59th Annual EIS Conference

EPIDEMIC INTELLIGENCE SERVICE

CROWNE PLAZA HOTEL – ATLANTA PERIMETER AT RAVINIA

APRIL 19-23, 2010

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

CENTERS FOR DISEASE CONTROL AND PREVENTION

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COLOR KEY NAME TAGS

Blue–EIS Alumni
Green–Current EIS Officers
Red–Incoming EIS Officers
Black–Conference Participants
Purple–Conference Staff
Blue Dot–Field EIS Alumni
Orange Dot–Recruiters
Pink Dot–Media

Save the Date!

60th Annual

Epidemic Intelligence Service (EIS)

Conference

April 11–15, 2011

Centers for Disease Control and Prevention

Atlanta, Georgia

Preface

Dear Friends of EIS:

Welcome to the 59th Annual Epidemic Intelligence Service (EIS) Conference. We are delighted that you are able to attend our annual conference, which highlights the professional activities of EIS officers. The scientific program this year includes 95 oral presentations and 31 poster presentations. In addition, your experience this week will be enriched by International Night, the EIS skit, the Prediction Run, special award presentations, and other activities that have been longstanding traditions at the conference.

The overriding theme this year of EIS has probably been the H1N1 pandemic. In the middle of conference week last year, I ran into a colleague who told me that she was going to have to leave early because she had to deal with two children in San Diego who had come down with a novel strain of influenza. I remember at the time thinking, "She seems pretty excited about two cases of the flu!" Wow, if only I knew then what I know now!

Flu response rapidly became the focus of EIS Program activities. For the first 2–3 weeks, we set up shop in the Emergency Operations Center (EOC) and coordinated deployment of EIS officers from there. EISOs played an important role in CDC's response, and during the first 3 weeks, 119 EISOs (74%) put in >9,500 person-hours on H1N1. Fortunately, the pace has dropped off substantially, but as of the last week in December, 184 officers have put in >35,000 hours on H1N1 response.

As always, we extend a special welcome to the incoming EISOs, the Class of 2010. This was the second year we used an online application system, and it was even more productive than last year because we had a record number of applications. For the last decade, we have averaged 280 completed applications each year; this year we received 412.

This year's 86 red tags are a select group of men and women with a broad array of interests and skills. Fifty-five (64%) of the new officers are women, and 13 (15%) are citizens of other nations. We will have one officer from each of the following countries: Costa Rica, France, Haiti, Iraq, Japan, Kenya, South Korea, Mexico, and Nigeria; and two each from Canada and India. Among the 76 U.S. citizens or permanent residents who have supplied race and ethnicity data, 30 (35%) represent racial and ethnic minority groups. Thirty (35%) PhD-level scientists, 42 (49%) physicians, 9 (10%) veterinarians, 3 (3%) nurses, and 2 (2%) dentists are in the new class. One of the physicians and 3 of the veterinarians also hold PhDs. Ten members of the class have accepted prematch assignments in state health departments.

Again this year, we will hold concurrent oral sessions on Tuesday and Wednesday mornings; please check your program carefully. Special lunchtime sessions start on Tuesday with "Influenza: A History and Chronology of Response." On Wednesday, the author of a new EIS history, Mark Pendergrast, will discuss his research in "Inside the Outbreaks: The Elite Medical Detectives of the Epidemic Intelligence Service." Thursday's presentation, "Graduate Student Epidemiology Response Programs (GSERPs): A Resource for Supporting the Epidemiologic Capacity of the Public Health Infrastructure," will be of interest to many. Finally, Friday's lunchtime session will focus on the CDC response to the 7.0 magnitude earthquake in Haiti.

The 2010 Conference provides you the opportunity to hear about many current applications of epidemiology to public health and prevention by EIS officers. We welcome you to an exciting week — an opportunity to learn, to meet old and new friends, and to welcome the incoming officers. I look forward to seeing you.

Douglas Hamilton, MD, PhD
Director, Epidemic Intelligence Service
Division of Applied Sciences *(proposed)*
Scientific Education and Professional Development Program Office *(proposed)*

Program Committees

2010 EIS CONFERENCE

SCIENTIFIC PROGRAM COMMITTEE

Thomas Clark, Chair, National Center for Immunization and Respiratory Diseases
Priti Patel, Chair Elect, National Center for Emerging and Zoonotic Infectious Disease*

Vinicius Antao, National Center for Environmental Health/Agency for Toxic Substances and Disease Registry
Matt Breiding, National Center for Injury Prevention and Control
Geoffrey Calvert, National Institute for Occupational Safety and Health
Nicole Flowers, National Center for Chronic Disease Prevention and Health Promotion
Cindy Hinton, National Center on Birth Defects and Developmental Disabilities
Susan Lukacs, National Center for Health Statistics
Sheryl Lyss, Scientific Education and Professional Development Program Office*
Alexa Oster, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention
Ann Schmitz, National Center for Emerging and Zoonotic Infectious Disease*
Jacqueline Tate, National Center for Immunization and Respiratory Diseases
Eddie Weiss, Scientific Educational Professional Development Program Office*
Emad Yanni, National Center for Emerging and Zoonotic Infectious Disease*

FRONT ROW, left to right, ***Vincius Antao, Nicole Flowers, Eddie Weiss, Sheryl Lyss, Alexa Oster, Cindy Hinton***

BACK ROW, left to right, ***Emad Yanni, Priti Patel, Matt Breiding, Thomas Clark, Ann Schmitz, Geoffrey Calvert***

LATEBREAKER SESSION COMMITTEE

Ann Schmitz, Chair, National Center for Emerging and Zoonotic Infectious Disease*
Nicole Flowers, National Center for Chronic Disease Prevention
Eddie Weiss, Scientific Education and Professional Development Program Office*
Emad Yanni, National Center for Emerging and Zoonotic Infectious Diseases*

PROGRAM PRODUCTION

Scientific Education and Professional Development Program Office

EIS Program

Avchen, Rachel
Dott, Mary
Edwards, Ronald
Green, Kathryn (contractor)
Hamilton, Douglas H.
Jeter, Korwaski
Jones, Jean Michaels
Knoll, William
Piper, Catherine R.
Porter, Sheila
Rickman, Jill (contractor)
Tucker, Tracey (contractor)

Science Office

Smith, C. Kay

Office of Communication

Creative Services

Jacobs, Virginia (contractor)

**Proposed name under CDC reorganization*

The EIS Program gratefully acknowledges the valuable assistance and cooperation of Creative Services, the Management Analysis and Services Office, and the editorial and support staff of all CDC administrative units participating in the 2010 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 U.S. Public Health Service or the U.S. Department of Health and Human Services.

The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

General Information

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 located outside the Dunwoody Suites on the main floor of the hotel. Check-in and on site registration are available Monday–Friday, 7:30 a.m.–5:00 p.m.

Please wear your conference badge at all times during the conference. Your name badge includes your code to access messages in the Communications Center.

Conference staff are wearing purple badges and are available to assist if you need additional information or misplace your badge.

Message Center

Located in the Maplewood Room A, the Message Board System will handle internal communication needs during this year's conference. Please check the large-screen monitors for message notification. Messages can be accessed by using the code number on your name badge.

Computers in the Message Center are also available to access the Internet for e-mail or the continuing education evaluation forms. Please limit computer use to 10 minutes per session to allow other conference attendees an opportunity to use these services as well.

Speaker Ready-Room

Located in the Dogwood Room, this room is available for presenters who need to make changes to their presentations. Three computers with PowerPoint software, rewritable CD-ROM drives, and a printer will be available 8:00 a.m.–6:00 p.m. Monday–Thursday.

Exhibit Hall

Monday–Thursday, 8:00 a.m.–5:00 p.m., in the area outside the Dunwoody Suites.

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 turn off ringers on phones and pagers during conference sessions. Use of cellular phones is restricted to the meeting room foyers and public areas outside the meeting rooms.

Lactation Room

Please visit the EIS information table, next to the registration area if you need to use the lactation room. A sign-up schedule and key will be available at the table Monday–Friday, 7:30 a.m.–5:00 p.m.

2010 EIS Conference Schedule

MONDAY, APRIL 19, 2010

7:30 REGISTRATION DESK OPENS

8:15 WELCOME AND CALL TO ORDER ..... Ravinia Ballroom
Stephen B. Thacker,
Deputy Director for Surveillance, Epidemiology, and Laboratory Services, CDC

8:30 SESSION A: AMERICA'S MOST WANTED
Opening Session ..... Ravinia Ballroom
MODERATORS: ***Denise Koo and Stephen B. Thacker***

8:35 Can Quiet Kill? Pedestrian and Bicyclist Fatalities Caused by Hybrid Motor Vehicles — United States, 2004–2008. ***Amy Freeland***

8:55 Extensive Tuberculosis Outbreak Associated with an Assisted Living Facility for Adults with Mental Illness — Florida, 2008–2009. ***Joseph Cavanaugh***

9:15 Potluck Dinner Outbreak of *Salmonella* IV Infections Associated with Contamination from Bearded Dragon Reptiles — Minnesota, 2009. ***Sara Lowther***

9:35 Evaluation of Influenza A (H1N1) 2009 Monovalent Vaccines Safety Through the Vaccine Adverse Event Reporting System — United States, October 1–December 4, 2009. ***Yenlik Zheteyeva***

9:55 The Weight of War: The Psychological Impact of Displacement Due to Armed Conflict — Jaffna District, Sri Lanka, 2009. ***Farah Husain***

10:15 Remarks: ***HHS Secretary Kathleen Sebelius***

10:25 BREAK

10:45 SESSION B: HOW I MET YOUR MOTHER
Reproductive Health ..... Ravinia Ballroom
MODERATOR: ***Ursula Bauer***

10:50 Sickle Cell Disease and Pregnancy Outcomes Among Women of African Descent — Massachusetts, 1998–2006. ***Danielle Barradas***

11:10 Demographic Differences in Pregnancy Outcomes After Diagnoses of Neural Tube Defects — Texas, 1999–2005. ***Sharyn Parks***

11:30 Breast and Cervical Cancer Screening Among Women with Disabilities — United States, 2008. ***Brunella Frammartino***

11:50 Severity of 2009 Pandemic Influenza A (H1N1) Virus Infection in Pregnant Women — New York City, May–June 2009. ***Andreea Creanga***

12:15 LUNCH

12:30 POSTER SESSION — ***Meet the authors in the Ravinia Ballroom. All posters presented during the conference will be on display Monday, 9:00 a.m. through Friday, 12:00 p.m. The following authors will be present to discuss his/ her study on Monday, 12:30–1:30 p.m.***

POSTER SESSION 1: FRIENDS

P1. Impact of Rotavirus Vaccine on Diarrhea-Associated Hospitalizations Among Children <5 Years of Age — United States, 2004–2009. ***Catherine Yen***

P2. Evaluation of Tuberculosis Surveillance — Republic of the Marshall Islands, 2004–2008. ***Bisrat Abraham***

P3. Risk Factors for Community Mortality from Cholera — Chivi District, Zimbabwe. ***Diane Morof***

P4. Comparison of Internet-Based with Telephone Survey Methods in Investigating a Norovirus Outbreak — Oregon, 2009. ***John Oh***

P5. Critical Care Capacity During the 2009 H1N1 Influenza Pandemic — Argentina, 2009. ***Elissa Meites***

P6. Smoking During Pregnancy and Other Maternal Characteristics as Risk Factors for Low Birth Weight Among Singleton Full-Term Infants — West Virginia, 2005–2006. ***Rachel Radcliffe***

P7. An Assessment of Adherence to Artemether-Lumefantrine for the Treatment of Uncomplicated Malaria — Phalombe, Malawi, 2009. ***Kimberly Mace***

P8. Evaluation of Active Mortality Surveillance Following Hurricane Ike — Texas, 2008. ***Ekta Choudhary***

P9. Hospital-Based Mortality in Federal Capital Territory Hospitals — Nigeria, 2005-2008. ***Nykiconia Preacely***

P10. Impact of Pentavalent Rotavirus Vaccine on Healthcare Utilization for Diarrhea in Children Aged <5 Years — United States, 2007–2008. ***Jennifer Cortes***

P11. Impact of Changing Definitions of Penicillin Resistance on Vaccine Effects Against *Streptococcus pneumoniae*, United States, 1998-2008. ***Lee Hampton***

P12. Evaluation of a New Influenza-Like Illness Surveillance System Among Alaska Native Persons, 2009. ***James Keck***

P13. Travelers' Impressions of 2009 H1N1 Influenza National Health Messaging Campaign. ***Emily Jentes***

P14. Neonatal Male Circumcision Incidence and Adverse Events — United States, 1979–2006. ***Charbel El Bcheraoui***

P15. Epidemiology of Malaria Diagnostics with the Introduction of Rapid Diagnostic Tests in African Refugee Camps — 2007–2008. ***David Townes***

1:30 SESSION C: THE DEADLIEST CATCH

Tuberculosis ..... Ravinia Ballroom

MODERATOR: ***Kenneth Castro***

1:35 Relationship Between *Mycobacterium tuberculosis* Lineage and Extrapulmonary Tuberculosis — United States, 2004–2008. ***Eleanor Click***

1:55 Screening for Latent Tuberculosis Infection Among Immigration Facility Employees — Illinois, 2009. ***Marie de Perio***

2:15 Genotypic Clustering of Tuberculosis Cases Among the Foreign-Born — United States, 2004–2008. ***Philip Ricks***

2:35 Onsite Case-Finding During a Tuberculosis Outbreak in a Homeless Shelter — Georgia, 2008–2009. ***Krista Powell***

3:00 BREAK

3:15 SESSION D: 10 THINGS I HATE ABOUT FLU

Influenza ..... Ravinia Ballroom

MODERATOR: ***Lyn Finelli***

3:20 Influenza Surveillance by Using Emergency Department Health Records — Nebraska, September 2009. ***Parvathy Pillai***

3:40 Invasive Pneumococcal Disease Associated with Pandemic 2009 Influenza A (H1N1) — Denver Metro Area, October 2009. ***George Nelson***

4:00 Household Transmission of 2009 Pandemic Influenza A (H1N1) After a School-Based Outbreak in New York City, April–May 2009. ***Anne Marie France***

4:20 Influenza Vaccination Practices Among Healthcare Workers — North Dakota, 2007–2008. ***Jennifer Cope***

4:40 Knowledge, Attitudes, and Practices Among Parents During School Dismissal Because of Circulation of 2009 Pandemic Influenza A (H1N1) Virus — Pennsylvania, 2009. ***W. Roodly Archer***

5:00 2009 Pandemic Influenza A (H1N1) Deaths Among Children — United States, 2009. ***Chad Cox***

5:30 EIS CONFERENCE SOCIAL ..... Lobby Outside Dunwoody Suites

TUESDAY, APRIL 20, 2010

8:30 CONCURRENT SESSION E1: TRUE BLOOD

Human Immunodeficiency Virus ..... Ravinia Ballroom

MODERATOR: ***Jonathan Mermin***

8:35 Increase in HIV-Associated Tuberculosis in the Context of Widespread Drug-Resistant Tuberculosis — Kazakhstan, 2003–2008. ***Matthew Willis***

8:55 Evaluation of a Screening Tool To Assess Peripheral Neuropathy Among HIV-Infected Persons in Resource-Limited Settings. ***A. Danielle Iuliano***

9:15 Correlates of HIV Infection Among Injection Drug Users — Unguja, Zanzibar, 2007. ***Dita Broz***

9:35 Evaluation of a Tuberculosis Surveillance System Modified To Monitor Increased HIV Testing — Zambia, 2008. ***Simon Agolory***

9:55 Evaluation of the Quality of HIV Care and Treatment Services Provided in a Tuberculosis Clinic — Tanzania, 2006–2008. ***Surbhi Modi***

8:30 CONCURRENT SESSION E2: PARTY OF FIVE

Hot Topics ..... Dunwoody Suites

MODERATOR: ***Paul Cieslak***

8:35 Methicillin-Susceptible *Staphylococcus aureus* Infections After Intra-Articular Injections at a Primary Care Clinic — Georgia, 2009. ***W. Roodly Archer***

8:55 Usefulness of Sentinel Site Influenza-Like Illness Surveillance — Wyoming, 2003–2009. ***Aimee Geissler***

9:15 Sentinel Roulette: Utility of Individual Hospital Surveillance for Measuring Pneumococcal Conjugate Vaccine Impact in Young Children — Multiple States, 1998–2006. ***Lee Hampton***

9:35 Variations in Positive Predictive Values for Rapid Influenza Tests for 2009 Pandemic Influenza A (H1N1) — Arizona, 2009. ***Steven Baty***

9:55 Multiple-Serotype *Salmonella* Gastroenteritis Outbreak at a Wedding Reception — Connecticut, 2009. ***Jessica Kattan***

10:15 BREAK

10:45 CONCURRENT SESSION F1: BURN NOTICE

Sexually Transmitted Diseases ..... Ravinia Ballroom

MODERATOR: ***Kevin Fenton***

10:50 Cofactors for Cervical Intraepithelial Neoplasia in Women Referred to Colposcopy — Atlanta, Georgia and Detroit, Michigan, 2000–2004. ***Julia Gargano***

11:10 Health Insurance, Health Care Utilization, and Chlamydia and Gonorrhea Infection Among Females — United States, 1999–2008. ***Elizabeth Torrone***

11:30 Human Papillomavirus Vaccine Coverage Among Females Ages 9–59 years — National Health and Nutrition Examination Survey — United States, 2007–2008. ***La'Shan Taylor***

11:50 Outbreak of *Neisseria gonorrhoeae* Infection — Southwestern Alaska, 2008–2009. ***Tracie Gardner***

10:45 CONCURRENT SESSION F2: THE FALL GUY

Injury ..... Dunwoody Suites

MODERATOR: ***Grant Baldwin***

10:50 Aftermath of the DC Metrorail Crash: Type of Injuries and Evaluation of Postevent Emergency Response — Washington DC, 2009. ***Nagesh Borse***

11:10 Prescription Opioid Overdose Deaths — Utah, 2008–2009. ***William Lanier***

11:30 Have Self-Reported and Observed Seatbelt Use in the United States Converged? ***Aybaniz Ibrahimova***

11:50 Surveillance and Prevention of Occupational Injury Deaths — Wyoming, 2003-2007. ***Paul Anderson***

12:15 LUNCH

12:30 SPECIAL SESSION: INFLUENZA

A History and Chronology of Response ..... Dunwoody Suites

MODERATOR: *Lyn Finelli*

SPEAKERS: *Lyn Finelli, David Swerdlow, Alicia Fry, Beth Bell*

12:30 POSTERS ON DISPLAY IN THE RAVINIA BALLROOM

All posters presented during the conference will be on display in the Ravinia Ballroom Monday, 9:00 a.m., through Friday, 12:00 p.m.

