and residence location, we constructed a predictive logistic regression model encompassing 18 elements.

Results: Individuals in the highest decile of predicted risk had 72.7% sensitivity and 99.4% specificity for subsequent firearm perpetration. Within sample positive predictive value was 97.8%. Based on total city population, we project that 82.5% of high-risk individuals will become perpetrators. The area under the receiver operating characteristic curve is 0.96.

Conclusions: Combining and utilizing readily-available administrative data from several sources identified over 72% of future gun violence perpetrators over the study time period with high predictive ability. Our findings demonstrate the potential of data sharing across city and state institutions to focus prevention strategies on those at greatest risk for violence.

11:35 *Salmonella* Serotypes — Index of Association with Foodborne Transmission

Authors: Ulzii Orshikh Luvsansharav, A. Vieira, S. Bennett, M. Hoekstra, J. Huang, K. Walsh, C. Dana

Background: An estimated 94% of the 1.2 million non-typhoidal *Salmonella* illnesses occurring in the United States each year are foodborne, suggesting that prevention should focus on reducing exposure to contaminated food. However, for some serotypes reservoirs are poorly defined, and other transmission pathways may be more important. We developed a Foodborne Relatedness index (FBR) ranking *Salmonella* serotypes according to the strength of their association with foodborne transmission.

Methods: We used Foodborne Diseases Active Surveillance Network data to estimate the sporadic infection incidences for the 15 most common *Salmonella* serotypes during 2004–2012 and Foodborne Disease Outbreak Surveillance System data to calculate the percentage of foodborne *Salmonella* outbreaks caused by each serotype. We calculated an incidence:outbreak ratio for Enteritidis using the sporadic illness incidence and the percentage of outbreaks caused by Enteritidis. For other serotypes, we estimated the percentage of foodborne outbreaks that would be expected if the incidence:outbreak ratio was equal to Enteritidis. Then, using Enteritidis as a reference, we calculated FBR for each serotype by dividing the observed percentage of outbreaks by the expected percentage.

Results: There were 56,668 sporadic infections and 1,129 foodborne *Salmonella* outbreaks. Among the 15 serotypes, Heidelberg (1.5) and Braenderup (1.1) had the highest FBRs, exceeding our referent value for Enteritidis (1.0); Bareilly (0.3) and Javiana (0.2) had the lowest FBRs.

Conclusions: We developed a method to estimate the relative importance of foodborne transmission for *Salmonella* serotypes. Our results suggest that efforts to reduce infections caused by *Salmonella* serotypes with high FBRs, such as Heidelberg, should focus on reducing exposure to contaminated food. However, for serotypes with low FBRs, such as Javiana, prevention efforts should consider non-foodborne transmission.

SPECIAL SESSION: Global Health Security Agenda: Improving country capacity and accelerating progress towards IHR through partnerships and country commitment

12:00–1:30 PM

Dunwoody Suite

Moderators: Jordan Tappero and Kashef Ijaz

Sponsor: Center for Global Health (CGH)

This session will focus on the Global Health Security (GHS) Agenda and why it is important to strengthen GHS; GHS Agenda and connection to Ebola outbreak; GHS targets, CDC's role, and how we measure success; Partnerships, resources, and country commitments; and Headquarters and in-country opportunities for GHS implementation.

Relevance and Appropriateness for the EIS conference

The Global Health Security Agenda (GHS Agenda) seeks to prioritize coordinated action and specific measurable steps focused on preventing epidemics, detecting biological threats early, and rapidly responding to infectious disease outbreaks whether naturally occurring, intentionally produced, or accidentally caused. Accelerating progress towards the implementation of the GHS Agenda is a USG priority requiring coordination of many departments, agencies and international partners. The EIS Conference brings together epidemiologists, SMEs and partners from around the world and provides an important platform to share information about the GHS Agenda, our progress toward a world safe and secure from infectious disease threats and improving GHS, discuss gaps, and strategies for improving acceleration of the IHR goals and promoting global health security as an international priority. The session will make the connection between GHS work in place, work planned, and the opportunity to offer new EIS officers a unique training ground.

Speakers:

- CDC's Role and Strategy for Implementation of GHS. *Jason Thomas*
- Integrating CDC's Lab Expertise for Strengthened National Capacities. *Beth Skaggs*
- Importance of Workforce for Outbreak Investigation and Response. *Linda Quick*
- Integrating Disease-Specific Expertise into the GHSA. *Nicki Pesik*
- Leveraging Existing Investments to Improve Countries' Ability to Prevent, Detect, Respond to Emerging Pathogens. *Arun Balajee*

CONCURRENT SESSION N1: Data for Decision Making: Public Health Surveillance

1:35–3:20 pm

Ravinia Ballroom

Moderators: Michael King and Chesley Richards

1:40 An Analysis of Suspect Case Definitions Utilized During the 2014 Ebola Epidemic

Authors: Christopher Hsu, S.W. Champaloux, B. Knust, A.M. McCollum

Background: Rapid early detection and control of Ebola virus disease (EVD) is contingent on sensitive, consistent clinical case definition. Although the WHO definition is often used in Guinea, a challenge of identifying EVD patients is that different clinical case definitions are used in the field. Utilizing the Guinea EVD dataset, an analysis of the CDC and WHO clinical case definitions was conducted to assess their ability to predict laboratory confirmed EVD cases.

Methods: Eligible EVD patients (N = 1412) during March 2014-October 2014 with documented EVD laboratory results and clinical symptoms were identified in the Guinea dataset. Laboratory confirmation by polymerase chain reaction assay differentiated cases from non-cases. Current case definitions included fever or an additional symptom (CDC definition) or fever and three other symptoms (WHO definition). Utilizing cases and non-cases that satisfied the CDC and WHO clinical case definitions, the sensitivity, specificity, positive predictive values (PPV) and negative predictive values (NPV) were calculated and compared.

Results: Total cases and non-cases identified were 801 and 611, respectively. Among the totals, 458 cases and 232 non-cases satisfied the WHO clinical case definition with the following Results: sensitivity = 57.2%; specificity = 62.0%; PPV = 66.4%; NPV = 52.5%. Among the totals, 789 cases and 604 non-cases satisfied the CDC clinical case definition with the following Results: sensitivity = 98.5%; specificity = 1.1%; PPV = 56.6%; NPV = 36.8%.

Conclusions: The CDC clinical case definition performed better in identifying laboratory confirmed EVD cases but misclassified non-cases while the WHO definition, while missing many laboratory confirmed cases, identified more non-cases. Differences may reflect objectives of the case definitions such as identifying more cases (CDC) or identifying non-cases (WHO). Definition choice may depend on the outbreak size, resources available and the extent which the outbreak has progressed.

2:00 Is Receiving Post-Acute Care Associated with Subsequent Hospitalization Costs One Year After Stroke Among Medicare Beneficiaries?

Authors: Iman Martin, M.D. Ritchey, K.A, Lochner, K.J. Caines, C.M. Shoff, H.A. Johnson-Skrivanek, C.A. Powers

Background: The health and economic burden of ischemic stroke among Medicare beneficiaries is considerable. After hospitalization for ischemic stroke, patients frequently receive components of post-acute care (PAC), including treatment within long-term care (LTC), inpatient rehabilitation, or skilled nursing facilities, and/or via home health (HH) to maximize their recovery. We examined the relationship between PAC receipt after an initial ischemic stroke hospitalization (IISH) and subsequent hospitalization costs.

Methods: We analyzed Medicare Fee-For-Service data from beneficiaries aged ≥66 years who had an IISH (primary ICD-9 code: 433.X1, 434.X1, or 436) during 2011 and had no stroke history in the preceding year and survived one-year post-IISH discharge. We used two-part generalized linear modeling to associate receipt of any PAC, as well as by PAC component (e.g. LTC), with subsequent hospitalization costs incurred one-year post-IISH discharge, adjusting for socio-demographic, comorbidity, and enrollment factors.

Results: Data from 89,797 beneficiaries with IISHs were analyzed; 48,011 (53.5%) received any PAC. After adjustment, any PAC receipt was associated with a 3.1% ($p<.001$) increase in subsequent hospitalization costs. The association varied by PAC component. Beneficiaries who received LTC had 2.1 ($p<.001$) times higher costs than those who did not, while HH use was associated with a 1.1% ($p<.001$) decrease in costs.

Conclusions: While receipt of any PAC after an IISH was associated with increased hospitalization costs during the following year, most of this increase was associated with receiving care within higher acuity facilities (e.g., LTC). This analysis demonstrates the importance of including PAC components when assessing associations between PAC receipt and hospitalization costs. Examining utilization of PAC components, as well as associated contextual-level factors, may help identify and inform public health intervention opportunities.

2:20 Increase in *Vibrio alginolyticus* Infections in the United States, 1988–2012

Authors: Kara Jacobs Slifka, A.E. Newton, B.E. Mahon

Background: *Vibrio alginolyticus*, a halophilic bacterium, causes gastrointestinal and severe soft tissue infections. Little information about alginolyticus infection exists. We aimed to describe the epidemiology of alginolyticus infections, to facilitate recognition and prevention.

Methods: Lab-confirmed *Vibrio* infections are reported to the Cholera and Other Vibrio Illness Surveillance (COVIS) system, from which we analyzed alginolyticus data, categorizing specimen sites and determining transmission routes (non-foodborne or foodborne). We described demographic and clinical characteristics of cases (1988–2012) and calculated annual incidence using US Census Bureau estimates since vibriosis became nationally notifiable (2007).

Results: From 1988 through 2012, 1,331 alginolyticus infections were reported, with the highest percentage (40%) from Gulf Coast states and the highest incidence (1.7 per 100,000 population in 2012) from Hawaii. Since 2007, incidence increased in all coastal regions; the most pronounced increase was on the Gulf Coast—from 0.04 per 100,000 in 2007 to 0.13 in 2012. Most infections were non-foodborne (86%), with 74% of patients reporting exposure to a body of water and 67% reporting a wound, either pre-existing or sustained during water exposure. Skin and soft tissue infection was most frequent (50% [lower extremity 34%]), followed by ear (33%). Fever (20%) and cellulitis (39%) were the most common clinical findings. Twenty percent of patients were hospitalized, and 12 died (1%). Complications of the non-foodborne infections included debridement, amputation, skin grafting, and hearing loss.

Conclusions: Alginolyticus infections have increased throughout the coastal United States. Prevention efforts should target non-foodborne infections, which are usually associated with injury and/or wounds present during water exposure. Understanding the epidemiology surrounding the increasing incidence may help prevent infection and improve early recognition and treatment.