1:45 SESSION G: RUGRATS

School-Age Children ..... Ravinia Ballroom

MODERATOR: *Richard Olney*

1:50 Racial Disparities in Community Identification of Autism Spectrum Disorders Over Time — Metropolitan Atlanta, 2000–2006. ***Vanessa Jarquin***

2:10 Does the "Food Insecurity — Obesity Paradox" Exist in U.S. Children? The National Health and Nutrition Examination Survey, 2001–2006. ***Molly Lamb***

2:30 Changes in Preventative Asthma Medication Use Among Asthmatic Children Following Evidence-Based Treatment Guidelines — United States, 1999–2002 and 2003–2006. ***Brian Kit***

2:50 Overweight and Obesity Among Third-Graders — New Hampshire, 2008–2009. ***Sherry Burrer***

3:10 Perceived Family Support Associated with Decreased Alcohol Use Among Youth — Iowa, 2008. ***Mary Fournier***

3:30 Evaluation of Integration of TB/HIV Surveillance into Tuberculosis Treatment for Children — Ethiopia, 2007–2009. ***Eleanor Click***

4:00 BREAK

6:00 PREDICTION RUN ..... Brook Run Park

WEDNESDAY, APRIL 21, 2010

8:30 CONCURRENT SESSION H1: FREQS AND GEEKS

Peavy Award Finalists ..... Ravinia Ballroom

MODERATOR: *Owen Devine*

8:35 Novel Metric for Risk-Adjustment of Hip Replacement Surgical Site Infection Frequency at Healthcare Facilities — National Healthcare Safety Network, 2006–2009. ***Matthew Wise***

8:55 That Yeast Won't Cease: Understanding the Significance of Persistent *Candida* Bloodstream Infections — a Multi-Center Prospective Survival Analysis. ***Loretta Chang***

9:15 The Effect of Body Mass Index and Weight Change on Epithelial Ovarian Cancer Survival — United States, 1980–1997. ***Crystal Tyler***

9:35 Age, Period and Cohort Effects on Contraceptive Practices — Honduras and Nicaragua, 1991–2006. ***Andreea Creanga***

9:55 Using Spatial Analysis To Identify Areas of Increased Active Tuberculosis Incidence Among Asians — California, 2005–2008. ***Erin Murray***

8:30 CONCURRENT SESSION H2: BIG BROTHER

Surveillance.....Dunwoody Suites

MODERATOR: ***James Buehler***

8:35 To Test or Not To Test: Influenza-Like Illness Case Definition Versus Antigen Testing for 2009 Pandemic Influenza A (H1N1) in a Pilot Respiratory Virus Surveillance System — New York City, May–June 2009. ***Teeb Al-Samarrai***

8:55 Reasons for the Increasing Hispanic Infant Mortality Rate — Florida, 2004–2007. ***Erin Sauber-Schatz***

9:15 Acute Versus Paired Serology for La Crosse Encephalitis Surveillance. ***Rendi Murphree***

9:35 Evaluation of Three School Absenteeism Influenza Surveillance Indicators: Lessons Enabled with the 2009 Pandemic Influenza A (H1N1) — Tri-County (Denver Metropolitan Region), Colorado. ***Nancy Williams***

9:55 Emergency Department Visits for Suspected Medication-Related Angioedema — United States, 2007. ***Elissa Meites***

10:15 BREAK

10:30 CONCURRENT SESSION I1: COUGAR TOWN

Zoonoses.....Ravinia Ballroom

MODERATOR: ***Tracee A. Treadwell***

10:35 Dirty Chicks: Human *Salmonella* Typhimurium Infections Associated with Exposure to Baby Poultry from Agricultural Feed Stores and Mail-Order Hatcheries — United States, 2009. ***Anagha Loharikar***

10:55 Factors Associated with Patient Delay in Rabies Postexposure Prophylaxis Initiation — Puerto Rico, 2008–2009. ***Kis Robertson***

11:15 Evaluation of Hantavirus Pulmonary Syndrome Clinical Findings and Case Definition — United States, 2003–2009. ***Barbara Knust***

11:35 It's Not Easy Being Green: A Multistate Outbreak of Human *Salmonella* Typhimurium Infections Associated with Aquatic Frogs — United States, 2009. ***Shauna Mettee***

10:30 CONCURRENT SESSION I2: JUST SHOOT ME

Vaccines and Preventable Diseases.....Dunwoody Suites

Presentation of the Iain C. Hardy Award

MODERATOR: ***Nancy Messonnier***

10:35 Impact of 2-Dose Vaccination on Varicella Epidemiology — Connecticut, 2005–2008. ***Jessica Kattan***

10:55 Projected Impact and Cost-Effectiveness of a National Rotavirus Vaccination Program — India. ***Douglas Esposito***

11:15 Comparison of Administration Time Between Seasonal Live Attenuated Influenza Vaccine and Trivalent Influenza Vaccine During Hawaii's Stop Flu at School Campaign — Hawaii, 2009. ***Meera Sreenivasan***

11:35 Impact of Rotavirus Vaccination on Rotavirus-Coded Hospitalizations — Colorado, 2000–2008. ***Christa Hale***

12:00 LUNCH

12:30 SPECIAL SESSION: MEET THE AUTHOR

Inside the Outbreak: The Elite Medical Detectives of the Epidemic Intelligence Service ..... Dunwoody Room

SPEAKER: ***Mark Pendergrast***

12:30 POSTER SESSION — *Meet the authors in the Ravinia Ballroom. All posters presented during the conference will be on display Monday, 9:00 a.m., through Friday, 12:00 p.m. The following authors will be present to discuss his/ her study on Wednesday, 12:30–1:30 p.m.*

POSTER SESSION 2: PERFECT STRANGERS

P16. Oseltamivir Resistance Among 2009 Pandemic Influenza A (H1N1) Viruses — United States, 2009. ***Samuel Graitcer***

P17. Outbreak of Salmonellosis Associated with Pulled Pork — Memphis, 2009. ***Rendi Murphree***

P18. Referral and Treatment of Persons with a New Diagnosis of Chronic Hepatitis B Virus Infection — Pinellas County, Florida, 2007–2008. ***Roxanne Williams***

P19. Outbreak of *Mycobacterium goodii* Surgical Site Infections — Midwest Region, 2007–2009. ***Parvathy Pillai***

P20. Outbreak of *Pseudomonas aeruginosa* Surgical Site Infections Following Arthroscopy — Texas, 2009. ***Pritish Tosh***

P21. Oseltamivir-Resistant 2009 Pandemic Influenza A (H1N1) Among Campers Receiving Chemoprophylaxis — North Carolina, 2009. ***Natalie Dailey***

P22. Hantavirus Pulmonary Syndrome in Five Pediatric Patients — Arizona, Colorado, Washington, and California, 2009. ***Barbara Knust***

P23. What Happens in Vegas Doesn't Always Stay in Vegas! A Persistent Outbreak of Travel-Associated Legionnaires' Disease — Nevada, 2001–2008. ***Benjamin Silk***

P24. What's Hiding Within the Pandemic — Analysis of Non-2009 Pandemic Influenza A (H1N1) Fatal Cases — United States, 2009. ***Dianna Blau***

P25. Respiratory Tract Hemorrhage Associated with 2009 Pandemic Influenza A (H1N1) Infection — United States, 2009. ***Erin Kennedy***

P26. First Documented Multistate Outbreak of *Salmonella* Carrau Infections — United States, 2009. ***Carrie Nielsen***

P27. Viral Shedding Duration of 2009 Pandemic Influenza A (H1N1) Virus During an Elementary School Outbreak — Pennsylvania, May–June 2009. ***Achuyt Bhattarai***

P28. Viral Shedding of 2009 Pandemic Influenza A (H1N1) Virus Among Healthcare Workers and Implications for Exclusion from Patient Care — Seattle, Washington, 2009. ***Meagan Kay***

P29. Distribution of Laboratory-Confirmed 2009 Pandemic Influenza A (H1N1) Cases Among Healthcare Workers — Wisconsin, April–July 2009. ***Jevon McFadden***

P30. Blood and Blood Product Donor Fatalities Reported to the Food and Drug Administration — United States, 1984–2008. ***Sanjaya Dhakal***

P31. Typhoid Fever with Neurologic Findings — Malawi-Mozambique Border, 2009. ***Emily C. Lutterloh***

1:30 SESSION J: DIRTY JOBS

Occupational Health ..... Ravinia Ballroom

MODERATOR: ***Christine Branche***

1:35 Influenza Vaccination Among Nursing Assistants Working in U.S. Nursing Homes. ***Matthew Groenewold***

1:55 Investigation of Mantle Cell Lymphoma Cluster — Virginia, 2009. ***Thomas Bender***

2:15 Silicosis Mortality with Respiratory Tuberculosis — United States, 1979–2006. ***Muazzam Nasrullah***

2:35 What's Work Got To Do With It? Potential Contribution of Occupational Physical Activity Towards Meeting 2008 Recommended Physical Activity Guidelines — United States, 2007. ***Myduc Ta***

2:55 Acute Pesticide Illnesses Associated with Off-Target Pesticide Drift from Agricultural Applications — United States, 1998–2006. ***Soo-Jeong Lee***

3:15 Outbreak of 2009 Pandemic Influenza A (H1N1) Aboard a U.S. Navy Vessel — San Diego, 2009. ***Christina Khaokham***

3:45 BREAK

4:00 SESSION K: ALEXANDER D. LANGMUIR MEMORIAL LECTURE AND RECEPTION

..... Ravinia Ballroom

Announcement of Langmuir Prize Winner

Announcement of Distinguished Friend of EIS Award

Cosponsored by the EIS Alumni Association and Scientific Education and Professional Development Program Office*

MODERATOR: ***Stephen B. Thacker***

SPEAKER: ***Pat Remington***

TOPIC: Community Health Rankings — Epidemiology in Action

**Proposed name under CDC reorganization*

5:30 EIS ALUMNI ASSOCIATION MEETING.....Oakwood Room

INTERNATIONAL NIGHT

COSPONSORED BY: The Center for Global Health (CGH)/ Division of Public Health Systems and Workforce Development and the Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET).

The posters and presentations featured during 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 these sessions.

6:00 INTERNATIONAL NIGHT POSTER SESSION

Posters from the Field Epidemiology Training Program will be on display in the lobby outside the Dunwoody Suites.

IP1. Protective Effect of Handwashing and Good Hygienic Habits Against Confirmed Influenza — Fujian Province, China, 2009. ***Mingbin Liu***

IP2. Dental Caries and Oral Health Knowledge and Practice among Children in Nairobi West and Mathira West Districts — Kenya. ***Gladwell K. Gathecha***

IP3. The Danger of Pirated Piped Water Connections: Post-Cyclonic Cholera Outbreak — Sundarban Area of West Bengal, India 2009. ***Rama Bhunia***

IP4. Epidemic of Chilblains in Rural Boarding Schools — Southwestern Peoples Republic of China, 2009. ***Bike Zhang***

IP5. Investigation and Control of Novel Influenza A H1N1 2009 Outbreak in two Boarding Schools, Angthong Province — Thailand, August 2009. ***Sanisa Santayakorn***

IP6. Risk Factors for Child Sexual Abuse — Harare, Zimbabwe, 2009. ***Ngoni W. Mashumba***

IP7. Desperately Seeking Diarrhea: Outbreak of Hemolytic Uremic Syndrome Caused by Emerging Sorbitol-Fermenting *Escherichia coli* O157 — Germany, 2009. ***Stine Nielsen***

IP8. Cross-Border Outbreak of Rabies — Upper East Region, Ghana, 2009. ***Paul N. Polkuu***

IP9. Foodborne Outbreak of Gastrointestinal Disease — Atyrau, Kazakhstan, July 2009. ***Manar A. Kasimzhanova***

IP10. Leptospirosis Outbreak Associated with Bathing in a Polluted Irrigation Canal — El Salado, Galván, Baoruco, Dominican Republic, November 2009. ***Ronald E. Skewes-Ramm***

IP11. Risk Factors of Reston Ebola Virus (REBOV) Infection Among Abattoir Workers After Its Discovery in Pigs — Philippines, 2009. ***Rolando V. Cruz***

7:30 SESSION L: INTERNATIONAL FIELD EPIDEMIOLOGY

Translating Science into Practice Around the World

International Night ..... Dunwoody Suites

MODERATORS: ***Patricia Simone and Paul Kelly***

OPENING REMARKS: ***Thomas Frieden***

7:35 Impact of Trained Social Entrepreneurs on Access to Health Products in Impoverished Rural Populations — Nyanza Province, Kenya, 2007–2009. ***Minal Patel***

7:55 Shigellosis Outbreak in an Elementary School — Sichuan Province, People's Republic of China, June 7–16, 2009. ***Ke Han***

8:15 Cholera Outbreak: The Importance of Hand Washing with Soap — Bashuri, Jigawa State, Nigeria, September 2009. ***Saheed O. Gidado***

8:35 Determinants of Nondisclosure of HIV Status among Women Attending the Prevention of Mother to Child Transmission Programme — Makonde District, Zimbabwe. ***Pride Mucheto***

8:55 Severity and Factors Associated with Road Traffic Injuries in Patients — Thika District Hospital, Kenya, 2009. ***Eric M. Osoro***

9:15 A Sustained Multi-State Outbreak of Hepatitis A Associated with Semi-Dried Tomatoes — Australia, 2009. ***Ellen J. Donnan***

9:35 ***Presentation of William H. Foege Award*** ..... Dunwoody Suites

Reception to follow

THURSDAY, APRIL 22, 2010

8:30 SESSION M: CSI ATLANTA

Mackel Award Finalists ..... Ravinia Ballroom

MODERATOR: ***Mitchell L. Cohen***

8:35 Mucormycosis Outbreak Associated with Hospital Linens — Louisiana, 2009. ***Jonathan Duffy***

8:55 Investigation of Autochthonous Dengue Fever Outbreak — Key West, Florida, 2009. ***Christopher Gregory***

9:15 The Perfect Storm: Investigation of a Suspected Pertussis Outbreak — Colorado, Summer 2009. ***Sema Mandal***

9:35 Fatal Case of Laboratory-Acquired Infection with an Attenuated *Yersinia pestis* Strain of Plague — Illinois, 2009. ***Andrew Medina-Marino***

9:55 Cookie Monster: Multi-State outbreak of *Escherichia coli* O157:H7 Infections Associated with Consumption of Prepackaged Raw Cookie Dough — United States, 2009. ***Karen Neil***

10:15 BREAK

10:30 SESSION N: THE TICK

Vectorborne Diseases ..... Ravinia Ballroom

MODERATOR: ***Paul Mead***

10:35 Evaluation of Health Facility Versus Household Surveys for Measuring Malaria Burden — Tanzania, 2002, 2004, 2006. ***Kimberly Mace***

10:55 Epidemiology of Babesiosis — New Jersey, 2006–2009. ***Andria Apostolou***

11:15 Practices Regarding Treatment of Rocky Mountain Spotted Fever Among Healthcare Providers — Tennessee, 2009. ***Kristina McElroy***

11:35 Old Face in a New Place: La Crosse Encephalitis Virus Infection — Missouri, 2009. ***Yi-Chun Lo***

12:00 LUNCH

POSTERS ON DISPLAY

All posters presented during the conference will be on display in the Ravinia Ballroom, Monday, 9:00 a.m. through Friday, 12:00 p.m.

12:30 SPECIAL SESSION:
GRADUATE STUDENT EPIDEMIOLOGY RESPONSE PROGRAMS (GSERPS):

A Resource for Supporting the Epidemiologic Capacity of the Public Health Infrastructure ..... Dunwoody Suites

MODERATOR: ***Randolph Daley***

SPEAKERS: ***Laura Bettencourt, Erin Koers, Shauna Mettee***

1:30 SESSION O: GENERAL HOSPITAL

Healthcare-Associated Illness ..... Ravinia Ballroom

MODERATOR: ***Denise Cardo***

1:35 Acute Hepatitis B Virus Infections in a Psychiatric Skilled Nursing Facility — Los Angeles, California, 2008. ***Matthew Wise***

1:55 *Staphylococcus aureus* Infections Associated with Epidural Injections at a Pain Clinic — West Virginia, 2009. ***Rachel Radcliffe***

2:15 Outbreak of Hepatitis C Virus Infections at an Outpatient Hemodialysis Facility — Maryland, 2009. ***Agam Rao***

2:35 Management of a Vancomycin-Resistant Enterococci Outbreak in a Neonatal Intensive Care Unit — Indiana, 2009. ***Matthew Ritchey***

2:55 Cluster of Oseltamivir-Resistant 2009 Pandemic Influenza A (H1N1) Infections on a Hospital Ward Among Immunosuppressed Patients — North Carolina, 2009. ***Natalie Dailey***

3:15 BREAK

3:30 SESSION P: COLD CASE
Respiratory Illness ..... Ravinia Ballroom
MODERATOR: ***Matt Moore***

3:35 Does Group A Streptococcal Strain Predict the Severity of Invasive Disease? ***Benjamin Silk***

3:55 Hospital-Associated Measles Outbreak — Pennsylvania, March–April 2009. ***George Han***

4:15 Epidemiology and Outcomes of Adults with Asthma Hospitalized for 2009 Pandemic Influenza A (H1N1) — California, 2009. ***Eva Mortensen***

4:35 Modes of Transmission and Risk Factors for *Mycoplasma pneumoniae* During an Outbreak at a Child and Adolescent Residential Treatment Center — New Mexico, 2009. ***Megin Nichols***

8:30 EIS SATIRICAL REVUE ..... Ravinia Ballroom

FRIDAY, APRIL 23, 2010

8:30 SESSION Q: THIRD ROCK FROM THE SUN
Environmental Health ..... Ravinia Ballroom
MODERATOR: ***Mike McGeehin***

8:35 Community Needs Assessment for Public Health Emergency Response Following the Earthquake and Tsunami — American Samoa, 2009. ***Ekta Choudhary***

8:55 Are Formaldehyde Levels in Portable and Traditional Classrooms a Cause for Concern? Georgia, 2009. ***Isabela Ribeiro***

9:15 Lead Poisoning in U.S.-Bound Burmese Refugee Children — Thailand-Burma Border Refugee Camps, May–June 2009. ***Tarissa Mitchell***

9:35 Outbreak of Acute Pesticide-Related Illness — Bangladesh, April 2009. ***Ellen Yard***

10:00 BREAK

10:15 PRESENTATION OF AWARDS ..... Ravinia Ballroom
MODERATOR: ***Douglas Hamilton***

- ***Donald C. Mackel Memorial Award***
- ***J. Virgil Peavy Memorial Award***
- ***Paul C. Shnitker International Health Award***
- ***James H. Steele Veterinary Public Health Award***
- ***Outstanding Poster Presentation Award***

10:30 SESSION R: LATE-BREAKING REPORTS ..... Ravinia Ballroom
10:30–11:45 a.m. *See supplement for presenters and abstracts.*
MODERATORS: ***Thomas Frieden, Ann Schmitz***

12:00 LUNCH

12:30 SPECIAL SESSION: THE HAITI RESPONSE
A Tale of Two Cities — the Efforts on the Ground and in Atlanta ..... Dunwoody Suites
MODERATOR: ***Mehran Massoudi***
SPEAKERS:
Roc Magloire, Susan Cookson, Isabela Ribeiro, Jeanette Rainey, Robin Nandy, Sara Vagi

1:30 SESSION S: THE CLOSER
Food- and Waterborne Diseases in the International Setting ..... Ravinia Ballroom
MODERATOR: ***Michael J. Beach***

1:35 Evaluation of Pot-Chlorination of Wells During a Cholera Outbreak — Bissau, Guinea-Bissau, 2008. ***Elizabeth Cavallaro***

1:55 Rapid Assessment of Aflatoxin Contamination in Food Commodities — Bangladesh, 2009. ***Monika Roy***

2:15 Changing Water Treatment Practices in People Living with HIV/AIDS in Response to Diarrhea Prevention Programs — Gonder, Ethiopia, 2008-2009. ***Ethel Taylor***

2:35 Excess Mortality During Epidemic Cholera — Cameroon, 2009. ***Emily Cartwright***

2:55 Trends in Diarrheal Disease Mortality and Use of Household Water Treatment, Kisumu Health and Demographic Surveillance System (KHDSS) — Nyanza Province, Kenya, 2003–2007. ***Kashmira Date***

3:15 CLOSING REMARKS AND ADJOURNMENT ..... Ravinia Ballroom
Stephen B. Thacker, Deputy Director for Surveillance, Epidemiology and Laboratory Services, CDC

Presenting EIS Officers

EIS OFFICERS BY AGENCY OR CDC ORGANIZATIONAL UNIT

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Jessica Kattan
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Emily Lutterloh
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Andrew Medina-Marino
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Erin Murray
Megin Nichols
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John Oh
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Parvathy Pillai
Rachel Radcliffe
Matthew Ritchey
Erin Sauber-Schatz
Meera Sreenivasan
Myduc Ta
Nancy Williams

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**Proposed name under CDC reorganization*

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Awards

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 epidemiological investigation or study.

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.

DISTINGUISHED FRIEND OF THE 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.

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.

DONALD C. MACKEL MEMORIAL AWARD

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

J. VIRGIL PEAVY MEMORIAL AWARD

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

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.

PAUL C. SCHNITKER INTERNATIONAL HEALTH AWARD

Paul C. Schnitker, M.D., 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.

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.