2:40 Claims Data Evaluation for Lyme Disease Surveillance — Tennessee, 2011–2013

Authors: Joshua Clayton, S. Jones, J. Dunn, W. Schaffner, T.F. Jones

Background: Lyme disease (LD) is the most frequently reported tickborne disease in the United States, with >36,000 cases reported during 2013. Although Tennessee reported only 25 LD cases during that time, a recent study of claims data estimated >200 cases may have occurred. We analyzed claims data to investigate their utility for supplementing LD surveillance.

Methods: We compared LD cases reported to the Tennessee Department of Health (TDH) during January 2011–June 2013 with LD diagnoses among persons insured by Blue Cross and Blue Shield (BCBS), a managed care organization covering ~50% of Tennesseans. TDH cases were classified according to the Council for State and Territorial Epidemiologists (CSTE) case definition and BCBS diagnoses were defined as a Tennessee resident beneficiary with ≥3 primary or secondary *International Classification of Diseases*, Ninth Revision (ICD-9) codes for LD (088.81) recorded in their claims. Medical records of BCBS cases were randomly sampled to abstract and classify cases per CSTE case definition.

Results: During the study period, 74 LD cases were reported to TDH, and 391 LD diagnoses were identified from BCBS. Five individuals matched in both datasets. Of BCBS diagnoses, 123 (31%) were sampled; 4 (3%) met the CSTE case definition for LD. Of the remaining 119 BCBS diagnoses, 22 (18%) were subsequently ruled out by laboratory testing, 53 (45%) had a history of Lyme disease before the study period, 27 (23%) lacked sufficient evidence for case classification, and 17 (14%) lacked an available medical record.

Conclusions: Our claims data review identified additional LD cases for public health surveillance, but a more efficient means of differentiating cases from noncases is needed before using this method to supplement TDH surveillance.

3:00 Fetal and Infant Mortality Reporting: Are Data Complete? — Wyoming, 2006–2013

Authors: Alexia Harrist, A. Busacker, K. Bisgard, T. Murphy

Background: Fetal and infant deaths are devastating events for families and communities. Because effective interventions to reduce fetal and infant mortality rates rely on accurate data, we evaluated the sensitivity of Wyoming's passive surveillance system for detecting resident fetal and infant deaths and the quality of collected cause-of-death data.

Methods: To evaluate fetal and infant deaths undetected by Wyoming's passive surveillance, we compared Wyoming resident fetal and infant deaths identified by the Wyoming Department of Health (WDH) with those reported to the National Center for Health Statistics (NCHS) during 2006–2011. To assess quality of cause-of-death data during 2011–2013 (when fetal and infant 2003 NCHS death certificate revisions were both in use in Wyoming), we compared proportions of missing and nonspecific causes of death between Wyoming fetal and infant certificates; we defined nonspecific as unspecified or prematurity-related. Z-test was used for comparisons.

Results: During 2006–2011 for Wyoming resident fetal and infant deaths, compared with NCHS data, WDH identified 204 of 239 (85.4%) fetal deaths, and 320 of 313 (102%) infant deaths. During 2011–2013, the prevalence of missing cause of death was 39.6% (40/101) of Wyoming fetal deaths compared with 0.9% (1/116) of Wyoming infant deaths (P <.01). Nonspecific causes were identified for 3.3% (2/61) of fetal versus 13% (15/115) of infant deaths (P <.04); for nonspecific causes of death, 1 of 2 fetal and 9 of 15 infant were prematurity-related.

Conclusions: Wyoming surveillance fails to detect 15% of resident fetal deaths. Differences in data quality between fetal and infant certificates indicate cause-of-death reporting can be improved by providing education to stakeholders regarding detection of fetal deaths and cause-of-death determination.

CONCURRENT SESSION N2: Parasitic Diseases and Malaria

1:35–3:20 PM

Dunwoody Suite

Moderators: Alex Rowe and Douglas H. Hamilton

1:40 Efficacy of Artemether-Lumefantrine and Artesunate-Amodiaquine for Uncomplicated *Plasmodium falciparum* Malaria — Malawi, 2014

Authors: Magdalena Paczkowski, D. Mwandama, D. Marthey, M.Luka, G. Makuta, J. Sande, D. Ali, P. Troell, D.P. Mathanga, J. Gutman

Background: In 2010, malaria was the second leading cause of death among children <5 years old in Malawi, where the first- and second-line treatments for uncomplicated malaria are artemether-lumefantrine (AL) and artesunate-amodiaquine (ASAQ), respectively. Emerging antimalarial drug resistance threatens treatment efficacy. We evaluated the efficacy of AL and ASAQ for the treatment of uncomplicated malaria in Malawi.

Methods: During March–July 2014, febrile children aged 6–59 months with microscopy-confirmed uncomplicated *Plasmodium falciparum* malaria (1,000–200,000 parasites/μL) were enrolled in an in vivo efficacy trial at 3 sites in northern, central and southern Malawi. Outcomes were early (≤ day 3) and late treatment failure. Children were randomized 3:1 to receive AL or ASAQ. Blood was collected for microscopy and molecular testing on days 0–3, 7, 14, 21, and 28. Power, at 95% confidence, was sufficient to estimate site-specific efficacy for AL and overall efficacy for ASAQ.

Results: We enrolled 453 children; 314/338 (92.9%) and 102/115 (88.7%) reached a study endpoint in the AL and ASAQ arms, respectively, with no early treatment failures. Recurrent parasitemia (RP) occurred in 21% (95% confidence interval [CI]: 17–26%) of AL patients and 3% (95% CI: 1–7%) of ASAQ. RP did not differ significantly across sites (20% [95% CI: 13–28%], 28% [95% CI: 20–38%], and 15% [95% CI: 9–23%]).

Conclusions: The RP rate was significantly lower for ASAQ than for AL in Malawi. This is expected given the relatively shorter half-life of lumefantrine compared to amodiaquine, allowing for higher reinfection incidence during follow-up. Results of ongoing molecular testing to differentiate reinfection from recrudescence are needed to estimate true efficacy and inform antimalarial policies.

2:00 Four Years of "Test and Treat" in Uganda: Understanding the Role of Malaria Case Management in Reporting Malaria Burden to the Health Management Information System (HMIS) — Uganda, 2014

Authors: Nelli Westercamp, H. Wanzira, B.K. Kapella, S. Powell, A. Mpimbaza, A. Sserwanga, S. Yoon, A.K. Rowe, M.J. Hamel

Background: In malaria-endemic countries, malaria control programs rely on accurate and timely disease reporting for targeting and evaluating interventions. Universal "test and treat" strategy has been recommended by WHO since 2010. While this strategy is intended to increase diagnostic specificity and reduce unnecessary treatments, its translation into practice has been slow. To better understand how malaria is diagnosed and reported in Uganda, we evaluated testing and treatment practices and data quality in health facilities (HFs) reporting to Uganda's HMIS.

Methods: We observed patient flow, malaria case management and reporting practices in a purposive sample of 6 HFs in two districts. The number of tested, diagnostically-confirmed, treated and total reported cases were abstracted from the outpatient and laboratory registers for August and September, 2014, and compared to the numbers submitted to HMIS.

Results: Rather than reporting the number of diagnostically-confirmed cases per WHO guidelines, HFs reported as cases all individuals treated for malaria regardless of test history or results. The number of cases reported to HMIS ranged from 96% to 110% of cases documented as malaria in HF registers, indicating adequate agreement between registers and reports. However, the proportion of reported diagnostically-confirmed cases ranged from 4% to over 90%, highlighting HF and district variability in adherence to malaria testing guidelines and continuing the outdated practice of classifying all febrile illnesses as malaria. This variability could not be explained by availability of diagnostic tests and treatment.

Conclusions: Due to testing, treatment and reporting practices, HMIS data do not accurately reflect the true burden of malaria in Uganda. Identifying gaps in diagnostic practices and targeting interventions to support adherence to "test and treat" guidelines will be necessary to achieve accurate malaria reporting.

2:20 Blood Demand and the Appropriate Use of Blood in Tanzania, 2013

Authors: Ibironke Apata, S. Pathak, A. De, M. Lyimo, A. Juma, M. Kuehnert, M. Mahmoud, A. Bjork, B. Drammeh

Background: Blood shortages pose major challenges to the treatment of life-threatening anemia. While studies of blood availability in Africa have focused on individual hospitals or regions in a country, the Tanzania Blood Needs Study aimed to estimate nationwide blood availability. It also examined factors affecting blood demand (e.g., medical conditions and clinician blood-ordering practices) to inform strategies to increase blood availability.

Methods: During June–September 2013, we conducted a prospective study of blood request forms and patient records from a nationally representative sample of 42 hospitals across Tanzania. We reviewed blood requests for management of anemia. We developed an algorithm to evaluate the appropriateness of blood requests based on clinical data. Abstracted data included (a) cause of anemia (e.g., cancer, malaria, maternal hemorrhage and trauma) (b) number of requested units, (c) number of requested units unfilled by the blood bank, and (d) patient symptoms, vital signs, and hemoglobin.

Results: The leading diagnoses driving blood demand were malaria and maternal hemorrhage, comprising 3,553 (21.4%) and 2,407 (14.5%) blood units, respectively, of 16,634 requested units. Of requests that could be assessed for clinical appropriateness, 2,840 (19.3%) of 14,728 units were deemed inappropriate. Blood banks were unable to fill 566 (3%) requested units, of which 73% (416 units) were clinically appropriate and 28% (156 units) were for patients with severe anemia (i.e., hemoglobin < 5 g/dL).

Conclusions: Blood shortages exist in Tanzania. Decreasing inappropriate blood requests by improving clinician ordering practices, and increasing blood supply by increasing the blood donor pool, should help address these shortages. Strategies to prevent and manage underlying causes of anemia, such as malaria and maternal hemorrhage, will decrease blood demand.

2:40 Lymphatic Filariasis and Onchocerciasis Among Residents of Three Senegal Districts Who Have Received Mass Ivermectin Administration for Onchocerciasis

Authors: Nana Wilson, A. Ly, N. Sy, L. Diawara, A. Direny, M. Fall, K. Feeser, V. Cama, P. Cantey, M. Eberhard, L. Fox, D. Ndiaye, C. Dubray

Background: Lymphatic filariasis (LF) and onchocerciasis are debilitating diseases caused by parasitic filarial nematodes that affect >150 million people throughout the tropics. Disease symptoms include lymphoedema and hydrocoele in LF, and dermatitis and ocular inflammation in onchocerciasis. Current efforts to eliminate these diseases rely on mass drug administration (MDA) with ivermectin alone for onchocerciasis or with ivermectin and albendazole for LF. In Senegal were these diseases are co-endemic, MDA for onchocerciasis started in 1988 but albendazole was not added to target LF. The objective was to determine the status of LF by conducting an integrated assessment of LF and onchocerciasis in three districts of Kedougou after ≥10 years of MDA for onchocerciasis.