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Awards Presented at the 2009 EIS Conference

ALEXANDER D. LANGMUIR PRIZE MANUSCRIPT AWARD

Epidemiologic Investigation of Immune-Mediated Polyradiculoneuropathy Among Abattoir Workers Exposed to Porcine Brain. *PLOS ONE 5 (3): e9782.*

Stacy M. Holzbauer, A. S. DeVries, J. J. Sejvar, C. Lees, J. Adjemian, J. H. McQuiston, C. Medus, C. Lexau, J. R. Harris, S.E. Recuenco, E. D. Belay, J. F. Howell, B. Buss, M. Hornig, J. D. Gibbins, S. E. Brueck, K. E. Smith, R. N. Danila, W. I. Lipkin, D. H. Lachance, P. J. B. Dyck, R. Lynfield

DONALD C. MACKEL MEMORIAL AWARD

Cardiac Events and Deaths in a Dialysis Facility Associated with a Healthcare Provider — Texas, 2008

Melissa K. Schaefer, C. Lucero, M. Sochaski, R. Kleiman, J. Su, M. Arduino, A. Kallen, M. Schwartz, P. Patel for the Texas Dialysis Investigation Team

OUTSTANDING POSTER PRESENTATION

Seroprevalence of Herpes Simplex Type 2 — National Health and Nutritional Examination Surveys, United States, 2005–2006

Sara E. Forhan, F. Xu, M. Sternberg, S. Gottlieb, S. Berman, L. Markowitz

J. VIRGIL PEAVY MEMORIAL AWARD

Predicting the Effects of *Haemophilus influenzae* Type b (Hib) Vaccine Shortage on the Incidence of Hib Disease in Children <5 years of Age — United States, 2008

Michael L. Jackson, C. Rose, F. Coronado, T. Clark, N. Messonnier

PHILIP S. BRACHMAN AWARD

C. Kay Smith, Julie Magri

DISTINGUISHED FRIEND OF THE EIS AWARD

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Amanda Cohn, Rosalyn O'Loughlin

JAMES H. STEELE VETERINARY PUBLIC HEALTH AWARD

Casey Barton Behravesh, Stacy Holzbauer

Alexander D. Langmuir Lectures, 1972–2009

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 Guin eans 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. Langmuir: 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 Infec tious 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 Frieden

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

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

Alexander D. Langmuir Prize Manuscripts, 1966–2009

1966 Complications of Smallpox Vaccination: I. National Survey in the United States, 1963. N Engl J Med 1967;276:125–32.
J.M. Neff, J.M. Lane, J.H. Pert, R. Moore, J.D. Millar, D.A. Henderson

1967 An Outbreak of Neuromyasthe nia in a Kentucky Factory — The Possible Role of a Brief Exposure to Organic Mercury. Am J Epidemiol 1967;86:756–64.
G. Miller, R. Chamberlin, W.M. McCormack

1968 Salmonellosis from Chicken Prepared in Commercial Rotisseries: Report of an Outbreak. Am J Epidemiol 1969;90:429–37.
S.B. Werner, J. Allard, E.A. Ager

1969 Outbreak of Tick-Borne Relapsing Fever in Spokane County, Washing ton. JAMA 1969;210:1045–50.
R.S. Thompson, W. Burgdorfer, R. Russell, B.J. Francis

1970 Tularemia Epidemic: Vermont, 1968 — Forty-Seven Cases Linked to Contact with Muskrats. N Engl J Med 1969;280:1253–60.
L.S. Young, D.S. Bicknell, B.G. Archer, et al.

1971 Tomato Juice-Associated Gastro enteritis, Washington and Oregon, 1969. Am J Epidemiol 1972; 96:219–26.
W.H. Barker Jr., V. Runte

1972 *Salmonella* Septicemia from Platelet Transfusions: Study of an Outbreak Traced to a Hematogenous Carrier of Salmonella cholerae-suis. Ann Intern Med 1973;78:633–41.
F.S. Rhame, R.K. Root, J.D. MacLowry, T.A. Dadisman, J.V. Bennett

1973 Outbreak of Typhoid Fever in Trini dad in 1971 Traced to a Commercial Ice Cream Product. Am J Epidemiol 1974;100:150–7.
A. Taylor Jr., A. Santiago, A. Gonzales-Cortes, E.J. Gangarosa

1974 Oyster-Associated Hepatitis: Fail ure of Shellfish Certification Pro grams to Prevent Outbreaks. JAMA 1975;233:1065–8.
B.L. Portnoy, P.A. Mackowiak, C.T. Caraway, J.A. Walker, T.W. McKinley, C.A. Klein Jr.

1975 Staphylococcal Food Poisoning Aboard a Commercial Aircraft. Lancet 1975;2:595–9.
M.S. Eisenberg, K. Gaarslev, W. Brown, M. Horwitz, D. Hill

1976 Nursery Outbreak of Peritonitis with Pneumoperitoneum Probably Caused by Thermometer-Induced Rectal Perforation. Am J Epidemiol 1976;104:632–44.
M.A. Horwitz, J.V. Bennett

1977 Epidemic *Yersinia entercolitica* Infection due to Contaminated Chocolate Milk. N Engl J Med 1978;298:76–9.
R.E. Black, R.J. Jackson, T. Tsai, et al.

1978 Measles Vaccine Efficacy in Children Previously Vaccinated at 12 Months of Age. Pediatrics 1978;62:955–60.
J.S. Marks, T.J. Halpin, W.A. Orenstein

1979 An Outbreak of Legionnaires' Dis ease Associated with a Contaminated Air-Conditioning Cooling Tower. N Engl J Med 1980;302:365–70.
T.J. Dondero, Jr., R.C. Rendtorff, G.F. Mallison, et al.
and
Risk of Vascular Disease in Women: Smoking, Oral Contraceptives, Noncontraceptive Estrogens, and Other Factors. JAMA 1979;242:1150–4.
D.B. Petitti, J.Wingerd, J. Pellegrin, et al.

1980 Injuries from the Wichita Falls Tornado: Implications for Prevention. Science 1980;207:734–8.
R.I. Glass, R.B. Craven, D.J. Bregman, et al.

1981 Respiratory Irritation due to Carpet Shampoo: Two Outbreaks. Environ Int 1982;8:337–41.
K. Kreiss, M.G. Gonzalez, K.L. Conright, A.R. Scheere
and
Toxic-Shock Syndrome in Menstruating Women: Association with Tampon Use and Staphylococcus aureus and Clinical Features in 52 Cases. N Engl J Med 1980;303:1436–42.
K.N. Shands, G.P. Schmid, B.B. Dan, et al.

1982 Risk Factors for Heatstroke: A Case-Control Study. JAMA 1982;247:3332–6.
E.M. Kilbourne, K. Choi, T.S. Jones, S.B. Thacker

1983 Epidemic Listeriosis C — Evidence for Transmission by Food. N Engl J Med 1983;308:203–6.
W.F. Schlech III, P.M. Lavigne, R.A. Bortolussi, et al.

1984 Unexplained Deaths in a Children's Hospital: An Epidemiologic Assessment. N Engl J Med 1985;313:211–6.
J.W. Buehler, L.F. Smith, E.M. Wallace, C.W. Heath, R. Kusiak, J.L. Herndon
and Medication Errors with Inhalant Epinephrine Mimicking an Epidemic of Neonatal Sepsis. N Engl J Med 1984;310:166–70.
S.L. Solomon, E.M. Wallace, E.L. Ford-Jones, et al.

1985 The Use and Efficacy of Child-Restraint Devices: The Tennessee Experience, 1982 and 1983. JAMA 1984;252:2571–5.
M.D. Decker, M.J. Dewey, R.H. Hutcheson Jr., W.S. Schaffner

1986 The Role of Parvovirus B19 in Aplastic Crisis and Erythema Infectiosum (Fifth Disease). J Infect Dis 1986;154:383–93.
T.L. Chorba, P. Coccia, R.C. Holman, et al.

1987 Oral Contraceptives and Cervical Cancer Risk in Costa Rica: Detection Bias or Causal Association? JAMA 1988;259:59–64.
K.L. Irwin, L. Rosero-Bixby, M.W. Oberle, et al.

1988 A Day-Care-Based Case-Control Efficacy Study of Haemophilus influenzae B Polysaccharide Vaccine. JAMA 1988;260:1413–8.
L.H. Harrison, C. Broome, A.W. Hightower, et al.

1989 Group A Meningococcal Carriage in Travelers Returning from Saudi Arabia. JAMA 1988;260:2686–9.
P.S. Moore, L.H. Harrison, E.E. Telzak,, G.W. Ajello, C.V. Broome

and Transmission of Plasmodium vivax Malaria in San Diego County, California, 1986. Am J Trop Med Hyg 1990;42:3–9.
Y.A. Maldonado, B.L. Nahlen, R.R. Roberta, et al.

1990 An Outbreak of Surgical Wound Infections due to Group A Streptococcus Carried on the Scalp. N Engl J Med 1990;323:968–72.
T.D. Mastro, T.A. Farley, J.A. Elliott, et al.

1991 An Investigation of the Cause of the Eosinophilia-Myalgia Syndrome Associated with Tryptophan Use. N Engl J Med 1990;323:357–65.
E.A. Belongia, C.W. Hedberg, G.J. Gleich, et al.

1992 An Outbreak of Multidrug-Resistant Tuberculosis among Hospitalized Patients with the Acquired Immunodeficiency Syndrome. N Engl J Med 1992;326:1514–21.
B.R. Edlin, J.I. Tokars, M.H. Grieco, et al.

1993 Comparison of Prevention Strategies for Neonatal Group B Streptococcal Infection: A Population-Based Economic Analysis. JAMA 1993;270:1442–8.
J.C. Mohle-Boetani, A. Schuchat, B.D. Plikaytis, J.D. Smith, C.V. Broome

and Retrospective Study of the Impact of Lead-Based Hazard Remediation on Children's Blood Lead Levels in St. Louis, Missouri. Am J Epidemiol 1994;139:1016–26.
C. Staes, T. Matte, C.B. Copley, D. Flanders, S. Binder

1994 A Massive Outbreak in Milwaukee of Crytosporidium Infection Transmitted through the Public Water Supply. N Engl J Med 1994;331:161–7.
W.R. Mac Kenzie, N.J. Hoxie, M.E. Proctor, et al.

1995 A Multistate Outbreak of *Escherichia coli* 0157:H7-Associated Bloody Diarrhea and Hemolytic Uremic Syndrome from Hamburgers: The Washington Experience. JAMA 1994;272:1349–53.
B.P. Bell, M. Goldoft, P.M. Griffin, et al.

1996 A Multistate Outbreak of *Salmonella enteriditis* Infections Associated with Consumption of Schwan's Ice Cream. N Engl J Med 1996; 334:1281–6.
T.W. Hennessy, C.W. Hedberg, L. Slutsker, et al.
and Passenger to Passenger Transmission of *Mycobacterium tuberculosis* Aboard Commercial Aircraft During Transoceanic Travel. N Engl J Med 1996;334:993–8.
T.A. Kenyon, S.E. Valway, W.W. Ihle, I.M. Onorato.

1997 Epidemic Meningococcal Disease and Tobacco Smoke: A Risk Factor Study in the Pacific Northwest. Pediatr Infect Dis J 1997;16:979–83.
M.A. Fisher, K. Hedberg, P. Cardosi, et al.

1998 Suicide After Natural Disasters. N Engl J Med 1998;338:373–8.
E.G. Krug, M. Kresnow, J.P. Peddicord, et al.

1999 Legalized Physician-Assisted Suicide in Oregon C — The First Year's Experience. N Engl J Med 1999;340:577–583.
A.E. Chin, K. Hedberg, G.K. Higginson, D.W. Fleming

2000 Infantile Hypertrophic Pyloric Stenosis After Pertussis Prophylaxis with Erythromycin: A Case Review and Cohort Study. Lancet 1999;354:2101–5.
M.A. Honein, L.J. Paulozzi, I.M. Himelright, B. Lee, J.D. Cragan, L. Patterson, A. Correa, S. Hall, J. D. Erickson

2001 *Salmonella* Typhimurium Infections Transmitted By Chlorine-Pretreated Clover Sprout Seeds. Am J Epidemiol 2001 Dec 1;154:1020–8.
J.T. Brooks, S. Rowe, P. Shillam, D. Heltzel, S. Hunter, L. Slutsker, R. Hoekstra, S. Luby

2002 *Serratia liquefaciens* Bloodstream Infections from Contamination of Epoetin Alfa at a Hemodialysis Center. N Engl J Med. 2001 May 17;344(20):1491–7.
LA Grohskopf, VR Roth, DR Feikin, MJ Arduino, LA Carson, JI Tokars, SC Holt, BJ Jensen, RE Hoffman, WR Jarvis

2003 Transmission of West Nile Virus from an Organ Donor to Four Transplant Recipients. N Engl J Med. 2003; 348:2196–2203.
M. Iwamoto, D.B. Jernigan, A. Guasch, M.J. Trepka, C.G. Blackmore, W.C. Hellinger, S.M. Pham, S. Zaki, R.S. Lanciotti, S.E. Lance-Parker, C.A. DiazGranados, A.G. Winquist, C.A. Perlino S. Wiersma, K.L. Hillyer, J.L. Goodman, A.A. Marfin, M.E. Chamberland, L.R. Petersen, the West Nile Virus in Transplant Recipients Investigation Team

2004 Risk of Bacterial Meningitis in Children with Cochlear Implants. N Engl J Med. 2003; 349:435–445.
J. Reefhuis, M.A. Honein, C.G. Whitney, S. Chamany, E.A. Mann, K.R. Biernath, K. Broder, S.Manning, S. Avashia, M. Victor, P. Costa, O. Devine, A. Graham, C. Boyle

2005 Changes in Invasive Pneumococcal Disease Among HIV-Infected Adults Living in the Era of Childhood Pneumococcal Immunization. Ann Intern Med .2006 Jan 3;144(1):1–9
B.L. Flannery, R.T. Heffernan, L.H. Harrison, et al.

2006 Case-Control Study of an Acute Aflatoxicosis Outbreak, Kenya, 2004. Environ Health Perspect 2005; Dec 113: 1779–1783.
E. Azziz-Baumgartner, K.Y. Lindblade, K. Gieseker, et al., *and the* ***Aflatoxin Investigative Group***

2007 Methaphetamine Use is Independently Associated with Risky Sexual Behaviors and Adolescent Pregnancy. JSch Health. 2008 Dec; 78 (12): 641–8.
L.B. Zapata, S.D Hillis, P.M. Marchbanks, K.M. Curtis, R. Lowry

2008 Characteristics of Perpetrators in Homicide-Followed-by-Suicide Incidents: National Violent Death Reporting System — 17 US States, 2003–2005. Am J Epidemiol. 2008 Nov 1; 168 (9): 1056–64.
J. Logan, H.A. Hill, A.E. Crosby, D.L. Karch, J.D. Barnes, K.M. Lubell

2009 Epidemiologic Investigation of Immune-Mediated Polyradiculoneuropathy Among Abattoir Workers Exposed to Porcine Brain. PLoS ONE. 5(3): e9782.
Stacy M. Holzbauer, A. S. DeVries, J. J. Sejvar, et al.

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Abstracts

2010 CONFERENCE ABSTRACTS

MONDAY, APRIL 19

SESSION A: America's Most Wanted

Opening Session ..... Ravinia Ballroom, 8:30–10:15 a.m.

MODERATORS: ***Denise Koo, Stephen Thacker***

8:35

Can Quiet Kill? Pedestrian and Bicyclist Fatalities Caused by Hybrid Motor Vehicles — United States, 2004–2008

AUTHORS: ***Amy L. Freeland, A. Wendel, A. Dannenberg***

BACKGROUND: Hybrid-electric vehicles (HEV) have environmental benefits, including decreased noise and reduced emissions of local air pollutants, which may provide public health benefits. However, anecdotal evidence suggests that pedestrians and bicyclists may have difficulty hearing quiet HEVs, resulting in increased risk of injury and death.

METHODS: We used data from all 496,142 person-files recorded in the National Highway Transportation Safety Administration's Fatality Analysis Reporting System between 2004 and 2008. Data were pooled across years, and pedestrian, bicyclist, and crash-specific variables were analyzed. We used National Insurance Crime Bureau manuals to identify HEVs by decoding vehicle identification numbers, except for General Motors™ and Nissan™ HEVs, which were coded ambiguously. We compared non-motorist fatalities associated with both standard engine vehicles (SEV) and HEVs using Chi-squared analyses.

RESULTS: There were 479,597 vehicles involved in 207,041 traffic-related fatalities between 2004 and 2008. Of involved vehicles, <0.1% (n=300) were HEV. Of total fatalities, 25,252 (12.2%) were pedestrians and 3,798 (1.8%) were bicyclists. Of vehicles involved in fatal crashes, 16.7% of HEVs were involved in pedestrian fatality crashes compared to 11.9% of SEVs (P=.01), and 2.4% of HEVs were involved in bicyclist fatalities compared to 2.1% for SEVs (P=.74). Only seven (13.0%) of the 54 HEV-related pedestrian and none of the six HEV-related bicyclist fatalities occurred at speeds <35 miles per hour when HEVs are quietest.

CONCLUSIONS: The proportion of pedestrian fatalities is higher for HEVs than SEVs, yet HEVs caused very few of the overall non-motorist deaths. Few HEV fatalities occur when HEVs are quiet. Future research should examine population-based fatal and non-fatal injury data, HEV market distribution, crash- and vehicle-specific variables, and environmental factors that may help explain risk variations.

KEYWORDS: environment design, motor vehicle, traffic crash, injury prevention, fatality risk

8:55

Extensive Tuberculosis Outbreak Associated with an Assisted Living Facility for Adults with Mental Illness — Florida, 2008–2009

AUTHORS: *Joseph S. Cavanaugh, K. Powell, C. Benjamin, A. Hilliard, K. Davis, O. Renwick, K. Mitruka*

BACKGROUND: Despite often residing in congregate settings and a relative inability to communicate symptoms, persons with severe and persistent mental illness, who constitute 2.6% of the adult U.S. population, are rarely categorized as more vulnerable to infectious disease. In May 2009, a tuberculosis (TB) outbreak was reported at a 91-bed assisted living facility for mentally ill adults in Florida. We investigated to determine the cause and extent of the outbreak.

METHODS: A case was defined as TB disease diagnosed January 1, 2008–July 9, 2009, caused by either the outbreak strain (PCR00160) or an unavailable/pending genotype, in a person associated with the facility. We reviewed medical records and interviewed patients or their proxies to identify contacts. Facility residents and staff underwent standard TB evaluation, including a tuberculin skin test to detect latent infection.

RESULTS: Fifteen facility residents and three nonresidents composed the outbreak. The index patient was contagious for 8 months before diagnosis. Ten of the 18 patients did not report symptoms and instead were identified through the health department's extensive contact investigation regarding the index patient. Sixteen had severe mental illness. Eight had substantial problems with TB treatment adherence: five ultimately required involuntary inpatient commitment to ensure cure. Two patients died. Of 87 contacts evaluated, 72 (83%) had latent TB infection — a percentage that was 20-fold that of the general U.S. population.

CONCLUSIONS: The convergence of diagnostic delays, numerous infectious cases, and non-adherence to TB treatment resulted in intense transmission and deaths that could have been prevented. Active TB screening and measures to ensure treatment adherence may diminish transmission and prevent deaths in challenging populations like this one.

KEYWORDS: tuberculosis, epidemiology, mental illness, group homes

9:15

Potluck Dinner Outbreak of *Salmonella* IV Infections Associated with Contamination from Bearded Dragon Reptiles — Minnesota, 2009

AUTHORS: *Sara Lowther, C. Medus, J. Scheftel, F. Leano, S. Jawahir, K. Smith*

BACKGROUND: Approximately 1.4 million *Salmonella* infections and 400 deaths occur annually in the United States. During December 1–4, 2009, three case-isolates of *Salmonella* IV 6,7:z4,z24:- with indistinguishable pulsed-field gel electrophoresis patterns were identified through Minnesota Department of Health laboratory-based surveillance. *Salmonella* IV is

primarily associated with reptiles. None of the three patients had reptile contact, but all had attended the same potluck dinner, thus warranting further investigation.

METHODS: Potluck attendees were interviewed about illness, foods they prepared for and consumed at the event, and pet ownership. Cases were defined as fever and diarrhea (≥3 loose stools in 24-hours) experienced after food consumption or laboratory confirmed *Salmonella* IV. Two weeks after the event, environmental samples were taken from a food preparer's house where two pet bearded dragons were kept.

RESULTS: Sixty-six of 73 dinner consumers were interviewed; 16 cases were identified; 12 reported illness but did not meet the definition. The median incubation period was 19 (range: 3–26) hours. Median duration of illness was 3 (range: 1–11) days. Five patients visited health-care providers. Only consumption of gravy, prepared by the reptiles' asymptomatic owner, was associated with illness (15/37 exposed versus 1/15 unexposed; risk ratio: 6.1; exact P=0.02). Salmonellae were recovered from 12/36 environmental samples, including the reptiles' terrarium and kitchen sink drains. The outbreak PFGE subtype of *Salmonella* IV was isolated, but only from vacuum cleaner bag contents.

CONCLUSIONS: This foodborne outbreak likely resulted from environmental contamination from bearded dragons. Reptiles pose a community threat when food for public consumption is prepared in households with reptiles. Education is needed on *Salmonella* risk from reptiles in terms of environmental contamination of food preparation surfaces.

KEYWORDS: *Salmonella*, disease outbreak, reptiles, foodborne disease

9:35

Evaluation of Influenza A (H1N1) 2009 Monovalent Vaccines Safety Through the Vaccine Adverse Event Reporting System — United States, October 1–December 4, 2009

AUTHORS: ***Yenlik A. Zheteyeva, K. Broder, A. Guh, M. McNeil, M. Nguyen, A. Calugar, J. Gidudu, D.Martin, J. Su, K. Walton, P. Haber, P. Tosh, A. Rao, S. Hocevar, J.Bell, D. Esposito, E. Meites, J. Duffy, C. Vellozzi***

BACKGROUND: In April 2009, the Department of Health and Human Services declared a pandemic influenza emergency. By October 2009, widespread US vaccination with Influenza A (H1N1) Monovalent Vaccines (H1N1 vaccines) began with 63.3 million doses distributed by December 3, 2009. With potential vaccination of >100 million people, ensuring vaccine safety was a top priority. We implemented enhanced safety monitoring through the Vaccine Adverse Event Reporting System (VAERS) to promptly detect new, rare, or unusual patterns of adverse events, including anaphylaxis and Guillian-Barré Syndrome (GBS).