Method: Using African Programme for Onchocerciasis Control protocols including skin biopsy (skin snip), 16 villages were selected, and a convenience sample of residents ≥5 years old was evaluated. Antigen and antibody (Wb 123) testing for LF and antibody (OV-16) testing for onchocerciasis were included. The study was conducted from January-February 2014.

Results: Forty percent (1154/2925) of eligible residents participated. About 0.6% (7/1131) of the participants were LF Wb123 antibody-positive. In two districts, no participants were positive for onchocerciasis skin snip or LF antigen. In the third district, 3.4% (6/176) were antigen positive for LF (village range 1.9–6.4%) and 0.7% (1/150) were skin snip-positive. OV-16 antibody results were positive in 7/279 (2.5%) children <10 years old.

Conclusions: After ≥10 years of ivermectin MDA, LF prevalence remained above treatment threshold (<2% antigenemia) in one district. OV-16 antibody testing in children <10 years old indicated that onchocerciasis transmission had occurred within the last 10 years. Integrated evaluations provide information to guide program decisions about treatment interventions for both diseases.

3:00 Lymphatic Filariasis Mass Drug Administration in Seven Communes in and Around Metropolitan Port-au-Prince, Haiti, March–May 2014: Has Coverage Been Attained?

Authors: Maximilian Nerlander, A.K. Knipes, M. Beau De Rochars, J.F. Lemoine, C.R. Fayette, F. Monestime, L. Desir, A.N. Direny, M.C. Worrell, A. Dismer, K. Renneker, B. Chu, R. Wiegand, E. Barzilay, L. Fox, P. Lammie

Background: Lymphatic filariasis (LF) is a parasitic infection endemic in Haiti that causes lymphedema and hydrocoele. The World Health Organization called for LF elimination by using at least five yearly rounds of mass drug administration (MDA) with >65% coverage of the population at risk. Achieving good coverage in urban settings is challenging, making Port-au-Prince (PAP) a priority area. In May 2014, PAP completed its third MDA, and two nearby communes completed their fourth. The study objectives were to assess MDA coverage and knowledge, attitudes and practices (KAP) of the population regarding LF MDA.

Methods: Five communes inside and two communes outside metropolitan PAP were selected using a two-stage cluster sample design. Thirty clusters per commune were selected with probability proportional to estimated size with 10 households per cluster. Coverage and KAP questionnaires were administered. Children aged <2, pregnant women and severely ill people were ineligible for MDA and excluded from the survey.

Results: Preliminary results indicated a response rate of 99.8% across the seven communes surveyed. 76.4% of 4794 eligible individuals in 1731 households reported having swallowed pills during the 2014 MDA. There was no significant difference in coverage between males (79.3%) and females (74.2%). Grand-Goâve commune had the highest coverage (80.9%) while Pétion-Ville had the lowest (67.2%). The most common reasons for noncompliance in Pétion-Ville were being absent during MDA (13.0%) and not being aware of MDA (11.2%).

Conclusions: Results indicated that 2014 MDA achieved satisfactory coverage. Gaps in timely communication with the communities could explain lowest coverage in Pétion-Ville. Earlier notification of communes regarding upcoming MDA may assist in improving compliance in the future.

Presentation of Awards

3:35-3:50 PM

Ravinia Ballroom

Moderator: Diana Bensyl

- Donald C. Mackel Memorial Award
- J. Virgil Peavy Memorial Award
- Paul C. Schnitker International Health Award
- James H. Steele Veterinary Public Health Award
- Outstanding Poster Presentation Award

SESSION O: Late-Breaking Reports

3:50–5:15 PM

Ravinia Ballroom

Moderators: Kevin Vagi and Diana Bensyl

3:55 Outbreak of *Listeria monocytogenes* Infections Linked to Whole Apples Used in Commercially Produced, Prepackaged Caramel Apples — United States, 2014–2015

Authors: Kristina Angelo, A. Conrad, A. Saupe, H. Dragoo, M. Needham, V. Philips, A. Sorenson, D. MacDonald, M. Wise, I. Williams, M. Doyle, S. Lance, S. Stroika, Z. Kucerova, B. Jackson

Background: *Listeria monocytogenes* (Lm) infection is the third leading cause of death from foodborne illness in the United States. Lm isolates undergo pulsed-field gel electrophoresis (PFGE) and whole genome sequencing (WGS) to identify disease clusters. In November 2014, two multistate clusters of Lm infections with distinct PFGE patterns were detected. Due to geographic and temporal overlap and a case with co-infection, they were investigated together to identify the source and prevent illnesses.

Methods: Cases were defined as illnesses with highly related Lm strains by WGS reported to PulseNet, the national molecular subtyping network for foodborne disease surveillance, with onset from 10/17/2014 to 2/12/2015. Information was collected on foods consumed in the weeks before illness onset using hypothesis-generating questionnaires and open-ended interviews. Case-patient food exposures were compared with data from listeriosis patients with genetically unrelated Lm using Fisher's exact test. Traceback was performed to identify the suspect food source. WGS was performed on all case-patient, produce, and environmental isolates.

Results: Thirty-five cases from 12 states and 1 from Canada were identified; 34 patients were hospitalized and 7 died. Three cases of meningitis occurred among healthy children. Twenty-eight (90%) of 31 patients reported consuming prepackaged caramel apples (multiple brands) compared with 1 (2.8%) of 36 patients with unrelated Lm isolates ($p<0.001$). Environmental and produce samples from a common apple supplier were highly related to clinical isolates by WGS. Three caramel apple producers and the apple supplier issued voluntary recalls.

Conclusions: Whole apples used in prepackaged caramel apples were the outbreak source. This is a new vehicle for Lm infections. Research is needed to understand factors specific to caramel apple production to prevent further contamination and illness.

4:05 Rapid Measles Containment — Utah, 2015

Authors: Angela Dunn, J. Eason, L. Guerra, F. Alvarez, A. Nakashima

Background: On January 3, 2015, Utah Department of Health (UDOH) was notified of 2 suspect measles cases in unvaccinated siblings (index cases). Their only identified exposure risk was a California theme park. We investigated to confirm etiology and implement control measures.

Methods: Cases interviews and public messaging were used to identify contacts. Contacts, persons exposed to an index case during the 8-day contagious period, were traced to determine susceptibility and postexposure prophylaxis eligibility. Susceptible contacts, or contacts with no history of immunization, previous disease, or antibody testing, were voluntarily home-quarantined and actively monitored for 21 days to assess measles symptoms and quarantine compliance. Postexposure prophylaxis was offered to infants aged <1 year, pregnant women, and immunocompromised contacts.

Results: The index cases were isolated upon report; interviews revealed 16 exposure locations, all in Utah. Upon measles laboratory confirmation on January 5, UDOH implemented active contact tracing of all identified contacts. Among 388 identified contacts, 239 provided measles immunity documentation. Among the 149 susceptible contacts, 82 (55.0%) reported 21-day quarantine compliance. Seventy-three (49.0%) susceptible contacts had been exposed in health care settings; 48/73 (65.8%) were aged £6 years. Twenty-five infants aged <1 year and 1 pregnant woman received immunoglobulin £6 days postexposure; none experienced disease. One secondary illness occurred in an unvaccinated sibling of the index cases.

Conclusions: Half of susceptible contacts were exposed in health care settings, with the majority too young to be fully vaccinated. Educating unvaccinated ill patients and their guardians to contact their clinician's office before arriving, and screening unvaccinated patients for vaccine-preventable disease upon arrival to the clinic might limit exposure. Rapid report and implementation of measles containment measures limited measles spread.

4:15 Ebola Virus Disease Extended Transmission from Single Funeral Ceremony — Kissidougou, Guinea, December 2014–January 2015

Authors: Kerton Victory, F.E. Coronado, S.O. Ifono, T.Soropogui, B.A. Dahl

Background: On December 18, 2014, the Guinea Ministry of Health was notified by Kissidougou prefecture public health authorities of 62 Ebola virus disease (EVD) cases occurring during December 15–17 compared with 1 EVD case reported during December 8–14. We investigated to identify transmission chains and implement control measures.

Methods: We defined a confirmed case as >1 positive specimen for Ebola virus by polymerase chain reaction in a Kissidougou resident, and a probable case as EVD-compatible symptoms reported for a decedent with no specimens collected during December 1–January 10. Contact tracing teams interviewed case-patients or their relatives using a standard case investigation form to identify and isolate patients, and identify transmission chains.

Results: We identified 85 confirmed cases, including 62 (73%) reported during December 15–17. Forty-one (48%) case-patients were male; median age was 33 (range: 2–85) years. Sixty-seven (79%) case-patients were diagnosed at an Ebola treatment center (ETC) and 18 (21%) were diagnosed post-mortem through oral swab testing (community case-patients). All 18 community case-patients attended a traditional funeral ceremony on December 4 and had direct contact with the corpse of the only probable case identified. All 67 case-patients diagnosed at an ETC were contacts of community case-patients. Forty-five (67%) case-patients had died as of January 31; no cases were reported since January 10.

Conclusions: This local outbreak is the largest weekly increase in EVD cases reported from a Guinean prefecture since the beginning of the epidemic, and highlights the need for culturally-sensitive safe burial practices to prevent Ebola virus transmission. Targeted strategies are needed for improving reporting and investigation, and securing successful management and prevention of EVD cases in rural communities.

4:25 Adverse Events Associated with Administration of Simulation Intravenous Fluids to Patients — United States, 2014

Authors: Misha Robyn, J.C. Hunter, A. Burns, A.P. Newman, J. White, E.J. Clement, E. Lutterloh, M. Quinn, C. Edens, L. Epstein, K. Seiber, D. Nguyen, A. Kallen, D. Blog

Background: In December 2014, New York State Department of Health (NYSDOH) learned of 2 residents hospitalized after administration of simulation saline intravenous solution. Simulation intravenous fluids are nonsterile products not meant for human or animal use; they are intended for nonclinical use by health care trainees. We investigated to understand the situation and prevent further administration of simulation saline products to patients.

Methods: Review of customer orders from a distributor revealed product distribution to clinical facilities in multiple states. Public health officials contacted affected facilities, redistributors, and the manufacturer. Information was collected regarding procurement, product use, and adverse events.

Results: Forty-three clinical facilities in 23 states purchased the simulation saline during May 22, 2014–January 6, 2015. Preliminarily, 10 facilities reported potential administration of simulation intravenous product to 45 patients; adverse events involved 25 persons, including 11 hospitalizations and 2 deaths. It is not known if the deaths were directly related to use of the product. All clinical facilities were outpatient settings; at the time of purchase none was aware this product was not intended for human use and believed they were purchasing regular saline. On December 30, 2014, FDA issued an alert warning against using these simulation products in human or animal patients; the manufacturer initiated a recall on January 6, 2015.