METHODS: Between October 1–December 4, 2009, we reviewed all VAERS reports after H1N1 vaccinations daily. Reports were coded as serious based on the Code of Federal Regulations. We calculated proportional reporting ratio (PRR) to compare proportions of serious reports after H1N1 and seasonal influenza vaccines. We reviewed reports and medical records of deaths, GBS and anaphylaxis to verify physician diagnosis.

RESULTS: VAERS received 4,981 reports after H1N1 vaccination and 5,099 after seasonal influenza vaccination. We observed no significant difference in proportion of serious adverse events after H1N1 vaccination (291/4,981 [5.8%]) compared with seasonal influenza vaccination (336/5,099 [6.6%]) (PRR=0.87, 95%CI 0.75-1.04). For the 19 death reports after H1N1 vaccinations, the reported causes of death were: cardiac (7), infectious (7), trauma (1), and unknown (4). We identified 9 GBS (8 serious) and 53 anaphylaxis reports (22 serious). Reports of death, GBS and anaphylaxis were rare (each <1 per million H1N1 vaccine doses distributed).

CONCLUSIONS: During the first two months of the H1N1 vaccination program, VAERS data revealed no significant safety problems. We observed similar proportions of serious reports after H1N1 vaccine and seasonal influenza vaccine, which has a well-established safety record.

KEYWORDS: vaccine safety, H1N1, influenza vaccine, Vaccine Adverse Event Reporting System

9:55

The Weight of War: The Psychological Impact of Displacement Due to Armed Conflict — Jaffna District, Sri Lanka, 2009

AUTHORS: *Farah Husain, M. Anderson, B. Lopes-Cardozo, K. Becknell, C. Blanton, D. Araki, E. Vithana, J. Ratto, N. Schaad, R. Chandrasekera*

BACKGROUND: Each year, nearly 2.6 million people worldwide are displaced from their homes due to armed conflict. While overall patterns of psychiatric morbidity in conflict-affected populations have been well documented, little is known about the psychological impact of forced displacement within this group. To understand this association, we assessed the level of psychiatric morbidity among a population from northern Sri Lanka, a region affected by >25 years of armed conflict.

METHODS: From July-September 2009, we conducted a two-stage cluster survey among 1,448 persons aged 15 years or older in Jaffna District. We assessed depression and anxiety symptoms using the Hopkins Symptom Checklist-25 and posttraumatic stress disorder (PTSD) using the Harvard Trauma Questionnaire. To measure the association between displacement and psychiatric morbidity, we used a logistic regression model including other risk factors for psychiatric morbidity such as sex, age, marital status, education, and income as covariates.

RESULTS: Overall, 31.8%, 31.0%, and 7.5% of respondents reported symptoms of anxiety, depression, and PTSD, respectively. Compared to persons never displaced, recently displaced persons (currently living in a displacement camp) were more likely to report symptoms of anxiety (48.5%, AOR=3.3, 95% confidence interval [CI]=2.3-4.7), symptoms of depression (40.0%, AOR=2.0, 95% CI=1.2-3.3), and symptoms of PTSD (13.0%, AOR= 2.9, 95% CI=1.4-6.2). Long-term displaced persons (resettled in community) were more likely to report PTSD symptoms (11.3%, AOR=2.0, 95% CI=1.1-3.5) than persons never displaced.

CONCLUSIONS: The psychological consequences of armed conflict in Sri Lanka were more severe in displaced persons than in people not displaced. Relief efforts must recognize the

importance of mental health interventions for all people affected by armed conflict, but focus particular attention on those living in displacement camps.

KEYWORDS: mental health, armed conflict, displacement, Sri Lanka, PTSD, depression, anxiety

MONDAY, APRIL 19

SESSION B: How I Met Your Mother

Reproductive Health ..... Ravinia Ballroom, 10:45 a.m.–12:15 p.m.

MODERATOR: *Ursula Bauer*

10:50

Sickle Cell Disease and Pregnancy Outcomes Among Women of African Descent — Massachusetts, 1998–2006

AUTHORS: *Danielle T. Barradas, W. Barfield, S. Manning, M. Kotelchuck, C. Shapiro-Mendoza*

BACKGROUND: Sickle cell disease (SCD) is a severe hematologic condition whose potential complications among pregnant women, including vascular effects to the uterus and placenta, increase risks to the woman and fetus. Using data from a large, population-based sample, we assessed differences between pregnancy-related outcomes among women of African ancestry with SCD and those without SCD.

METHODS: We used linked Massachusetts birth/death certificates, fetal death (FD) certificates, and hospital discharge data to identify in-state resident deliveries during 1998–2006. We then used logistic regression analyses to estimate the association between SCD and risk for FD and risk for preterm (<37 weeks gestational age [GA]), low birth weight (LBW, birth weight [BW] <2500 g), small-for-gestational-age (SGA, BW <10th percentile for sex), intrauterine growth restriction (IUGR, BW <5th percentile for sex and GA), and cesarean delivery. Results were adjusted for adequacy of prenatal care; plurality; infant's sex; and maternal age, education, parity, insurance status, and smoking status during pregnancy.

RESULTS: We estimated that 116,076 deliveries occurred among 84,561 African descendant women in Massachusetts during 1998–2006. SCD prevalence in this group was 0.6%. SCD was positively associated with risk for FD (adjusted odds ratio [AOR]=2.2, 95% confidence interval [CI]=1.2–4.2) and for preterm (AOR=1.5; 95% CI=1.2–1.8) and LBW deliveries (AOR=1.7, 95% CI=1.1–2.6). SCD was also positively associated with risk for SGA and cesarean delivery but not with risk for IUGR.

CONCLUSIONS: Population-based linked data systems are useful for assessing risks for adverse health outcomes among women with specific medical conditions such as SCD. Women with SCD should seek preconception care to identify and modify risk factors and receive counseling regarding potential adverse SCD-related pregnancy outcomes.

KEYWORDS: sickle cell disease; perinatal mortality; premature birth; infant, low birth weight; Cesarean delivery

11:10

Demographic Differences in Pregnancy Outcomes After Diagnoses of Neural Tube Defects — Texas, 1999–2005

AUTHORS: *Sharyn E. Parks, M. Canfield*

BACKGROUND: Neural tube defects (NTDs) affect 1 in 2,000 births in the United States annually and cause severe, life-long complications among surviving infants. Because NTDs often result in fetal death or outpatient elective termination, not all cases are captured in typical hospital-based surveillance. This biases studies of risk factors and prevalence of NTD-affected pregnancies. We examined demographic differences in pregnancy outcomes to assess sources of bias.

METHODS: Using 1999–2005 Texas Birth Defects Registry data, a hospital-based, active surveillance system, we calculated crude and adjusted prevalence ratios (aPRs) for pregnancy outcomes of fetal death, elective termination, and live birth of NTD subtypes (i.e., anencephaly, spina bifida [SB], and encephalocele) using Poisson regression. Models were stratified and adjusted for maternal race/ethnicity, age, and education.

RESULTS: Data were available for 1,868 NTDs (anencephaly=689; SB=957; encephalocele=222), resulting in 1,211 live births, 236 fetal deaths, and 405 elective terminations. Compared with women aged 25–29 years, women ≥30 experienced fewer anencephaly fetal deaths (aPR=0.55; P=.04) and terminations (aPR=0.26; P=.001), but more SB fetal deaths (aPR=2.59; P=.02). Compared with non-Hispanic whites, Hispanic women experienced more live births across all NTDs. Black women experienced fewer anencephaly terminations (aPR=0.50; P=.03) and SB fetal deaths than white women (aPR=0.31; P=.07). Compared with women with education beyond high school, women with less than high school education experienced more fetal deaths for anencephaly (aPR=1.83; P=.007) and SB (aPR=2.68; P=.009) and more live births for SB (aPR=1.39; P=.001).

CONCLUSIONS: Demographic differences in NTD pregnancy outcomes exist and are a potential source of bias. Supplementing hospital-based NTD data with outpatient data will improve ascertainment of outcomes for NTD-affected pregnancies and enhance capacity to study and monitor NTDs.

KEYWORDS: neural tube defects, congenital abnormalities, pregnancy outcome, surveillance

11:30

Breast and Cervical Cancer Screening Among Women with Disabilities—United States, 2008

AUTHORS: *Brunella Frammartino, J. Miller, B. Armour, E. Courtney*

BACKGROUND: Breast and cervical screening are the best available methods for early cancer detection. However, approximately 26 million U.S. women have a disability, and these women have lower rates of cancer screening services than women without a disability. Understanding factors that influence underutilization of cancer screening services among women with disabilities may help identify key issues to improve health care for these women.

METHODS: Using data from 258,806 female respondents to the 2008 Behavioral Risk Factor Surveillance System questionnaire, we calculated the age-adjusted prevalence of women with mammogram in the last two years or Pap test in the last three years by disability status. "Disability" was defined as any activity limitations or use of special equipment. We used SAS/SUDAAN to conduct multivariable logistic regression to assess disability status and other variables associated with use of these cancer screening tests.

RESULTS: Among women with disabilities, 18% aged ≥40 (N=66,632) denied having a recent mammogram, and 20% aged ≥18 (N=73,685) denied a recent Pap test. After adjusting for demographic and socioeconomic variables, women with disabilities were less likely than women without to have had a mammogram (Odds Ratio [OR]=0.90, 95% Confidence Interval [CI]=0.85–0.95) or a Pap test (OR=0.80, 95% CI=0.75–0.84). Underutilization of cancer screening among women with disabilities was associated with white race, not being married, not having a healthcare provider, not having medical insurance, and lack of social and emotional support.

CONCLUSIONS: This study identified demographic and socioeconomic factors which can be used for targeted interventions. A next step would be to identify specific barriers and increase access to cancer screening services for women with disabilities as proposed in the Healthy People 2010 objectives.

KEYWORDS: disparities, women with disability, breast cancer, cervical cancer, screening services

11:50

Severity of 2009 Pandemic Influenza A (H1N1) Virus Infection in Pregnant Women — New York City, May–June 2009

AUTHORS: *Andreea A. Creanga, T. Johnson, S. Graitcer, L. Hartman, T. Al-Samarrai, A. Schwarz, S. Chu, J. Sackoff, D. Jamieson, A. Fine, C. Shapiro-Mendoza, L. Jones, T. Uyeki, S. Balter, C. Bish, L. Finelli, M. Honein*

BACKGROUND: Information on the impact of 2009 H1N1 influenza infection on pregnant women is limited. Whereas pregnant women account for only about 1% of the U.S. population, early surveillance reports indicated that they have accounted for 6% of U.S. deaths attributable to 2009 H1N1 influenza infection. This study estimated the 2009 H1N1 influenza hospitalization rate and examined the severity of 2009 H1N1 influenza illness among pregnant women in New York City.

METHODS: We abstracted medical record data from a case-series of hospitalized pregnant women (N=62) with laboratory-confirmed 2009 H1N1 influenza between May 1 and June 30, 2009. We conducted Chi-square, Fisher's exact, and Cuzick's trend tests to compare characteristics of women with severe 2009 H1N1 influenza illness (resulting in intensive care admission or death) with corresponding characteristics among women with moderate illness.

RESULTS: The rate of 2009 H1N1 hospitalization among pregnant women was 55.3 per 100,000 population. Eight infected women (12.9%) had severe illness, and two of them died. Six women with severe illness (75.0%) and 16 with moderate illness (29.6%) delivered during their hospitalization (P=0.03). Five (83.3%) of the infants whose mothers had severe illness were admitted to neonatal intensive care or died, compared with only 2 (12.5%) of those whose mothers had moderate illness (P=0.004). Severe illness occurred in only 3.3% of women who received oseltamivir within 2 days of symptom-onset, compared with 21.4% and 44.4% of those who started treatment 3–4 days and ≥5 days after symptom-onset, respectively (P=0.002 for trend).

CONCLUSIONS: Our findings highlight the potential for severe illness among 2009 H1N1 influenza-infected pregnant women and for adverse outcomes among their infants, and suggest the benefit of early oseltamivir treatment. Such regulation might help prevent similar RGM SSI outbreaks.

KEYWORDS: influenza A virus, H1N1, infection, pregnancy

MONDAY, APRIL 19

POSTER SESSION 1: Friends

Meet the Authors of Posters 1–15.....Ravinia Ballroom, 12:30–1:30 p.m.

POSTER 1

Impact of Rotavirus Vaccine on Diarrhea-Associated Hospitalizations Among Children <5 Years of Age — United States, 2004–2009

AUTHORS: *Catherine Yen, J. Tate, J. Wenk, J. Harris II, U. Parashar*

BACKGROUND: Rotavirus is the leading cause of severe diarrheal illness among young children worldwide. Prior to implementation of routine rotavirus vaccination of United States (U.S.) infants in 2006, rotavirus gastroenteritis caused 55,000–70,000 hospitalizations annually among children <5 years of age. We examined trends in diarrhea-associated hospitalizations at U.S. pediatric hospitals from 2003–2009 to assess the impact of the rotavirus vaccine program.

METHODS: We examined hospital discharge data provided by the National Association of Children's Hospitals and Related Institutions and compared all-cause diarrhea hospitalization trends of pre-vaccine rotavirus seasons (2003–2006) to post-vaccine introduction seasons (2007–2009) among children <5 years. We defined rotavirus seasons using laboratory testing results reported to the National Respiratory and Enteric Virus Surveillance System. Seasons began once >10% of tests reported were rotavirus antigen-positive for at least 3 consecutive weeks. Seasons ended once the proportion of positive tests decreased below 10%.

RESULTS: Among 62 pediatric hospitals, a median of 16,826 (range 15,536–17,100) diarrhea-associated hospitalizations occurred each rotavirus season among children <5 years during 2003–2006. Compared to this median, diarrhea-associated hospitalizations decreased

by 53% (n=7,901) in 2007–2008 and by 30% (n=11,713) in 2008–2009. The greatest reductions occurred in 2007–2008, particularly among children ≤2 years (50–54%). Major reductions also occurred among vaccine-ineligible children >2 years (49-51%). In 2008–2009, these reductions decreased in magnitude, especially among children >2 years (11-26%).

CONCLUSIONS: Large reductions in diarrhea-associated hospitalization rates have occurred and continue nationally following introduction of rotavirus vaccine in the U.S. Given the year-to-year variation in hospitalization rates in 2007–2008 and 2008–2009, continued surveillance is required to monitor vaccine impact on diarrheal disease burden.

KEYWORDS: rotavirus, gastroenteritis, diarrhea, rotavirus vaccines

POSTER 2

Evaluation of Tuberculosis Surveillance — Republic of the Marshall Islands, 2004–2008

AUTHORS: ***Bisrat K. Abraham, A. Forbes, J. Jones, R. Bukbuk, M. Hauma, L. Armstrong***

BACKGROUND: The Republic of the Marshall Islands (RMI) has the highest tuberculosis (TB) incidence of all the U.S.-affiliated Pacific Islands, and case rates are substantially higher than those in the United States (192/100,000 vs. 4.2/100,000 in 2008). Citizens of RMI can freely travel without health screening to the United States, where TB in RMI natives has been identified. The RMI began reporting TB surveillance data to CDC in 2004, but underreporting has been suspected. We performed an evaluation of RMI's TB surveillance system.

METHODS: We reviewed data from CDC's National Tuberculosis Surveillance System (NTSS) to identify all cases reported from RMI during 2004–2008. In RMI, we examined TB registration log books, medical records, hospital admission and discharge records, death records, and laboratory records to document unreported cases. We determined the proportion of cases reported and performed a sensitivity analysis. Chi-square analysis was used to compare sensitivity during two periods. TB surveillance personnel were interviewed to assess their knowledge of reporting requirements.

RESULTS: During 2004–2008, we identified 782 TB cases in RMI, of which 384 were reported to the NTSS (sensitivity: 49.1%). Reporting improved in 2007–2008 (sensitivity: 74.4%), as compared with 2004–2006 (sensitivity: 30.0%; $P < .001$). Discussions with TB surveillance staff revealed lack of knowledge of reporting requirements.

CONCLUSIONS: Although >50% of TB cases in RMI were unreported during 2004–2008, reporting has markedly improved in recent years. Further training of TB surveillance personnel is needed to optimize TB reporting in RMI. Improved reporting will give stakeholders a better understanding of the TB burden in RMI and thus help them allocate resources accordingly.

KEYWORDS: tuberculosis, Marshall Islands, population surveillance, disease notification

POSTER 3

Risk Factors for Community Mortality from Cholera — Chivi District, Zimbabwe

AUTHORS: *Diane Morof, S. Cookson, S. Laver, D. Chirundu, S. Desai, P. Mathenge, D. Shambare, L. Charimari, S. Midzi, C. Blanton, T. Handzel*

BACKGROUND: A cholera outbreak occurred in Zimbabwe, from August 2008–July 2009 resulting in >100,000 cases and >4,000 deaths. Approximately 60% of reported deaths occurred outside of health facilities. A case-control study was conducted in one affected district to determine risk factors for cholera-related community deaths.

METHODS: The case-control study was conducted in September 2009 in Chivi District. A case was defined as anyone ≥5 years of age with ≥3 episodes of sudden onset watery diarrhea from October 1, 2008–July 28, 2009 who died outside of a health facility. Two surviving cholera patients were selected per case and matched by age, symptom onset, and residence. A questionnaire captured information on demographics, illness duration and severity, health seeking behaviors, and cholera awareness. Factors associated with cholera-related mortality were identified using chi-squared or Fisher's exact tests. Conditional logistic regression was performed.

RESULTS: We enrolled 55 cases and 110 controls with an average age of 37 and 36, respectively. The odds of death were higher among males (adjusted odd ratio [AOR] =5.0, 95% CI=1.6-16.1) and persons with larger household sizes (AOR=1.2, 95% CI=1.0-1.5). Receiving fluids at home (AOR=0.21, 95% CI=0.06-0.71) and visiting a cholera treatment center (CTC) (AOR=0.06, 95% CI=0.02-0.22) were protective. Having any source of income had borderline protection (AOR=0.24, 95% CI=0.05-1.13). Receiving cholera information was associated with receiving home care and visiting a CTC. Oral rehydration salts were present in 28% of households, but not associated with reduced mortality.

CONCLUSIONS: A failure to receive care at home or visit a CTC was associated with mortality. Community cholera education is needed to reinforce the importance of prompt rehydration and referral to CTCs.

KEYWORDS: cholera, community mortality, risk factors, Zimbabwe

POSTER 4

Comparison of Internet-Based with Telephone Survey Methods in Investigating a Norovirus Outbreak — Oregon, 2009

AUTHORS: *John Y. Oh, J. Bancroft, M. Cunningham, W. Keene, S. Lyss, P. Cieslak, K. Hedberg*

BACKGROUND: Internet-based questionnaires during outbreak investigations conserve resources otherwise needed for telephone interviews. Differential response on the basis of exposures, outcomes or survey method might bias results, highlighting the importance of

validating Internet-based survey methods. In September 2009, a gastroenteritis outbreak among participants in a weeklong cycling tour in Oregon enabled us to compare Internet-based surveys with telephone surveys.

METHODS: E-mail addresses and telephone numbers were available for all 1,288 Oregon cyclists. Cohorts were randomly selected to participate in identically formatted Internet-based or live telephone surveys. Illness was defined as vomiting or diarrhea (≥3 loose stools in 24 hours) with onset during September 11–22, 2009. Specimens were collected for norovirus testing prior to the survey. Survey completion was defined as answering the last question which asked whether illness had developed.

RESULTS: Norovirus (GII) infection was confirmed among 5/6 persons tested. In the Internet-based survey, 153/201 (76%) initiated the survey, 137/153 (90%) confirmed ride participation, and 129/137 (94%) completed the survey. For the telephone survey, 76/91 (84%) initiated the survey, 72/76 (95%) confirmed ride participation, and 72/72 (100%) completed the survey. Most completed surveys were collected within 2 days (92/129 [71%] Internet-based versus 47/72 [65%] telephone; P=0.44). Fewer Internet-based than telephone surveys had >90% of food-item questions answered (73/126 [58%] Internet-based versus 68/72 [94%] telephone, P<0.0001). Attack rates (18%) were identical in both surveys. Illness was unassociated with age, sex, hand-hygiene practices and accessibility, or foods consumed in either survey.

CONCLUSIONS: Internet-based and telephone surveys revealed similar response and attack rates, suggesting no differential response based upon illness. Internet-based surveys might facilitate data collection and entry but must be designed carefully to maximize questionnaire completion.

KEYWORDS: gastroenteritis, norovirus, travel, Internet, questionnaires

POSTER 5
Critical Care Capacity During the 2009 H1N1 Influenza Pandemic — Argentina, 2009

AUTHORS: *Elissa M. Meites, D. Farias, L. Raffo, O. Carlino, L. McDonald, M. Widdowson*

BACKGROUND: During the 2009 influenza A (H1N1) pandemic in the Southern Hemisphere, Argentina reported the most H1N1-related deaths from severe respiratory disease through 8/31/2009. Most were from Buenos Aires, where the largest national hospital (500+ beds) is located. Our objectives were to assess critical care capacity and preparedness at this hospital during the 2009 H1N1 pandemic peak.

METHODS: We reviewed daily administrative records on available hospital critical care ventilator beds, comparing data from the 3-month peak pandemic period (6/1–8/31/2009) with the previous 3-month period (3/1–5/31/2009), and the same 3-month period in 2008 (6/1–8/31/2008). Overflow was calculated as bed-days when demand exceeded available resource limits.

RESULTS: Beginning on 4/26/2009, in response to reports of severe influenza in North America, the hospital implemented a pandemic plan, adding 33 ventilator beds. During the peak pandemic period, ventilator demand increased by 27% (3837 versus 3033 bed-days) compared to the prior three months, and 16% (3837 versus 3306 bed-days) compared to the prior year. Demand increased most in adult critical care wards, where ventilated patients increased by 56% (2220 versus 1427 bed-days), and increased only 1% (1617 versus 1606 bed-days) in pediatric critical care wards, compared to the prior three months. Hospital critical care capacity was never exceeded during the pandemic. However, were it not for the addition of ventilator beds in April, overflow would have occurred for 166 bed-days in adult wards and three bed-days in pediatric wards.

CONCLUSIONS: Without advanced assessment of critical care demand, and methods to redistribute or acquire new resources in a timely fashion, the needs of patients with severe respiratory disease can exceed capacity for a prolonged period during a pandemic.

KEYWORDS: Argentina, disease outbreaks, hospitals, influenza A virus

POSTER 6

Smoking During Pregnancy and Other Maternal Characteristics as Risk Factors for Low Birth Weight Among Singleton Full-Term Infants — West Virginia, 2005–2006

AUTHORS: *Rachel A. Radcliffe, B. Cadwell, L. Zapata*

BACKGROUND: Low birth weight (LBW) is a major determinant of neonatal mortality and morbidity. Although prematurity contributes to LBW, fetal growth restriction can cause LBW among term infants. Certain factors, including maternal smoking, contribute to fetal growth restriction. In West Virginia (WV), maternal smoking was 26.6%–27.2% during 2005–2006. We examined smoking during pregnancy and other maternal characteristics as risk factors for term LBW in WV.

METHODS: Secondary analysis of cross-sectional 2005–2006 WV birth certificate data was completed. Live, singleton, term infants weighing <4,000 grams born to mothers residing in WV, aged 18–45 years, and white or black were included for analysis. LBW was defined as <2,500 grams. Adjusted odds ratios (AORs) and 95% confidence intervals (95% CIs) for associations between maternal characteristics and LBW were estimated with multilevel logistic regression.

RESULTS: Of 31,450 births, 959 (3%) were LBW. Among all mothers, median age was 26 years; 97% were white. Smoking 1–10 (AOR: 2.3; 95% CI, 2.0–2.7), 11–20 (AOR: 2.7; 95% CI, 2.2–3.4), and >20 cigarettes per day (AOR: 4.3; 95% CI, 3.0–6.4) were independently associated with term LBW. Being unmarried (AOR: 1.3; 95% CI, 1.1–1.5), having a high school education (AOR: 1.3; 95% CI, 1.1–1.6) or less (AOR: 1.6; 95% CI, 1.3–1.9), and residing in the highest poverty counties (AOR: 1.3; 95% CI, 1.1–1.7) were also independently associated with term LBW.

CONCLUSIONS: Smoking during pregnancy demonstrated the strongest association with term LBW and exhibited a dose-response effect as the number of cigarettes smoked per day increased. Tobacco cessation by WV mothers might help improve perinatal health.

KEYWORDS: infant, low birth weight, smoking, term birth, tobacco use cessation

POSTER 7

An Assessment of Adherence to Artemether-Lumefantrine for the Treatment of Uncomplicated Malaria — Phalombe, Malawi, 2009

AUTHORS: *Kimberly E. Mace, D. Mwandama, J. Jafali, M. Luka, S. Kachur, S. Filler, D. Mathanga, J. Skarbinski*

BACKGROUND: Malaria due to *Plasmodium falciparum* infection causes substantial morbidity and mortality in Malawi. Prompt and effective treatment of malaria patients is a cornerstone of malaria control. In 2007, due to increasing parasite resistance to the first-line treatment for uncomplicated malaria, Malawi replaced single-dose treatment with sulphadoxine-pyrimethamine with a six-dose, three-day treatment regimen of artemether-lumefantrine (AL). Given concerns about adherence to the more complicated AL regimen, we assessed patient adherence to AL for the treatment of uncomplicated malaria in Phalombe District, Malawi.

METHODS: Adults and children with uncomplicated malaria were recruited at three health centers. To assess adherence, we conducted visual pill counts and in-home interviews regarding medication administration 72 hours after patients received AL. Complete adherence was defined as correctly taking all six doses of AL as assessed by pill count and patient recall of number of doses, number of pills per dose, and the timing of each dose.

RESULTS: We recruited 427 patients, completed in-home interviews on 414 (97%) patients and included 368 (86%) patients with complete data on pill count and dose-recall in the analysis. Among 368 patients with complete data, 238 (65%) were completely adherent. Main classifications of non-adherence included failing to take the entire regimen or the correct number of pills per dose and taking the medication at incorrect times. We also explored reasons for errors in adherence and predictors of adherence.

CONCLUSIONS: Two-thirds of patients in Phalombe District, Malawi were completely adherent to a six-dose AL regimen for the treatment of uncomplicated malaria. Interventions that further increase complete adherence to AL treatment could potentially improve clinical cure rates and might mitigate the development or spread of antimalarial drug resistance.

KEYWORDS: malaria, antimalarials, medication adherence, Malawi, drug resistance

POSTER 8

Evaluation of Active Mortality Surveillance Following Hurricane Ike — Texas, 2008

AUTHORS: *Ekta Choudhary, R. Noe, C. Martin, T. Bayleygen, D. Zane*

BACKGROUND: Hurricane Ike landed as the third most destructive hurricane to date in the United States. Ike, a Category 2 hurricane, struck Texas, on September 13, 2008. The Texas Department of State Health Services implemented Hurricane-Related Mortality Surveillance (HRMS) system to enumerate and characterize hurricane-related deaths. HRMS used estab-

lished case definitions to categorize deaths as directly, indirectly, and possibly related to hurricane. The objective of this study was to evaluate HRMS, the first system based on the CDC's mortality surveillance guidelines.

METHODS: We conducted interviews with stakeholders and analyzed the surveillance database. We retrospectively reviewed Texas Vital Statistics (VS) data for the same time period as the active surveillance to identify deaths captured by HRMS and additional Hurricane Ike-related deaths.

RESULTS: From September 8, 2008, to October 13, 2008, medical examiners (MEs) and Justices of the Peace (JPs) in 44 affected counties reported deaths daily using a one-page, standardized mortality form. HRMS identified 74 hurricane-related deaths. A review of VS data revealed only 4 deaths that were possibly-related to the hurricane. We reviewed a 10% random sample of HRMS forms and found that 98% were complete. All MEs and JPs participated in the system, although some found classifying deaths by using HRMS case definitions difficult.

CONCLUSIONS: HRMS successfully identified hurricane-related deaths. HRMS data were used for situational awareness, media reporting, and missing persons inquires. HRMS is necessary for collecting detailed and representative mortality data because VS does not capture sufficient information to identify hurricane-related deaths. HRMS findings will help enhance preparedness and response plans and identify public health interventions to reduce future hurricane-related mortality. In addition, we recommend improving case definitions and training data reporters.

KEYWORDS: hurricane, active mortality surveillance, surveillance evaluation, disaster-related mortality

POSTER 9

Hospital-Based Mortality in Federal Capital Territory Hospitals — Nigeria, 2005–2008

AUTHORS: ***Nykiconia D. Preacely, O. Biya, S. Gidado, H. Ayanleke, M. Kida, M. Akhimien, A. Abubakar, I. Kurmi***

BACKGROUND: Cause-specific mortality data are important to monitor trends in mortality over time. Nigeria requires civil registration of births and deaths, however, there is evidence indicating these events are often underreported. Medical records provide reliable documentation of the causes of deaths occurring in hospitals. This study describes all causes of mortality reported at hospitals in the Federal Capital Territory (FCT).

METHODS: Deaths reported in 15 secondary and tertiary FCT hospitals occurring from January 1, 2005- December 31, 2008 were identified by a retrospective review of hospital records. All public FCT secondary and tertiary hospitals were included in the study in addition to the two largest private hospitals. Data extracted from the records included sociodemographics, geographic area of residence and underlying cause-of-death information. Physicians assigned *International Classification of Disease,* Tenth Revision codes for reported deaths.

RESULTS: A total of 4,623 deaths occurred in the hospitals. The top five causes of death were: HIV 951 (21%), road traffic accidents 422 (9%), malaria 264 (6%), septicemia 206 (5%), and hypertension 194 (4%). Mortality occurred most frequently among males 2724 (59%). The median age at death was 30 years (range: 0-100); 888 (20%) of deaths were among those less than one year of age.

CONCLUSIONS: Many of the leading causes of mortality identified in this study are preventable. Infant mortality is a large public health problem in FCT hospitals. Although these findings are not representative of all FCT deaths, they may be used to quantify mortality in that occurs in FCT hospitals. These data combined with other mortality surveillance data can provide evidence to inform policy on public health strategies and interventions for the FCT.

KEYWORDS: hospital, mortality, surveillance, Federal Capital Territory

POSTER 10

Impact of Pentavalent Rotavirus Vaccine on Healthcare Utilization for Diarrhea in Children Aged <5 Years — United States, 2007–2008

AUTHORS: *Jennifer E. Cortes, A. Curns, J. Tate, M. Cortese, M. Patel, F. Zhou, U. Parashar*

BACKGROUND: Routine vaccination of US infants with pentavalent rotavirus vaccine (RV5) began in 2006. To assess vaccine impact, we examined healthcare utilization for diarrhea before and after vaccine introduction.

METHODS: We evaluated RV5 coverage and impact on diarrhea-associated healthcare utilization rates and medical expenditures during July 2007–June 2008 compared with July 2001–June 2006 among privately insured US children <5 years using MarketScan® databases. We calculated rate reductions during January–June 2008 among children <2 for vaccinated versus unvaccinated children to assess direct benefits of vaccine and for unvaccinated children versus prevaccine rates to estimate indirect benefits.

RESULTS: On December 31, 2007, ≥1 dose RV5 coverage was 18% among children <5, 63% in children <1, 23% for 1 year olds, and negligible in 2–4 year olds. Compared with 2001–2006, 2007–2008 rates per 10,000 children declined from 52 to 31 for diarrhea hospitalizations (rate reduction, 40%, 95% confidence interval [CI], 38%–43%), from 185 to 158 for ED visits (reduction, 14%, CI, 13%–16%), and from 1348 to 1245 for outpatient visits (reduction, 8%, CI 7%–8%). Declines were similar across age groups. Compared with unvaccinated children, vaccinated children had 39% (CI 25%–50%) fewer diarrhea hospitalizations, 36% (CI 29%–43%) fewer ED visits, and 11% (CI 7%–14%) fewer outpatient visits. 2008 hospitalization rates for unvaccinated children were 33% less than prevaccine rates. Nationally, in 2007–2008 compared the prevaccine baseline, we estimated a reduction of 44,112 hospitalizations, 56,236 ED visits, 217,915 outpatient visits, and nearly $200 million in medical costs annually among children <5.

CONCLUSIONS: Following RV5 introduction, diarrhea-associated healthcare utilization in US children decreased in vaccinated and unvaccinated children.

KEYWORDS: gastroenteritis, rotavirus, vaccine, disease burden

POSTER 11

Impact of Changing Definitions of Penicillin Resistance on Vaccine Effects Against *Streptococcus pneumoniae*, United States, 1998–2008

AUTHORS: ***Lee M. Hampton, M. Farley, W. Schaffner, A. Thomas, A. Reingold, L. Harrison, R. Lynfield, N. Bennett, S. Petit, B. Beall, J. Jorgensen, M. Moore***

BACKGROUND: *Streptococcus pneumoniae* (pneumococcus) causes 43,000 U.S. invasive pneumococcal disease (IPD) cases annually. Antibiotic nonsusceptible IPD is more difficult to treat. We evaluated the effects of a pediatric pneumococcal conjugate vaccine (PCV7) introduced in 2000 using new penicillin susceptibility definitions adopted in 2008.

METHODS: IPD cases were defined by isolation of pneumococcus from a normally sterile site in children <5 years old residing in any of eight Active Bacterial Core surveillance (ABCs) areas during 1998-2008. Pneumococci were serotyped and tested for antibiotic susceptibility. We compared penicillin nonsusceptible IPD rates in 2008 to the 1998-99 average rate using the new (MIC >2 ug/ml in non-meningitis cases) and older definitions (MIC >0.06 ug/ml, also used for all meningitis cases under both definitions).

RESULTS: During 1998-2008, ABCs identified 5,707 IPD cases among children <5 years old. Using the old and new definitions, 35.3% and 14.6% of these cases, respectively, were caused by penicillin nonsusceptible strains. The penicillin nonsusceptible IPD rate (cases per 100,000 population) using the old definitions dropped from 35.6 (1998-1999 average) to 8.0 by 2008 (-78%, 95%CI: -72,-82). Using the retrospectively-applied new definitions, the penicillin nonsusceptible IPD rate declined from 13.0 to 5.2 (-61%, 95% CI: -47, -71). Rates of penicillin nonsusceptible IPD caused by serotypes in PCV7, which accounted for 82.8% or 93.7% of all nonsusceptible IPD in 1998-99 under the old and new definitions, respectively, dropped to 0.8 and zero under the old and new definitions, respectively.

CONCLUSIONS: PCV7's introduction triggered a major decline in penicillin nonsusceptible IPD among children <5 years old, regardless of the definitions used. PCV7's disparate effects under different definitions illustrate how changing case definitions can affect measured vaccine effects.

KEYWORDS: *Streptococcus pneumoniae*, pneumococcal infections, microbial drug resistance, heptavalent pneumococcal conjugate vaccine

POSTER 12

Evaluation of a New Influenza-Like Illness Surveillance System Among Alaska Native Persons, 2009

AUTHORS: *James W. Keck, M. Bruce, S. Kitka, J. Cheek, T. Cullen, L. Layne, J. Redd, T. Hennessy*

BACKGROUND: Influenza disproportionately affects Alaska Native persons (AN); 2009 pandemic influenza A (H1N1) related hospitalization rates among AN in Anchorage were 4.5 times higher than in Caucasians. National influenza-like illness (ILI) reporting provides little data on this vulnerable population. We evaluated the ability of the Indian Health Service Influenza Awareness System (IIAS), a new electronic surveillance system, to monitor ILI in AN.

METHODS: We reviewed ambulatory patient visits in September 2009 at one urban and one rural Alaska Tribal Health System hospital using the ILINet definition for an ILI visit (temperature ≥100°F and either sore throat or cough). We measured the sensitivity and specificity of IIAS to detect ILI visits identified by chart review and assessed the timeliness of IIAS by measuring the delay from an ILI visit to data entry into the electronic health information system.

RESULTS: Of 2,375 patient visits reviewed, 111 (4.7%) met the ILI case definition. IIAS urban and rural ILI surveillance had sensitivities of 95.2% and 97.9% and specificities of 98.2% and 96.1%, respectively. Eliminating the 33 IIAS false positives that lacked a documented temperature ≥100°F increased the overall IIAS specificity from 97.8% to 99.3%. IIAS detected >90% of ILI visits within 11 days of the urban and 46 days of the rural hospital encounter.

CONCLUSIONS: IIAS has high sensitivity and specificity for identifying ILI visits in AN receiving care at rural and urban hospitals. Modifying the IIAS ILI detection algorithm to exclude visits without documented fever increased the system's specificity to nearly 100%. IIAS can fill a gap in influenza surveillance by providing accurate information on ILI activity in AN.

KEYWORDS: influenza, Native Americans, surveillance, Alaska

POSTER 13

Travelers' Impressions of 2009 H1N1 Influenza National Health Messaging Campaign

AUTHORS: *Emily S. Jentes, A. Whatley, K. Holton, G. Brunette*

BACKGROUND: During the spring 2009 H1N1 influenza (H1N1) outbreak, initial illnesses were associated with travel from Mexico, and later with travel to and from the United States. To promote healthy travel and the prevention of H1N1 transmission, a national communications campaign was planned to target travelers by disseminating effective health messages in transportation centers (airports, etc.). Before the fall 2009 H1N1 campaign launch, we sought to determine travelers' impressions of the proposed health messages.

METHODS: Five campaign posters (B-F) focusing on CDC travel recommendations for H1N1 were proposed and compared with the spring CDC Health Alert (HA). Travelers enrolled through a professional recruitment firm and completed online anonymous surveys while viewing the posters. Surveys included questions [scaled 1-10(high)], regarding understandability, appeal, clarity, and reported motivation for behavior change. Data were analyzed by Student's t-test and were significant if $P<.05$.

RESULTS: Surveys were completed by 901 travelers (51% female). Preliminary data showed that HA rated significantly higher than posters B-F for clarity and motivation for change. However, D and F rated significantly more understandable (D, $\bar{x}=7.6$; F, $\bar{x}=7.8$; HA, $\bar{x}=7.4$), visually appealing (D, $\bar{x}=7.2$; F, $\bar{x}=7.3$; HA $\bar{x}=5.7$), and likeable (D, $\bar{x}=7.1$; F, $\bar{x}=7.3$; HA $\bar{x}=6.6$) compared with HA.

CONCLUSIONS: Although travelers reported that HA would motivate change and was clear, D and F were considered more understandable, appealing, and likeable. CDC adapted concepts from these three posters to use as campaign cornerstones. This study highlights that including travelers when developing travel health messages is essential, especially when these messages compete with consumer products advertisements in transportation centers. These results also underscore the need to check messages with target audiences for effective campaign guidance and direction.

KEYWORDS: travel, communication, influenza A virus, H1N1 subtype, advertisements

POSTER 14

Neonatal Male Circumcision Incidence and Adverse Events — United States, 1979–2006

AUTHORS: *Charbel E. El Bcheraoui, K. Kretsinger, R. Chen*

BACKGROUND: Three African randomized controlled trials recently showed that adult male circumcision (MC) conferred approximately 50% protection against HIV acquisition. CDC is preparing guidelines on adult and neonatal MC for HIV prevention in the United States. A large nonrepresentative database showed neonatal MC incidence to be 57.5% during 1993-2006, and published cohort studies have reported rates of adverse events (AEs) ranging from 0.2 to 2.0%. Representative data on MC incidence and AEs are needed to develop the forthcoming guidelines and monitor their impact. We evaluated the National Hospital Discharge Survey (NHDS) as a potential national surveillance system to meet this need.

METHODS: NHDS provides representative national estimates of health care utilization from a stratified random sample of nonfederal hospitals. Using weighted analysis for 1979–2006 data, we calculated the incidence of neonatal MC and rates of AEs (e.g., wounds and sutures) in circumcised neonates by using relevant International Classification of Diseases (ICD-9) codes for 18 diagnoses (e.g., edema of penis) and 14 procedures (e.g., suture of laceration of penis).

RESULTS: Of 54,786,525 newborn males, 33,306,056 (60.8%) underwent circumcision with relatively stable MC rates during the survey period. Among circumcised neonates, rates of AEs were 0.07/100,000 person-years, and rates of penile procedures were 0.10/100,000 person-years.

CONCLUSIONS: Compared to published studies, NHDS found similar MC incidence but much lower rates of AEs. The lower AE rates may be due to the fact that ICD-9 codes are not specific enough to capture MC AEs or failure to ascertain AEs after hospital discharge. Specific codes and better longitudinal data are needed to monitor rates of neonatal MC AEs.

KEYWORDS: circumcision, adverse effects, newborn, United States, HIV

POSTER 15

Epidemiology of Malaria Diagnostics with the Introduction of Rapid Diagnostic Tests in African Refugee Camps — 2007–2008

AUTHORS: *David A. Townes, C. Blanton, C. Haskew, S. Kachur, H. Williams*

BACKGROUND: In Africa approximately 1.1 million refugees are under the protection of the United Nations High Commissioner for Refugees, with the majority living in malaria-endemic areas. Historically, malaria has been diagnosed clinically or by microscopy. Introduced in African refugee camps in 2008, malaria rapid diagnostic tests (RDTs) offer a portable, rapid, easy to use and potentially cost effective addition to malaria diagnostics. We describe changes in malaria testing and confirmation in the year following the introduction of RDTs.

METHODS: UNHCR records health indicators, including malaria diagnostics on a paper form at camp level and electronically at country level. Malaria confirmation is by microcopy or RDT. Malaria diagnostics data from Chad, Ethiopia, Kenya, Sudan, Tanzania, and Uganda (2007-2008) were analyzed with SAS version 9.2 and Microsoft Office Excel 2003.