Conclusions: This investigation demonstrates the potential for simulation medical products to enter the clinical supply chain, be inadvertently used on patients, and cause harm. Health care providers should remain aware that simulation products exist and carefully examine product labeling to ensure safety for clinical use. Clear labeling of simulation products and segregation from products intended for clinical use can help avoid misuse.

4:35 Serogroup B Meningococcal Disease Outbreak and Carriage Evaluation at a College — Rhode Island, 2015

Authors: Heidi Soeters, L.A. McNamara, M. Whaley, X. Wang, N. Alexander-Scott, K. Kanadanian, J. MacNeil, S.W. Martin, N. Raines, S. Sears, C. Vanner, J. Vuong, U. Bandy, K. Sicard, M. Patel, Rhode Island Meningococcal Carriage Evaluation Team

Background: Meningococcal disease is a severe infection with a 10–15% case fatality ratio. In the U.S., serogroup B meningococcal disease caused four university outbreaks in the last two years. Nasopharyngeal carriage of *Neisseria meningitidis* is a risk factor and necessary precursor for invasive disease. One of two serogroup B meningococcal (MenB) vaccines recently licensed in the U.S., Trumenba®, was used to control a serogroup B meningococcal disease outbreak at a Rhode Island college. Impact of MenB vaccination on nasopharyngeal carriage of *N. meningitidis* is unknown.

Methods: We characterized the outbreak, performed molecular typing on isolates, and calculated vaccination coverage. To establish baseline meningococcal carriage prevalence, a carriage evaluation comprised of a short questionnaire and oropharyngeal swab was conducted February 16–20. Specimens were evaluated using both bacterial culture and real-time polymerase chain reaction.

Results: On January 31 and February 5, two cases of serogroup B meningococcal disease occurred among undergraduates (attack rate: 44/100,000). Molecular typing revealed a novel outbreak strain, ST-9096. The first-dose vaccination campaign on February 8 and 11 achieved 96% coverage of eligible students. Among 719 carriage evaluation participants, 66% were female, 92% lived on-campus, 98% received MenB vaccine, and 15% had recent antibiotic use. Preliminary data indicate 176 (24%) and 31 (4%) had overall meningococcal and serogroup B carriage, respectively.

Conclusions: A mass MenB vaccination campaign quickly achieved high vaccine coverage; no further serogroup B meningococcal disease cases associated with this college were identified. Baseline meningococcal carriage was higher than previous U.S. estimates of 1-8%. Further carriage evaluations are planned for April and May 2015 to monitor MenB vaccination campaign impact on carriage among students at this college.

4:45 Preventing the International Spread of Ebola: Advancing the Capacity of 16 Unaffected African Countries to Rapidly Detect and Contain Ebola Virus Disease

Authors: Lucy Breakwell, S. Shadomy, R. Gerber, F. Angulo

Background: Guinea, Liberia and Sierra Leone are in the midst of the largest Ebola virus disease (EVD) epidemic; given porous national borders, there is a danger of EVD spread to other countries. From August 2014 to March 2015, CDC's Highrisk Unaffected Countries Team provided technical assistance to unaffected African countries to build their capacity to rapidly detect and contain EVD introduction.

Methods: We reviewed outbreak reports and other documents from CDC-deployed staff to unaffected countries, and surveyed returning staff, using a structured questionnaire to summarize trainings conducted, documents developed, and assessments completed. Survey responses were collated and descriptive analyses performed.

Results: CDC deployed 127 staff (who contributed 97.3 person-months) to 16 unaffected countries; of deployed staff, 90 (71%) of the deployed staff went to countries bordering Guinea (Cote d'Ivoire, Guinea-Bissau, Mali, and Senegal) or Nigeria. EVD introductions into Senegal and Mali were contained without further transmission; another EVD introduction into Mali was contained in two generations-of-transmission and EVD introduction into Nigeria was contained in three generations-of-transmission. Epidemiological training was facilitated in ten unaffected countries in collaboration with the Field Epidemiology Training Program (FETP); a 10-week FETP Surveillance Training for Ebola Preparedness course was completed in Cote d'Ivoire and Guinea-Bissau (where 108 surveillance staff were trained). Emergency operations centers were established in seven unaffected countries. Additional training was provided to 1,675 individuals, predominantly in contact tracing (n = 317) and infection control (n = 975). Deployed staff developed national preparedness protocols, standard operating procedures and contact tracing guidelines for eight unaffected countries. Staff also participated in EVD response assessments, principally targeting border screening and country preparedness.

Conclusions: The epidemiologic capacity for the rapid detection and containment of EVD was advanced in 16 unaffected African countries.

4:55 Rapid Detection of a Winter Outbreak of Legionellosis — New York City, 2014–2015

Authors: Isaac Benowitz, R. Fitzhenry, C. Boyd, M. Dickinson, M. Levi, Y. Lin, E. Nazarian, B. Ostrowsky, T. Passaretti, J. Rakeman, A. Saylors, E. Shamoonian, T. Smith, S. Balter

Background: *Legionella* bacteria, found in soil and water, infect humans by airborne transmission; outbreaks have been linked to cooling towers and building water systems. Environmental source investigations typically rely on culture, which can take two weeks to grow. We investigated a legionellosis outbreak in a 60,000-resident housing complex (HC) in New York City in 2014–2015.

Methods: A case was defined as legionellosis in a resident of HC, diagnosed by urine antigen test (UAT) or sputum culture during November 2014–January 2015. A structured patient interview was used to determine risk factors. Environmental samples from residential water systems and nearby cooling towers were cultured. Because of concern for an on-going hazard, we used a previously field-tested polymerase chain reaction (PCR) method to ascertain the presence of *Legionella pneumophila* serogroup 1 (LP1). Clinical and environmental isolates were compared by pulsed-field gel electrophoresis (PFGE).