RESULTS: In their first year of introduction, over 105,000 RDTs were performed. The rate of testing for malaria increased in five of the six countries (median 464%, range 20-2200%), with RDTs accounting for the majority of the increase, and decreased in Kenya (57%). The percentage of confirmed malaria cases increased in Chad, Ethiopia and Kenya (median 19%, range 10-28%), decreased in Sudan (5%) and Tanzania (14%) and was unchanged in Uganda.

CONCLUSIONS: During their first year of introduction, the use and impact of RDTs varied widely. The observed differences among countries are likely due, in part, to inconsistent integration of RDTs into existing guidelines for use of diagnostic tests in suspected malaria and disparities in training of staff on the use of RDTs. These results indicate a willingness to use RDTs to supplement existing diagnostics. However, guidelines and training for their integration in these settings is necessary.

KEYWORDS: malaria, refugee, health information system, malaria rapid diagnostic test

MONDAY, APRIL 19

SESSION C: The Deadliest Catch

Tuberculosis ..... Ravinia Ballroom 1:30–3:00 p.m.

MODERATOR: ***Kenneth Castro***

1:35

Relationship Between *Mycobacterium tuberculosis* Lineage and Extrapulmonary Tuberculosis — United States, 2004–2008

AUTHORS: ***Eleanor S. Click, P. Moonan, C. Winston, L. Cowan, J. Oeltmann***

BACKGROUND: Genotyping of *Mycobacterium tuberculosis* (*M. tuberculosis*) has revealed four major lineages with differential distribution worldwide. It is not known whether different lineages are associated with different sites of infection (e.g., pulmonary vs. extrapulmonary tuberculosis [EPTB]). Understanding such differences may increase clinical consideration of EPTB, the use of the specific diagnostics tests required to diagnose EPTB, and provision of appropriate treatment to patients with EPTB. We investigated the association between *M. tuberculosis* lineage and EPTB.

METHODS: All culture-confirmed cases of TB in the United States reported to the national surveillance system with routinely determined *M. tuberculosis* spoligotype-defined lineage from 2004-2008 were included. For each of the four lineages, the percentage of cases with EPTB was calculated. Controlling factors known to be associated with EPTB (sex, age, region of birth, HIV status, and race), we used logistic regression to assess the relationship between lineage and EPTB.

RESULTS: Of 70,560 reports of TB cases, 32,000 (45.4%) included data on lineage. Of these, 23,844 (74.5%) were pulmonary only, and 8,156 (25.5%) were EPTB. According to preliminary results, the percentages of EPTB cases differed by lineage: East Asian=996/4,302 (22.5%); East-African Indian=602/1,366 (44.1%); Indo-Oceanic=1,530/4,873 (31.4%); Euro-American=5,058/21,459 (23.6%) (chi-square $P<.001$). In a comparison of East Asian lineage and other lineages, the odds of EPTB increased for East-African Indian (adjusted odds ratio [AOR]=1.4, 95% confidence interval [CI]=1.3–1.7), Indo-Oceanic (AOR=1.4, CI=1.3–1.6) and Euro-American (AOR=1.2, CI =1.1–1.3).

CONCLUSIONS: *M. tuberculosis* lineage is associated with EPTB. In settings or populations in which EPTB-associated genotypic lineages are common, efforts to improve recognition of EPTB may be important to ensure adequate diagnosis and treatment.

KEYWORDS: tuberculosis, genotype, United States, *Mycobacterium tuberculosis*

1:55

Screening for Latent Tuberculosis Infection Among Immigration Facility Employees — Illinois, 2009

AUTHORS: *Marie de Perio, T. Niemeier, M. Groenewold*

BACKGROUND: One-third of the world's population has latent tuberculosis infection (LTBI). Foreign-born persons account for most active tuberculosis (TB) cases in the U.S. TB control in immigration facilities involves routinely screening and treating employees for LTBI. We assessed LTBI prevalence among employees at two immigration facilities and compared two screening methods.

METHODS: We administered questionnaires regarding demographics, work and medical history, and TB risk factors. Participants underwent tuberculin skin test (TST) placement and blood collection for the QuantiFERON-TB Gold in-Tube (QFT-GIT) assay; QFT-GIT requires only one visit and has higher specificity than TST. We compared completion rates for each method and determined predictors for completing TST screening through bivariate analyses.

RESULTS: Seventy-two (60%) of 120 employees participated; 67 (93%) employees reported face-to-face contact with detainees. Fifty-four employees underwent both QFT-GIT and TST placement. All QFT-GIT results were negative. Three (6%) employees tested TST positive and were likely false positives. Forty-seven (92%) employees did not have a TST in the previous year and required 2-step testing; only 23 (49%) underwent second TST placement. Return rates for first and second TST reading were 76% and 74%. The completion rate for QFT-GIT was higher than TST (100% vs. 39%, $P<0.001$). Agreement between TST and QFT-GIT results was 94%. Predictors for completing TST screening included older age ($P=0.006$), having lived outside of the U.S. ($P=0.003$), and being a detention removal assistant ($P=0.03$).

CONCLUSIONS: Most immigration employees have face-to-face contact with detainees, placing them at risk for exposure to TB. Employees had low return rates for TST reading and second TST placement. Our evaluation demonstrates the advantages of performing the one visit QFT-GIT for TB screening in this occupational group.

KEYWORDS: latent tuberculosis infection, tuberculin skin test, QuantiFERON-TB Gold, *Mycobacterium tuberculosis*, immigration

2:15

Genotypic Clustering of Tuberculosis Cases Among the Foreign-Born — United States, 2004–2008

AUTHORS: *Philip M. Ricks, K. Cain, S. Kammerer, P. Moonan*

BACKGROUND: In the United States, the percentage of reported tuberculosis (TB) cases in foreign-born persons doubled, from 29% in 1993 to 58% in 2008. Small, geographically limited studies have suggested that most of these cases are due, not to recent transmission, but to the

activation of latent TB infection (LTBI) acquired before U.S. arrival. Strategies for controlling TB due to activation of LTBI differ from strategies for addressing recent transmission: the former requires finding and treating LTBI; the latter requires interrupting transmission. We used a national data source to determine the percentage of TB cases due to the activation of LTBI and describe the characteristics of these cases.

METHODS: A bivariate analysis was performed using data on all reported TB patients with an isolate genotyped by the National TB Genotyping Service, 2005–2008. We defined a case of activated LTBI as a TB patient with a unique *Mycobacterium tuberculosis* genotype in a given county.

RESULTS: Among 26,711 patients with genotyped isolates, 15,444 (58%) were foreign-born. The activation of LTBI was more common among foreign-born than among U.S.-born persons (70% vs. 55%, odds ratio [OR]=1.88, 95% confidence interval [CI]=1.78–1.97). Among foreign-born persons aged 15–44 at arrival, activated LTBI was more commonly diagnosed <2 years after arrival, compared with >5 years after arrival (OR=1.57, CI=1.42–1.74).

CONCLUSIONS: TB among foreign-born persons, compared with U.S.-born persons, is more likely due to the activation of LTBI. TB control strategies among foreign-born persons should focus on strengthening the detection and treatment of LTBI within 2 years of arrival in the United States.

KEYWORDS: tuberculosis, foreign-born, genotyping, length of residence

2:35

Onsite Case-Finding During a Tuberculosis Outbreak in a Homeless Shelter — Georgia, 2008–2009

AUTHORS: ***Krista M. Powell, B. Yarn, R. Brown, R. Hardy, R. Sales, S. Bamrah***

BACKGROUND: Controlling *Mycobacterium tuberculosis* transmission among homeless persons remains challenging; high HIV prevalence can intensify transmission, and homeless persons with newly diagnosed tuberculosis (TB) may be unable to identify contacts by name. During March 2008–May 2009, 13 cases of genotypically identical TB were diagnosed among homeless persons whose only social link was use of a common shelter in Georgia. Because treatment of TB cases is necessary to interrupt *M. tuberculosis* transmission, we conducted onsite case-finding at the shelter in June 2009.

METHODS: We drew blood to test for TB infection (using interferon gamma release assay [IGRA]) and HIV infection. Physicians referred persons with TB symptoms or positive IGRA results for onsite digital chest radiography, sputum collection, or further off-site evaluation. A case was defined as (1) a positive *M. tuberculosis* culture with the outbreak-associated genotype or (2) clinical TB disease (without a specimen for genotyping) and an established social link to a culture-confirmed case in a Georgia resident.

RESULTS: We screened 311 shelter clients and staff. Of 286 participants with IGRA results, 117 (41%) tested positive. Of 301 participants with HIV test results, 17 (6%) tested positive. Of

134 participants referred for further off-site evaluation, 6 (2%) participants, including two with HIV infection, received a diagnosis of outbreak-associated TB disease and initiated treatment.

CONCLUSIONS: Onsite, location-based active case-finding was a successful alternative to traditional name-based contact investigation methods in this large outbreak in a challenging population. Because HIV increases TB risk, and homeless persons are disproportionately infected with HIV, public health officials should integrate HIV testing during TB case-finding at homeless shelters. Location-based methods should be considered early during outbreak investigations involving congregate settings.

KEYWORDS: tuberculosis, disease outbreaks, homeless persons, HIV

MONDAY, APRIL 19

SESSION D: 10 Things I Hate About Flu

Influenza ..... Ravinia Ballroom 3:15–5:20 p.m.

MODERATOR: *Lyn Finelli*

3:20

Influenza Surveillance by Using Emergency Department Health Records — Nebraska, September 2009

AUTHORS: *Parvathy Pillai, B. Buss, T. Safranek*

BACKGROUND: Characterizing the epidemiology of 2009 pandemic influenza A (H1N1) virus is a public health priority, and emergency department (ED) electronic medical records (EMRs) are a ready source of data. We evaluated performance of three case definitions for influenza-like illness (ILI) based on ED EMRs at one Nebraska healthcare facility (HCF A).

METHODS: Since September 1, 2009, a portion of the EMR for every patient visiting HCF A's ED has been transferred to the state health department and classified as ILI or non-ILI by using the following three ED EMR-based ILI case definitions: (1) "fever", plus "sore throat", "cough", or "flu," as detected by SAS® processing of chief-complaint text; (2) history of fever, plus history of either cough or sore throat, independent of chief complaint, as noted by yes/no questions asked by ED nurses during triage assessment; and (3) performance of influenza laboratory testing, regardless of result. Classification as ILI by these three case definitions was compared with a reference standard for influenza on the basis of physician review of the entire ED health record, defined as positive influenza laboratory test, or discharge diagnosis of influenza, or influenza antiviral prescription, or fever plus cough or sore throat without definitive noninfluenza diagnosis.

RESULTS: During September 3–28, 2009, a total of 417 of 2,469 unique ED EMRs were randomly selected and physician-reviewed. Sensitivity and specificity, respectively, were 75.2% and 89.2% for chief-complaint–based case definition; 56.2% and 90.2% for triage-assessment–based case definition, and 9.5% and 97.6% for laboratory-testing–based case definition.

CONCLUSIONS: Performance of the three ED EMR-based ILI case definitions varied. Chief-complaint–based case definition produced the most favorable balance of sensitivity and specificity.

KEYWORDS: influenza, human; public health informatics; public health surveillance

3:40

Invasive Pneumococcal Disease Associated with Pandemic 2009 Influenza A (H1N1) — Denver Metro Area, October 2009

AUTHORS: *George E. Nelson, S. Mandal, N. Williams, D. Aragon, B. Beall, D. Swerdlow, M. Moore, K. Gershman*

BACKGROUND: Death from *Streptococcus pneumoniae* (pneumococcus) was a frequent complication of influenza during past pandemics. The 23-valent pneumococcal polysaccharide vaccine (PPV23) is recommended for certain high-risk adults 18-64 years old. During October 2009, increases in pandemic 2009 influenza A(H1N1) [pH1N1] hospitalizations and invasive pneumococcal disease (IPD) were observed among Denver residents. We investigated the increase in IPD to determine the role of pH1N1 and to identify missed opportunities for PPV23 vaccination.

METHODS: IPD cases were defined as isolation of pneumococcus from normally sterile sites. Confirmed cases of influenza-associated IPD had any positive influenza test during their illness; possible cases had influenza-like illness (ILI: fever plus cough or sore throat). We abstracted medical records on all IPD cases to evaluate preceding ILI and disease severity. We ascertained PPV23 use through patient and provider interviews. Pneumococci were serotyped using the Quellung reaction.

RESULTS: During October 2009, 58 cases of IPD were identified (2004-2008 October average, n=18). Of these, 54 (93%) were hospitalized and seven (12%) were fatal. Of 48 cases tested for influenza, 10 (21%) had documented influenza infection, suggesting that >17% (10/58) of IPD cases were influenza-associated. Of 53 IPD cases with sufficient clinical information, 33 (62%) reported preceding ILI. Of 38 cases among adults aged 18-64 years, 29 (76%) had PPV23 indications, 19 (66%) of those had available vaccination records, and 5 (26%) had received PPV23. Among cases with available isolates (n=47), 75% were caused by serotypes included in PPV23.

CONCLUSIONS: Approximately 17-62% of IPD cases in Denver during October 2009 were associated with pandemic H1N1 infection, and missed opportunities for vaccination with PPV23 were common. Greater efforts are needed to improve PPV23 use.

KEYWORDS: pneumococcus, invasive pneumococcal disease, IPD, influenza, pneumococcal polysaccharide vaccine, PPV23, vaccination

4:00

Household Transmission of 2009 Pandemic Influenza A (H1N1) After a School-Based Outbreak in New York City, April–May 2009

AUTHORS: *Anne Marie France, M. Jackson, S. Schrag, M. Lynch, C. Zimmerman, M. Biggerstaff, J. Hadler*

BACKGROUND: In April 2009, an outbreak of infection with 2009 pandemic influenza A (H1N1) virus (pH1N1) was investigated in a New York City (NYC) high school (School A). This first known introduction of pH1N1 into NYC presented an opportunity to characterize household transmission dynamics of the virus.

METHODS: We surveyed households of School A students who reported influenza-like illness (ILI) during the peak of the school outbreak (April 22–30, 2009). A secondary case of ILI was defined as self-reported fever and either cough or sore throat in a household contact with onset after the index student's. Attack rates (AR) and bivariate and multivariate analyses of household- and individual-level factors associated with secondary ILI were calculated by using SAS® version 9.1.3.

RESULTS: ILI was reported by 79/702 household contacts (11.3% AR). On multivariate analysis, older age was protective; for each increasing year of age, risk for ILI was reduced by 5% (risk ratio [RR]: 0.95; 95% confidence interval [CI], 0.92–0.98). Providing care for the index patient increased risk among parents (RR: 4.98; 95% CI, 1.24–16.89); watching television with the index patient increased risk among siblings (RR: 2.23; 95% CI, 1.17–3.78). Both antiviral prophylaxis and having had a household discussion regarding influenza reduced risk for ILI (RR: 0.32; 95% CI, 0.12–0.82; and RR: 0.60; 95% CI, 0.35–0.99, respectively). Fifty percent of cases occurred ≤3 days after illness onset in the index patient.

CONCLUSIONS: Having household discussions regarding influenza transmission, reducing time spent in close proximity to ill persons, and taking antiviral prophylaxis can reduce secondary attack rates; however, because of transmission speed, intervention should occur immediately after index patient symptom onset.

KEYWORDS: 2009 pandemic influenza A (H1N1) virus; household transmission; secondary attack rates; antiviral prophylaxis

4:20

Influenza Vaccination Practices Among Healthcare Workers — North Dakota, 2007–2008

AUTHORS: *Jennifer R. Cope, S. Pickard, B. Cadwell, E. Weiss*

BACKGROUND: Vaccination of healthcare workers (HCWs) for influenza has been associated with fewer deaths among hospitalized and nursing home patients and reduced absenteeism. Despite recommendations by the Advisory Committee on Immunization Practices, <50% of U.S. HCWs receive influenza vaccination each year. We examined influenza vaccination coverage and factors associated with vaccine uptake among North Dakota HCWs.

METHODS: We analyzed data from the North Dakota Behavioral Risk Factor Surveillance System (2007–2008), a random-digit–dialed survey representative of adults aged ≥18 years in North Dakota. HCWs were defined as respondents who answered that healthcare work most accurately described the work they do most often. Using SAS®, we conducted multiple logistic regression to determine factors associated with influenza vaccination uptake. Data were weighted to account for complex sampling.

RESULTS: Sixty-one percent of North Dakota HCWs had received an influenza vaccination in the prior 12 months, compared with 40% of non-HCWs (P<.0001). Among 696 HCWs, odds of receiving influenza vaccination were significantly lower among smokers, compared with current nonsmokers (adjusted odds ratio [AOR]: 0.45; 95% confidence interval [CI], 0.26–0.77) and higher among those who were overweight or obese (body mass index [BMI] ≥25), compared with those who were not (BMI <25) (AOR: 1.79; 95% CI, 1.18–2.73). Model factors that were nonsignificant were sex, age, income, health insurance coverage, diabetes, physical activity, and binge drinking.

CONCLUSIONS: North Dakota HCWs received influenza vaccination more commonly than non-HCWs, but 39% of HCWs did not receive vaccination. Improved understanding of why smokers and nonoverweight or obese HCWs have lower vaccine uptake is needed to better tailor vaccination interventions among HCWs in North Dakota.

KEYWORDS: influenza, vaccination, health personnel, humans

4:40

Knowledge, Attitudes, and Practices Among Parents During School Dismissal Because of Circulation of 2009 Pandemic Influenza A (H1N1) Virus — Pennsylvania, 2009

AUTHORS: *W. Roodly Archer, C. Drenzek, T. Gift, M. Meltzer, B. Nygren, A. Bhattarai, R. Fagan, S. Sodha, S. Ostroff, T. Marchbanks, D. Swerdlow, A. McWhorter, and P. Edelson, for the Pennsylvania H1N1 Working Group*

BACKGROUND: School dismissal has been used to limit transmission of 2009 pandemic influenza A (H1N1) virus (pH1N1) among students and staff. However, evidence of effectiveness of school dismissal on reducing children's out-of-school contacts is scant. We investigated knowledge, attitudes, and practices (KAP) among parents of children attending a semirural elementary K–4 school (School A) during a pH1N1-outbreak–associated school dismissal to determine its effectiveness on reducing children's out-of-school contacts.

METHODS: We conducted telephone interviews of School A students' caregivers. We used chi-square testing to compare education level and KAP regarding pH1N1 transmission among caregivers experiencing ILI in their household, compared with those not experiencing ILI. We defined ILI as self-reported fever (≥100oF) with cough or sore throat on or after May 1, 2009.

RESULTS: Of 363 households, 214 (59%) were successfully contacted. Among respondents, 89% believed children could catch pH1N1 by coming within 6 feet of an ill person, 84% from

contact with germs on school surfaces, and 85% from participating in a social gathering; 52% perceived this outbreak as serious. Thirty-six percent of children did not remain at home during the week-long school dismissal, and 64% of students had interacted with other children at home or elsewhere (e.g., shopping, sports events). Respondent education level and KAP did not differ significantly among caregivers experiencing ILI in their household from those who did not.

CONCLUSIONS: Although knowledge of how pH1N1 is transmitted was high, without caregivers' keeping children from congregating, school dismissal alone cannot ensure effective social distancing. During school dismissals, public health educational efforts should encourage caregivers to limit out-of-school contacts for children to decrease the likelihood of influenza viruses transmission.

KEYWORDS: 2009 pandemic influenza A (H1N1) virus, social distancing, community mitigation, school

5:00

2009 Pandemic Influenza A (H1N1) Deaths Among Children — United States, 2009

AUTHORS: *Chad M. Cox, L. Blanton, R. Dhara, L. Brammer, L. Finelli*

BACKGROUND: The 2009 pandemic influenza A (H1N1) virus emerged in the United States in April 2009 with a disproportionate impact among children. Since the 2003–04 influenza season, CDC has conducted surveillance for laboratory-confirmed, influenza-associated pediatric deaths. We compared the frequency and types of underlying conditions among children who died from seasonal versus pH1N1influenza to determine if additional prevention strategies are needed.

METHODS: Laboratory-confirmed pH1N1-associated deaths occurring during April 15–December 5, 2009, were compared with laboratory-confirmed, seasonal influenza-associated deaths occurring September 30, 2007–April 14, 2009. State health departments completed questionnaires for each death. Seasonal and pH1N1-associated pediatric deaths were compared by using a chi-square test to evaluate differences between proportions.

RESULTS: During April 15–December 5, 2009, 224 pediatric deaths associated with pH1N1 virus infections were reported. Of 206 deaths with a reported medical history, 138 (67%) had underlying medical conditions. The most common conditions reported were neurological disorder (49%), developmental delay (45%) and nonasthma pulmonary disease (30%). Compared with seasonal influenza deaths, pH1N1 pediatric deaths were more likely to have an underlying neurological disorder ($P<.01$), developmental delay ($P<.01$), and nonasthma pulmonary disease ($P<.01$).

CONCLUSIONS: The majority of pediatric deaths from pH1N1 were among children with underlying chronic disease and were more likely to be associated with neurological disorders or pulmonary disease, compared with seasonal influenza deaths for the last two seasons. All children aged ≥6 months are recommended to receive pH1N1 and seasonal influenza vaccinations. Furthermore, antivirals should be used early and aggressively among children with conditions associated with increased risk for severe illness.

KEYWORDS: 2009 pandemic influenza A (H1N1), pH1N1, pediatric, mortality, chronic disease

TUESDAY, APRIL 20

CONCURRENT SESSION E1: True Blood

Human Immunodeficiency Virus ..... Ravinia Ballroom, 8:30–10:15 a.m.

MODERATOR: ***Jonathan Mermin***

8:35

Increase in HIV-Associated Tuberculosis in the Context of Widespread Drug-Resistant Tuberculosis — Kazakhstan, 2003–2008

AUTHORS: ***Matthew Willis, A. Tursynbaeva, I. Aitmagambetova, K. Cain, T. Holtz***

BACKGROUND: Kazakhstan has high tuberculosis (TB) incidence (126 cases/100,000). At 18%, the percentage of newly diagnosed TB cases that are multidrug-resistant (MDR) TB is among the world's highest. HIV prevalence in Kazakhstan is low (0.3%) but increasing. HIV increases incidence of TB, including MDR TB; HIV and MDR TB each increase the risk of death, especially when combined. Thus, increased HIV-associated TB compounds challenges in a country where MDR TB is common. We examined the prevalence and characteristics of HIV-associated TB in Kazakhstan.

METHODS: The Kazakhstan Electronic TB Registry (ETR) contains data on TB cases reported in the public sector (90% of cases). Using ETR data for available years (2005–2008), we computed HIV prevalence among TB patients. For 2003–2008, we compared the demographic characteristics of patients with TB alone and those with HIV-associated TB

RESULTS: HIV prevalence among persons with TB increased from 0.9% in 2005 to 1.4% in 2008 (chi-square $P<.001$). Compared with patients who had TB alone (n=102,368), those with HIV-associated TB (n=1011) were more commonly male (odds ratio [OR]=1.4; 95% confidence interval [CI]=1.3–1.6), aged 25–45 years (OR=3.2; CI=2.8–3.7), and living in an urban area (OR=2.0; CI 1.8–2.3). Of 16 regions, 2 (urban regions containing 13% of the country's population), reported 48% of all HIV-associated TB cases. Both are located on a heroin transit route.

CONCLUSIONS: HIV prevalence among TB patients in Kazakhstan is increasing — a trend of particular concern in the context of widespread MDR TB. Containment of the epidemic of HIV-associated TB requires urgent efforts, including a focus on HIV prevention in high-risk regions and evaluation of the impact of drug use on the epidemic.

KEYWORDS: tuberculosis, HIV, Kazakhstan

8:55

Evaluation of a Screening Tool To Assess Peripheral Neuropathy Among HIV-Infected Persons in Resource-Limited Settings

AUTHORS: *A. Danielle Iuliano, P. Odawo, P. Muange, C. Mwangi, P. Mwaura, M. Ackers, A. Njoroge, J. Brooks*

BACKGROUND: Peripheral neuropathy (PN) is a common complication of HIV infection and a consequence of antiretroviral therapy. If PN is recognized early, permanent disability can be prevented. The epidemiology of PN in resource-limited settings has not been well characterized because simple standardized examinations for PN are not widely used.

METHODS: We developed a clinical tool capturing signs and symptoms to screen for PN among HIV-infected patients attending four clinics in Nairobi, Kenya. We assessed 32 symptoms (pain, numbness, tingling, and weakness in each arm, leg, foot, and toe) and 12 signs (loss of sensation to fine touch at five sole points [by monofilament] and vibration at the medial malleoli [by tuning fork]) to produce a neuropathy score (sum of symptoms and signs), and, for those with PN, assessed functional impairment of daily activities (mild, moderate, and severe). We determined the prevalence and severity of PN captured by this tool and correlated these measures with functional impairment using the Wilcoxon Rank Sum test.

RESULTS: We screened 3,858 patients for PN (median assessment time, 4 minutes; cost<$0.20/assessment). At least one PN sign or symptom was found in 863 (22.4%) patients: 609 (70.6%), symptoms only; 107 (12.4%), signs only; and 147 (17.0%), both signs and symptoms. The median neuropathy score differed by extent of functional impairment (asymptomatic/mild, 4; moderate, 11; severe, 20.5; $P<.001$).

CONCLUSIONS: Our screening tool detected clinically relevant neuropathy. Higher neuropathy scores were linearly associated with greater functional impairment. This simple, brief screener could be used in other resource-limited settings to detect and monitor and address PN.

KEYWORDS: peripheral neuropathy, Kenya, human immunodeficiency virus, developing country

9:15

Correlates of HIV Infection Among Injection Drug Users — Unguja, Zanzibar, 2007

AUTHORS: *Dita Broz, A. Kim, E. Kim, A. Holman, A. Khatib, A. Othman, M. Mussa, L. Johnston, A. Kangolle, M. Dahoma*

BACKGROUND: Although the role of drug injection in the transmission of HIV is widely recognized, data in sub-Saharan Africa are limited. In Zanzibar, HIV prevalence is 0.5% among males and 0.7% among females; however, a major concern is that injection drug use will fuel the epidemic. Injection drug users (IDUs) are at increased risk of HIV through unsafe injection and sexual practices and can transmit HIV to the general population. Using a probability

sampling survey — the first to be used with IDUs in sub-Saharan Africa — we assessed HIV seroprevalence and HIV risk factors in Unguja, Zanzibar.

METHODS: During August–September 2007, IDUs were recruited by using respondent-driven sampling (RDS), a probability-based, peer-recruitment sampling method. Participants completed behavioral questionnaires and were tested for HIV and hepatitis C virus (HCV), a marker for unsafe injection practices. Proportion estimates and multiple logistic regression were adjusted for RDS design.

RESULTS: Of 499 IDUs, 96.8% were male, median age was 31 years (range: 15–66 years), and 34.6% had ≤7 years of education. HIV seroprevalence was 16.3% (95% confidence interval [CI]=11.6–21.8), and HCV seroprevalence was 25.7% (CI=20.2–31.9). After adjustment for age and sex, HIV infection was independently associated with lower education level (adjusted odds ratio [AOR]=2.2, CI=1.1–4.4), having never used condoms (AOR=2.5, CI=1.3–4.8), HCV infection (AOR=3.1, CI=1.6–6.2), and symptoms of sexually transmitted infections in the past 6 months (AOR=2.1, CI=1.1–4.2).

CONCLUSIONS: HIV seroprevalence among IDUs in Unguja is high. High-risk drug injection and sexual practices will probably continue the spread of HIV among IDUs and in the community. Comprehensive HIV prevention programs for IDUs in Zanzibar are greatly needed.

KEYWORDS: sub-Saharan Africa, HIV, respondent-driven sampling, injection drug use, HCV

9:35

Evaluation of a Tuberculosis Surveillance System Modified To Monitor Increased HIV Testing — Zambia, 2008

AUTHORS: *Simon G. Agolory, M. Desai, R. Shiraishi, N. Kapata, C. Kaayunga, A. Mwinga, N. Mwananyambe, A. Nakashima*

BACKGROUND: In Zambia, 55%-80% of tuberculosis (TB) patients are coinfected with HIV. Early HIV diagnosis and treatment significantly decrease morbidity and mortality among TB patients. Since 2004, TB clinics have been increasing HIV testing; in 2006, in an effort to monitor HIV testing, the Zambian government introduced revised TB treatment cards and registers. Accurate surveillance is essential to assess the increase in HIV testing. We evaluated the accuracy of registers and the implementation of increased HIV testing.

METHODS: We selected 53 TB clinics in the Northern (n=14), Eastern (n=14) and Western (n=25) provinces of Zambia to represent different levels of care, including provincial vs. district, urban vs. rural, large vs. small and government vs. private sector. Data from the treatment cards of 767 TB patients treated during 2008 were reviewed for completeness and were compared for agreement (by the kappa statistic) with the data in registers.

RESULTS: Revised registers and treatment cards were used during 2008 in 46 (87%) of 53 clinics. Data from registers indicated that 32 (70%) of 46 clinics had tested ≥80% of TB patients for

HIV. For HIV test results, the agreement between treatment cards and registers was substantial (kappa=0.70, 95% confidence interval=0.66–0.74). However, HIV testing results were missing from treatment cards and registers for 180 (23%) of 767 patients.

CONCLUSIONS: HIV testing is now available in most TB clinics. According to the monitoring data on the revised tools, most TB clinics are testing ≥80% of patients for HIV infection. Further investigation is needed to determine why data are missing. Interventions, such as additional training and closer supervision, should be instituted to address the deficiencies that led to missing data.

KEYWORDS: tuberculosis, HIV, TB/HIV coinfection, Zambia

9:55

Evaluation of the Quality of HIV Care and Treatment Services Provided in a Tuberculosis Clinic — Tanzania, 2006–2008

AUTHORS: *Surbhi Modi, A. Date, S. Nandi, M. Patel, M. Nyamkara, G. Arthur, Z. Mkomwa, J. Vertefeuille and S. Egwaga*

BACKGROUND: Early HIV care during tuberculosis (TB) treatment is important for reducing morbidity and mortality among HIV-infected TB patients, yet many patients do not receive needed HIV services. In Tanzania, 47% of TB patients are HIV-infected; only 32% of these patients receive antiretroviral therapy (ART) during TB treatment. In 2006, Tanzania initiated a pilot program to provide HIV services in a TB clinic. We evaluated this pilot program to assess the quality of HIV care provided.

METHODS: We reviewed records of patients registered for TB treatment during July 2006-June 2008 who were HIV-infected and who agreed to be enrolled in the pilot program. We extracted data on enrollment in HIV care, ART provision, and clinical outcomes from district TB registers, electronic medical records, and paper charts.

RESULTS: Forty-five percent (1363 of 3029) of HIV-infected TB patients sought HIV care; 60% (821 of 1363) enrolled in the TB clinic's pilot program. We located medical records for 675 (82%) of these 821 patients. The median time from HIV diagnosis to enrollment in HIV care was 0 (interquartile range: 0–6) days. Of 675 patients, 642 (96%) received cotrimoxazole prophylaxis against opportunistic infections. Of the 470 patients medically eligible for ART according to Tanzanian guidelines, 395 (84%) received ART, and 98% of these received appropriate regimens. The median time to ART initiation was 35 days after enrollment and 15 days after a patient was determined to be ART-eligible.

CONCLUSIONS: Provision of HIV services within the TB clinic resulted in early enrollment in HIV care and early initiation of appropriate ART regimens. Expansion of HIV services to TB clinics offers an opportunity to improve outcomes for HIV-infected TB patients.

KEYWORDS: tuberculosis, HIV, opportunistic infection, antiretroviral therapy

TUESDAY, APRIL 20

CONCURRENT SESSION E2: Party of Five

Hot Topics ..... Dunwoody Suites, 8:30–10:15 a.m.

MODERATOR: ***Paul Cieslak***

8:35

Methicillin-Susceptible *Staphylococcus aureus* Infections After Intra-Articular Injections at a Primary Care Clinic — Georgia, 2009

AUTHORS: ***W. Roodly Archer, M. Schaefer, K. Arnold, J. Noble-Wang, A. Srinivasan, J. Perz, M. Arduino, G. Fosheim, B. Jensen, S. McAllister, H. Davidson, A. Reeves, C. Drenzek***

BACKGROUND: Georgia Division of Public Health was notified of five patients who experienced joint infections after intra-articular (IA) corticosteroid injections at Clinic A during 1 week. IA corticosteroid injections are therapeutic techniques for inflammatory joint conditions. Reported infections from IA injections are rare (<1/15,000 injections). However, lapses in infection-control (IC) practices and extrinsic contamination of multidose vials (MDVs) have been associated with similar outbreaks. We investigated the outbreak to determine its extent, identify its source, and prevent additional cases.

METHODS: Clinic activity, injection logs, and medical records were reviewed for case finding, and IC practices were assessed. A case was defined as redness, warmth, and pain at the injection site in a patient who had received a methylprednisolone injection at Clinic A during December 1, 2008–February 12, 2009. MDVs and prepared syringes were tested for pathogen contamination, and genetic typing was performed on clinical isolates by pulsed-field gel electrophoresis (PFGE).

RESULTS: Five consecutive cases occurred among 15 patients who had received injections. Four patients (80%) were female (median age = 71 years). All patients required hospitalization and prolonged intravenous antibiotic treatment. Four had culture-confirmed methicillin-susceptible *Staphylococcus aureus* (MSSA) with indistinguishable PFGE patterns. MSSA was not identified in tested MDVs. The environmental investigation revealed IC errors at Clinic A, including mishandling of MDVs, inadequate hand hygiene, and incorrect cleaning and disinfection of medical equipment.

CONCLUSIONS: Clinical isolates were genetically indistinguishable, indicating a common source of joint infections. Despite lack of MSSA growth, injected medication from MDVs represents a possible source. IC errors increase likelihood of extrinsic contamination of MDVs. Recommendations include using single-dose medication vials, consistent hand hygiene, and correct cleaning and disinfection methods.

KEYWORDS: intra-articular injection, multidose vial, infection control, clinic

8:55

Usefulness of Sentinel Site Influenza-Like Illness Surveillance — Wyoming, 2003–2009

AUTHORS: *Aimee L. Geissler, R. McClinton, C. Van Houten, T. Murphy*

BACKGROUND: Early influenza activity detection is paramount for timely public health interventions. The Wyoming influenza surveillance system has two components, mandatory reporting of all laboratory-confirmed cases and sentinel clinic reporting of influenza-like illness (ILI). In the absence of laboratory-confirmed data, states use sentinel ILI surveillance to determine influenza season onset, conclusion, and geographic spread. We evaluated quality, accuracy, and timeliness of sentinel ILI surveillance for detecting influenza.

METHODS: Quality of sentinel ILI surveillance was assessed by reviewing all patient charts from three representative sentinels that reported consistently during the 5 peak weeks of the 2008–09 influenza season. Proportion of patients meeting CDC ILI case definition (fever ≥100.0°F plus cough, and/or sore throat) was compared with the reported proportion of patients with ILI. To assess accuracy of ILI case-definition use, a survey was distributed to all 23 sentinels. To evaluate timeliness, we compared reported sentinel ILI with laboratory-confirmed cases during each of six influenza seasons, 2003–2009.

RESULTS: Among 2,659 reviewed charts, percentage of patients with ILI was 8%, compared with 4% ILI reported by sentinels (sensitivity: 66%). Survey results indicated only 4/18 responding sentinels correctly used the ILI case definition. When compared with laboratory-confirmed cases, sentinel ILI reporting had a 4-week delay (95% confidence interval [CI], 2–6) in predicting season onset and a 4-week premature prediction of season conclusion (95%CI, 4–6); it failed to detect influenza activity during the 2006–07 season.

CONCLUSIONS: ILI case definition was inconsistently and inaccurately applied by most sentinels, resulting in low sensitivity for ILI detection. When compared with laboratory-based reporting, ILI surveillance inconsistently tracked influenza activity and provided limited added value to Wyoming's influenza surveillance system.

KEYWORDS: Wyoming, sentinel surveillance, influenza, ILI, influenza-like illness

9:15

Sentinel Roulette: Utility of Individual Hospital Surveillance for Measuring Pneumococcal Conjugate Vaccine Impact in Young Children — Multiple States, 1998–2006

AUTHORS: *Lee M. Hampton, M. Farley, W. Schaffner, A. Thomas, A. Reingold, L. Harrison, R. Lynfield, N. Bennett, S. Petit, B. Beall, J. Jorgensen, E. Zell, S. Schrag, A.Cohen*

BACKGROUND: *Streptococcus pneumoniae* causes >800,000 annual deaths in children <5 years old globally and is prevented by 7-valent pneumococcal conjugate vaccine (PCV7). In the U.S., population based surveillance found a 78% (95%CI: -76,-80) reduction in inva-

sive pneumococcal disease (IPD) rates after PCV7 introduction in 2000. The World Health Organization recommends that countries that cannot perform population-based surveillance use individual hospital surveillance to monitor PCV7 impact. We assessed whether individual hospital surveillance could accurately characterize this impact.

METHODS: IPD cases were defined as pneumococcus isolated from normally sterile sites in children <5 years old residing in any of eight, population-based Active Bacterial Core surveillance (ABCs) areas during 1998-2006. We calculated the percent change in cases at individual hospitals between the 1998-1999 pre-vaccine baseline and 2006, the year of maximum decline in the eight areas' aggregate IPD incidence.

RESULTS: During 1998-2006, we identified 4,664 total IPD cases among the eight ABCs areas. 217 hospitals in the eight ABCs areas reported at least one IPD case during 1998-2006, with an average of 21 cases per hospital (range: 1-536). The percent change in each hospital's IPD cases between baseline (1998-1999) and 2006 ranged from a 100% decline to a 100% increase; 146 (67%) hospitals showed a decline, 49 (23%) showed no change, and 22 (10%) showed an increase. Hospitals reporting >20% of their area's cases or >100 cases during 1998–2006 had declines of 22% to 97%.

CONCLUSIONS: IPD surveillance data from individual hospitals reporting relatively large numbers of cases may be appropriate for evaluating vaccine impact in children, but the use of IPD surveillance data from smaller hospitals carries a substantial risk of an incorrect assessment of vaccine impact.

KEYWORDS: *Streptococcus pneumoniae*, pneumococcal infections, sentinel surveillance, heptavalent pneumococcal conjugate vaccine

9:35

Variations in Positive Predictive Values for Rapid Influenza Tests for 2009 Pandemic Influenza A (H1N1) — Arizona, 2009

AUTHORS: ***Steven A. Baty, A. D'Souza, R. Sunenshine, L. Erhart***

BACKGROUND: Rapid influenza diagnostic tests (RIDTs) are used for influenza screening, clinical decision-making, and influenza surveillance. In August, a hospital reported increased false-positive RIDT results to the Arizona Department of Health Services (ADHS). Because of reported RIDT low sensitivities (40%–70%) for 2009 pandemic influenza A (pH1N1), the hospital's report raised further concerns about the specificity and clinical utility of RIDTs.

METHODS: To determine the positive predictive value (PPV) of RIDTs compared with the standard real-time reverse transcription-polymerase chain reaction assay (rRT-PCR), ADHS surveyed seven Arizona laboratories. Information collected included RIDT brand/lot number, training of personnel performing test, test location, swab and specimen type, time from collection to testing, sample storage, and viral transport medium. Because only positive RIDTs results were available and assuming equal disease prevalence during April–September, PPV was calculated based on rRT-PCR-positive results.

RESULTS: Results from 600 specimens using one of four RIDTs were available. Median pH1N1 PPV was 79% (range: 62%–91%). A significant difference in PPV was identified between the two largest facilities, which used the same RIDT brand (Laboratories A, 33% and B, 92%, [P<.01]). The facilities reported similar testing practices except lot numbers used and timing of testing. Laboratory A used Lot X and performed testing within 1 hour of collection; Laboratory B used multiple lots, excluding Lot X, and performed testing within 24 hours. Laboratory A switched RIDT brands and noted a significant PPV increase from 33% to 91% (P<.01).

CONCLUSIONS: Wide PPV variability combined with documented low sensitivity among RIDTs for pH1N1 diagnosis increases concerns about their specificity and clinical and epidemiologic utility. Results from Laboratory A demonstrate a need to investigate RIDT Lot X.

KEYWORDS: 2009 pandemic influenza A (H1N1), positive predictive value, rapid influenza diagnostic test.

9:55

Multiple-Serotype *Salmonella* Gastroenteritis Outbreak at a Wedding Reception — Connecticut, 2009

AUTHORS: ***Jessica A. Kattan, T. Rabatsky-Ehr, J. Krasnitski, Q. Phan, J. Brockmeyer, L. Bushnell, C. Applewhite, M. Mandour, L. Mank, M. Cartter***

BACKGROUND: Although *Salmonella* commonly causes foodborne illness, outbreaks of *Salmonella* infection with multiple serotypes are uncommonly reported. In September 2009, the Connecticut Department of Public Health was notified of laboratory-confirmed *Salmonella* infection in a wedding reception attendee; other attendees were reportedly ill. We investigated to characterize the illnesses and implement control measures.

METHODS: A case-control study was conducted. Case-patients were defined as attendees who experienced diarrhea (>3 stools/day) within 5 days after the reception. Because no guest list existed, the groom provided contact information for ill attendees; control subjects who did not experience diarrhea and additional case-patients were recruited by asking case-patients to identify other attendees. Stool samples were tested for enteric bacterial pathogens, and pulsed-field gel electrophoresis (PFGE) was done. An environmental investigation of the catering facility was conducted.