Results: Eight cases were identified by UAT; no patients died. LP1 was isolated from sputum. All cases resided in HC (42 apartment buildings). Two patients lived in the same building. PCR identified LP1 in samples from a large cooling tower 2 days later. No LP1 was identified in other cooling towers or at residential sites. Remediation began the following day. Results were confirmed by culture 5 days later. Clinical and environmental isolates were indistinguishable by PFGE. Repeat environmental sampling found no LP1. No further cases were identified. Changes in water disinfection contributed to *Legionella* overgrowth.

Conclusions: We linked a legionellosis outbreak to a cooling tower. Use of PCR in addition to culture allowed action to prevent further illness 5 days earlier than using culture alone. Adequate water disinfection may help prevent legionellosis outbreaks.

5:05 Development and Implementation of an Accountable and Managed Contact-Tracing System for Ebola Virus Disease (EVD) in Kambia District, Sierra Leone, December 2014–January 2015

Authors: Rebecca Levine, M. Ghiselli, F. Sesay, A. Conteh, A. Kemmoh, A. Gaeta, C. Davis

Background: The first EVD cases in Kambia District, Sierra Leone, were confirmed in September, 2014, and a Ministry of Health and Sanitation contact tracing system was initiated. By December, the system's performance remained unknown, lacking the capacity to report the numbers of contacts traced daily and suspect cases among the contacts. We enhanced the system to quantify and act on daily contact tracing indicators.

Methods: Two new positions were created: a database manager, responsible for enumerating and recording the daily health status (HS) of all contacts; and a field coordinator, responsible for ensuring quality control of contact tracing visits. Training and onsite mentoring were provided to the new staff and to existing contact tracing supervisors, district surveillance officers (DSOs), and contact tracers to increase management and accountability for the system. Daily monitoring of contact tracing indicators aimed for 100% of contacts having 1) a contact tracer visit, 2) HS appropriately assessed, 3) HS reported to Command, 4) HS recorded in a database, and 5) immediate (≤ 24 hours) investigation by a DSO if indicated.

Results: From January 8, 2015, when enhanced contact tracing was fully implemented, through February 18, the average number of contacts needing tracing daily was 201; of these, an average of 95.7% (193) received appropriate daily follow up. During this interval, 43 contacts showing signs or symptoms of EVD were identified and investigated.

Conclusions: Enhanced contact-tracing in Kambia, through ensured daily visits and follow-up, was effective in identifying suspect EVD cases that previously would likely have been missed due to lapses in recorded HS and accountability. Recommendations and training materials for improvements in data management and quality-control to increase the effectiveness of EVD contact-tracing were developed for widespread use in Sierra Leone.

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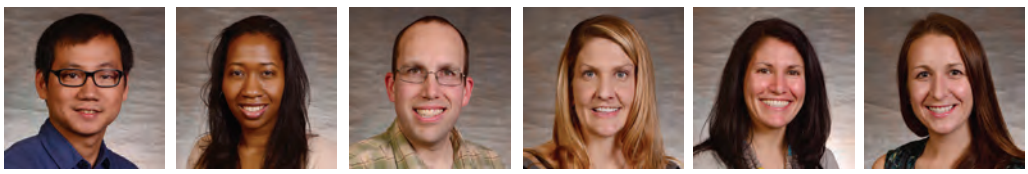

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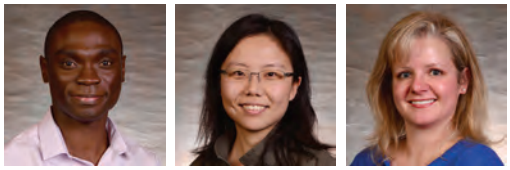

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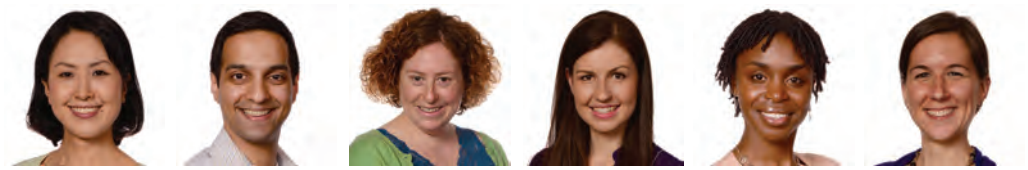

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Biswas, Hope PhD, ScM
Boyd, Andrew MD
Brooks, Richard MD, MPH
Chae, Sae-Rom MD, MPH
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Dasgupta, Sharoda PhD, MPH
Davis, Heather DVM, MPH
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De Voux, Alex PhD, MSc,
Dieke, Ada DrPH, MPH
Dirlikov, Emilio PhD, MA
Fill, Mary-Margaret MD
Fortenberry, Gamola PhD, MPH
Gambino-Shirley, Kelly DVM, MPH
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Krow-Lucal, Elisabeth PhD, MPH
Kuramoto, Satoko PhD, MHS
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Mccrickard, Lindsey DVM
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Rhee, Chul MD, PhD, MSc
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Vasquez, Amber MD, MPH
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Llewellyn, Anna PhD
Mercante, Alexandra PhD
Minchella, Peter PhD
Okoth, Sheila Akinyi PhD
Weiner, Zachary PhD, MS

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Notes