RESULTS: Of ~150 attendees, nine case-patients and 16 control subjects were identified. Seven (88%) of eight case-patients and one (8%) of 13 control subjects reported potato salad consumption (odds ratio=84.0; 95% confidence interval=4.5–1,564). Of six case-patients tested, two stool specimens yielded *S.* Schwarzengrund; two yielded *S.* Typhimurium (var. 5-); one yielded both. All four asymptomatic food workers were tested; one specimen yielded both *S.* Schwarzengrund and *S.* Typhimurium (var. 5-). All *S.* Schwarzengrund and *S.* Typhimurium isolates, respectively, had indistinguishable PFGE patterns. Food-worker bare-handed contact with ready-to-eat food was observed. Environmental samples of contact surfaces and spices tested negative for *Salmonella*.

CONCLUSIONS: Epidemiologic and laboratory data suggest an outbreak of Salmonella infection with multiple serotypes occurred among attendees; potato salad was the likely source but the contamination mechanism is unclear. Control measures included instruction regarding food-handling practices and exclusion of the *Salmonella*-positive food worker.

KEYWORDS: *Salmonella*, disease outbreak, case-control studies, Connecticut

TUESDAY, APRIL 20

CONCURRENT SESSION F1: Burn Notice

Sexually Transmitted Diseases ..... Ravinia Ballroom, 10:45 a.m.–12:15 p.m.

MODERATOR: ***Kevin Fenton***

10:50

Cofactors for Cervical Intraepithelial Neoplasia in Women Referred to Colposcopy — Atlanta, Georgia and Detroit, Michigan, 2000–2004

AUTHORS: ***Julia Gargano, R. Nisenbaum, D. Lee, M. Ruffin, M. Steinau, I. Horowitz, L. Flowers, T. Tadros, G. Birdsong, E. Unger***

BACKGROUND: Over 2 million women are referred to colposcopy annually after abnormal cervical cancer screening, but few have disease that requires treatment (i.e. cervical intraepithelial neoplasia grade 3 or worse [CIN3+]). Identifying variables associated with disease in the colposcopy referral population is one step toward risk stratification to reduce unnecessary colposcopy expenses and potentially harmful overtreatment. We aimed to identify cofactors for CIN3+ among women positive for high risk human papillomavirus (HR-HPV), a necessary cause of cervical cancer.

METHODS: We collected information on demographics, health behaviors, and reproductive history on 1658 women (12% Hispanic, 12% white, and 74% black) enrolled from urban public hospital colposcopy clinics. Study pathologists classified cervical disease as CIN0–CIN1 (no or low-grade), CIN2, CIN3+ or indeterminate based on histology and clinical findings. HPV detection and typing were conducted using consensus PCR of cervical cells. We used multiple logistic regression to identify cofactors for CIN3+ (versus CIN0–CIN2) among HR-HPV positive women.

RESULTS: A total of 1052 (63.4%) women had HR-HPV, and of these, 133 (12.6%) had CIN3+. CIN3+ was associated with age ≥30 (adjusted odds ratio [AOR] 1.9, 95% confidence interval [CI] 1.2–2.9), smoking (AOR 1.8, 95% CI 1.2–2.8), Hispanic ethnicity (AOR 1.9, 95% CI 1.1–3.5), incomplete secondary education (AOR 1.8, 95% CI 1.1–2.8), and HPV-16 (AOR 6.2, 95% CI 4.1–9.5). The model had moderate discrimination (c-statistic=0.77). Having at least one risk factor resulted in 90.3% sensitivity, 31.2% specificity, 18.6% positive predictive value and 94.8% negative predictive value for CIN3+.

CONCLUSIONS: If validated in an independent sample, age, smoking, ethnicity, education and HPV-16 may have clinical utility for risk stratification to reduce unnecessary colposcopy referrals.

KEYWORDS: cervical intraepithelial neoplasia, uterine cervical neoplasms, papillomavirus infections, early detection of cancer

11:10

Health Insurance, Health Care Utilization, and Chlamydia and Gonorrhea Infection Among Females — United States, 1999–2008

AUTHORS: *Elizabeth A. Torrone, S. Datta*

BACKGROUND: Chlamydia (CT) and gonorrhea (GC) are the most frequently reported diseases in the United States (1.5 million cases in 2008). To prevent CT- and GC- associated infertility, CDC recommends annual CT screening for sexually active females aged <26 years, and targeted CT and GC screening for all females at high-risk. We investigated associations between health insurance coverage or health care utilization and CT and GC infection.

METHODS: We analyzed nationally representative data for females aged 14–39 years (1999–2008 National Health and Nutrition Examination Survey). Respondents reported insurance coverage and type, gaps in coverage, usual place for health care, and health care visits during last 12 months. CT/GC infection was defined as a positive urine nucleic acid amplification test result for CT or GC. Adjusting for survey design, we calculated bivariate associations stratified by age and race/ethnicity.

RESULTS: Among 9,003 females surveyed, prevalence estimates were: CT=2.2% (95% Confidence Interval [CI] =1.8-2.7); GC=0.3% (CI=0.2-0.6); CT/GC=2.4% (CI=2.0-2.9). Health insurance coverage, type, and gaps were not associated with CT/GC. Place of usual care was associated with CT/GC for non-Hispanic blacks aged 14–25; prevalence was highest among non-Hispanic blacks whose usual place of care was emergency departments (26.0% [CI=12.8–45.8]). Health care visit was not associated with lower CT/GC prevalence, except among non-Hispanic blacks aged 26–39 (visit=2.7%, CI=1.6–4.3; no visit=8.0%, CI=4.7–13.2).

CONCLUSIONS: With few exceptions, we found no association between health insurance or health care utilization, and CT/GC. This may result from ineffective screening practices or confounding by patients' high-risk sexual behaviors. Young blacks using emergency departments for usual care had alarmingly high CT/GC prevalence and could benefit from targeted screening and prevention.

KEYWORDS: sexually transmitted diseases, health insurance, health services/utilization, NHANES

11:30

Human Papillomavirus Vaccine Coverage Among Females Ages 9–59 years — National Health and Nutrition Examination Survey — United States, 2007–2008

AUTHORS: *La'Shan D. Taylor, M. Sternberg, S. Hariri, E. Dunne, L. Markowitz*

BACKGROUND: Human papillomavirus (HPV) types 16 and 18 cause 70% of cervical cancers; types 6 and 11 cause 90% of genital warts. In 2006, a vaccine against these four HPV types was licensed for females aged 9-26 years. Routine three-dose vaccination is recommended at ages 11–12 and catch-up vaccination through age 26. Vaccine is available for uninsured and underinsured females aged 9-18 through the Vaccines for Children (VFC) program. We evaluated HPV vaccine coverage by examining data from a nationally representative sample.

METHODS: In 2007–2008, 2,775 females aged 9–59 responded to a question on HPV vaccine receipt in the National Health and Nutrition Examination Survey. Bivariate associations stratified by select demographic characteristics and adjusted for survey design were calculated.

RESULTS: Vaccine initiation varied significantly by age: 9–10 years, 4.4%; 11–13 years, 15.6%; 14–18 years, 21.6%; 19–26 years, 10.5%; and 27–59 years, 2.0% (P=0.001). Among females ages 11–26 who initiated vaccine, 37.2% received all three doses. Race and poverty level did not affect vaccine initiation in any age category. Type of insurance did not affect vaccine initiation among females aged 11–18, but more females aged 19–26 with private insurance initiated vaccine (16.3% vs. 4.0% who had public insurance; P=0.04).

CONCLUSIONS: Within the first few years after licensure, HPV vaccine initiation varied by age group and was highest in the 14-18 year-old catch-up group. The lack of difference by race, poverty level, and insurance type among females aged 11–18 years probably reflects the impact of the VFC program. Efforts to vaccinate girls at the recommended ages of 11 or 12 years should be increased.

KEYWORDS: human papillomavirus, HPV Vaccine, NHANES

11:50

Outbreak of *Neisseria gonorrhoeae* Infections— Southwestern Alaska, 2008–2009

AUTHORS: *Tracie J. Gardner, D. Cecere, S. Jones, D. Keebler, M. Boyette, T. Hernandez, J. McLaughlin*

BACKGROUND: *Neisseria gonorrhoeae* (GC), a common cause of pelvic inflammatory disease, causes approximately 700,000 infections annually in the United States. In Region-A, a largely Alaska Native (AN) community (86.2%), the GC infection rate approximately tripled (118 versus 373 cases/100,000 population, respectively) during 2007–2008. We conducted an investigation to confirm the outbreak, evaluate treatment interventions, and recommend control measures.

METHODS: A case was defined as laboratory-confirmed GC infection in a patient residing in Region-A during January 1, 2008–September 5, 2009. Medical records for patients were reviewed at Region-A's two healthcare facilities: Hospital-A and the regional public health center (Facility-B). Frequencies were calculated for clinical and risk behavior information. Subanalyses to determine use of dual treatment were conducted among symptomatic patients who exhibited GC risk factors (GCRF).

RESULTS: We identified 206 GC cases during the study period, aged from 6–69 years (median: 29 years). Cases were 52% male; 99% AN; 74% had received partner services and 21% were coinfected with *Chlamydia trachomatis* (CT). Of 113 symptomatic patients who reported GCRF at the time of testing, 64% had received empiric GC and CT dual treatment. On multivariate analysis, empiric dual treatment of symptomatic patients with GCRF was more likely to be provided to males (OR = 17.2; 95% CI, 2–149) and to Facility-A patients (OR = 12.1; 95% CI, 3.2–45).

CONCLUSIONS: This GC outbreak is affecting ANs with an approximately equal sex and age distribution. Intervention efforts should include improving empiric dual treatment rates for symptomatic persons with GCRF at Facility-B and for symptomatic females with GCRF at both facilities; increasing Region-A partner services rates; and providing education on GC-prevention, specifically targeting ANs.

KEYWORDS: *Neisseria gonorrhoeae*; disease outbreaks; chlamydia coinfection; dual treatment; Alaska Native

TUESDAY, APRIL 20

CONCURRENT SESSION F2: The Fall Guy

Injury ..... Dunwoody Suites, 10:45 a.m.–12:15 p.m.

MODERATOR: ***Grant Baldwin***

10:50

Aftermath of the DC Metrorail Crash: Type of Injuries and Evaluation of Postevent Emergency Response — Washington DC, 2009

AUTHORS: ***Nagesh N. Borse, M. Ballesteros, S. Basavaraju, J. Enders, J. Gilchrist, R. Hunt, A. Ibrahimova, E. Sullivent, M. Wald***

BACKGROUND: Between 2002 and 2008, the federal government spent more than $8 billion on hospital and public health preparedness mostly focused on bioterrorism and pandemic influenza. However, sudden mass casualty events have received little attention. At 4:58 pm on June 22, 2009, two Metrorail train collided resulting in the deadliest incident in the history of this transit system. This study characterized patterns of crash-related injuries and evaluated the postevent emergency medical response.

METHODS: Medical charts for 64 of 76 patients from 11 hospitals and death records for 9 of 9 deaths from the coroner's report were abstracted using a CDC mass casualty surveillance

instrument and EpiInfo™. Semi-structured interviews were conducted at 10 of 11 hospitals with emergency department and disaster preparedness staff.

RESULTS: All 9 deaths occurred at the crash site. Death due to pulmonary contusion was reported in 7 deaths. Of 64 injured patients, 10% were critical, 76% urgent and 14% minor. The most common injury mechanism was collision with a fixed object (60%). The hospitals that assisted in this event received between 1 and 27 patients and were located 1-12 miles from the crash site. The average arrival time was 140 minutes (range: 105–176) for critical patients and 200 minutes (range: 35–405) for urgent patients. Jurisdictions had different mass casualty response policies and plans. This resulted in an unsystematic distribution of patients, a lack of coordination, and poor communication among emergency responders and hospitals.

CONCLUSIONS: Crash-related injuries varied by type and severity. Distribution of patients from the site was not based on trauma severity or distance to the hospital. A unified incident command system for the nation's capital region is warranted.

KEYWORDS: injuries, mass casualty event, emergency medical service, Washington DC

11:10

Prescription Opioid Overdose Deaths — Utah, 2008–2009

AUTHORS: *William A. Lanier, E. Johnson, R. Rolfs*

BACKGROUND: Deaths from prescription opioids in Utah increased by >500% during 1999-2007. Knowledge is limited regarding factors that lead to these fatal overdoses. Understanding characteristics of those dying from prescription opioids can guide prevention efforts.

METHODS: During October 2008–August 2009, drug overdose decedents were identified by using medical examiner records. Next-of-kin were asked about decedent characteristics that might have contributed to the death. We focused on unintentional or intent-undetermined deaths where a prescription opioid, but not an illicit drug, was implicated as a cause. Data on history of substance abuse, mental illness, and prescriptions were assessed. Substance abuse history was defined as ever using heroin, cocaine, hallucinogens, or methamphetamine, or ever receiving substance abuse treatment. Mental illness history was defined as having a chronic mental illness, diagnosis of mental illness by a provider, or hospitalization for a nondrug–related psychiatric reason.

RESULTS: Of 155 prescription opioid overdose decedents, 82 (53%) were female. Median female age (46 years) was higher than median male age (32 years) ($P<0.0001$). Substance abuse history was reported for 93 (60%) decedents, prior heroin use for 31 (20%), and mental illness history for 89 (57%). Overall, 124 (80%) reportedly had used their own prescribed pain medication during their last year. Use of prescribed pain medication during their last year was common for decedents with history of substance abuse (n=75; 81%), heroin use (n=22; 71%), and mental illness (n=70; 79%).

CONCLUSIONS: Most prescription-opioid-overdose decedents in Utah had a history of substance abuse or mental illness. The majority used prescribed pain medication during their

last year. Providers should use caution when prescribing opioids to patients with history of substance abuse or mental illness.

KEYWORDS: overdose; analgesics, opioid; prescription drugs; mental disorders; substance-related disorders

11:30

Have Self-Reported and Observed Seatbelt Use in the United States Converged?

AUTHORS: *Aybaniz Ibrahimova, R. Shults, L. Beck*

BACKGROUND: Preventing motor-vehicle crashes is a major public health challenge in the United States. In 2008, motor-vehicle crashes in the United States resulted in more than 37,000 deaths and 5 million injuries. Seatbelts are the most effective means to reduce injuries and deaths in a crash. Historically, self-reported seatbelt use among Americans has been 10%–40% higher than observed seatbelt use, and the validity of self-reported seatbelt use has been persistently questioned.

METHODS: Self-reported seatbelt use from the 2008 Behavioral Risk Factor Surveillance System (BRFSS) (n=406,552) was compared with 2008 observed seatbelt use collected by states and territories and published by the National Highway Traffic Safety Administration (n=147,000). The comparison was made by using ratios of self-reported seatbelt use to observed seatbelt use and linear regression modeling.

RESULTS: National self-reported seatbelt use was 85%, while observed use was 83%. The median state ratio of self-reported to observed use was 0.97, indicating that self-reported seatbelt use was somewhat lower than observed use for at least half of the jurisdictions. Linear regression comparing the self-reported with observed seatbelt use for each jurisdiction revealed a moderate association (r2=0.514).

CONCLUSIONS: Findings suggest that, as seatbelt use has increased over time, measures of self-reported and observed use have converged and any bias in self-reported use due to social desirability has declined. The two surveillance systems do not duplicate but, rather, complement each other. BRFSS provides information on socio-demographic characteristics and health risk behaviors other than nonuse of seatbelts, whereas observational surveys differentiate seatbelt use patterns by vehicle type and seating position. Further analyses may reveal differences in convergence by age and sex of drivers and passengers.

KEYWORDS: motor-vehicle crashes, BRFSS, seatbelts, self-report, survey

11:50

Surveillance and Prevention of Occupational Injury Deaths — Wyoming, 2003–2007

AUTHORS: *Paul J. Anderson, G. Conway, J. Lincoln*

BACKGROUND: Four out of five years during 2003-2007, Wyoming reported the highest worker fatality rate in the United States. Wyoming's average annual worker fatality rate of 15.3/100,000 was almost 4 times the annual average U.S. worker fatality rate of 3.9/100,000 for this same period. Wyoming officials contacted the CDC for guidance in targeting prevention efforts.

METHODS: CDC gathered fatality surveillance data for 2003-2007 from Wyoming's Departments of Employment, Transportation, and Occupational Safety and Health. CDC confirmed occupational motor vehicle crash fatalities by matching a death certificate with a crash file from the Wyoming Department of Transportation.

RESULTS: From 2003-2007 Wyoming recorded 210 workplace deaths. By industry, most deaths occurred in Transportation (49) Oil and Gas Extraction (40), Construction (28) and Agriculture (20). By event type, highway motor vehicle crashes caused 103 (49%) deaths, while 35 (14%) deaths resulted from contact with objects and equipment, 12 (13%) deaths from falls, and 12 (13%) deaths from exposure to harmful substances. Speeding caused 30% of MVC deaths, and decedents did not use seatbelts in 58% of cases reviewed. Single-vehicle rollover crashes where the victim was unbelted and ejected accounted for 26% of worker MVC deaths.

CONCLUSIONS: Wyoming officials could target prevention efforts on the Transportation, Oil and Gas, and Construction industries and on motor vehicle crash deaths and deaths from contact with objects and equipment. Good evidence suggests that legislation, increased enforcement, and public health messaging all increase seatbelt use, decrease driver speeds, and decrease mortality from motor vehicle crashes. Industry partners could also adopt technology that removes workers from close contact with machinery on oil rigs and heavy construction sites in Wyoming.

KEYWORDS: Wyoming, surveillance, occupational fatalities, motor vehicle crashes

TUESDAY, APRIL 20

SESSION G: Rugrats

School-Aged Children ..... Ravinia Ballroom, 1:45–4:00 p.m.

MODERATOR: *Richard Olney*

1:50

Racial Disparities in Community Identification of Autism Spectrum Disorders Over Time — Metropolitan Atlanta, 2000–2006

AUTHOR: *Vanessa G. Jarquin, L. Wiggins, L. Schieve, K. Van Naarden Braun*

BACKGROUND: Research indicates non-Hispanic black (NHB) children may be less likely than non-Hispanic white (NHW) children to have an autism spectrum disorder (ASD) diagnosis. We hypothesized that NHB children with milder ASDs were particularly under-identified in community settings. NHB children with undiagnosed mild forms of ASD may be less likely to receive intervention services compared with NHW children.

METHODS: Participants were 1,273 8-year-old children identified as an ASD surveillance case in 2000-2006 using behavioral information abstracted from health and education records consistent with DSM-IV-TR criteria. Children were grouped into mutually exclusive ASD classifications based on diagnostic specificity and educational placements noted by community professionals in their records including autistic disorder, milder disorders on the spectrum (Asperger's disorder and pervasive developmental disorder-not otherwise specified [PDD-NOS]), ASD educational eligibility, and those without an ASD diagnosis/eligibility, but enough ASD behaviors noted to warrant inclusion as an ASD surveillance case. Differences between racial and ethnic groups were assessed using chi-square tests.

RESULTS: ASD prevalence was consistently lower among NHB than among NHW children overall. However, NHB children were more likely than NHW to have documented diagnosis of autistic disorder ($P<.05$ in 2002, 2004, 2006) and less likely to have diagnoses of either PDD-NOS ($P<0.05$ 2002, 2006) or Asperger's disorder ($P<0.05$ all years). In all years, NHB children were significantly more likely than NHW children to have co-occurring intellectual disability, a proxy for severity.

CONCLUSIONS: NHB children were less likely to be diagnosed with milder ASDs, such as PDD-NOS and Asperger's disorder. This disparity in diagnoses may contribute to the lower prevalence of ASDs in NHB children. Undiagnosed NHB children may not receive the necessary intervention services.

KEYWORDS: autism spectrum disorder, surveillance, racial disparities

2:10

Does the "Food Insecurity-Obesity Paradox" Exist in U.S. Children? The National Health and Nutrition Examination Survey, 2001–2006

AUTHORS: *Molly M. Lamb, C. Ogden*

BACKGROUND: In the U.S., over 10% of 2–5 year olds and almost 20% of 6–11 year olds are obese. Childhood obesity has been both positively and inversely associated with household food insecurity (limited access to adequate food due to lack of household money / resources). Most studies thus far have only examined household-level data, however, access to food may differ between individuals within a household. We examined individual-level food insecurity for association with obesity in U.S. children.

METHODS: Measured weight and height and information on food insecurity were available from 5,579 participants in the National Health and Nutrition Examination Survey (NHANES, 2001–2006) age 2–11 years. The NHANES interview contains five individual-level food insecurity questions for children, answered by a caregiver. Food insecurity was defined as an affirmative answer to at least one of these five questions. Obesity was defined as a BMI (weight (kg) / height $(m)^2$) ≥ age- and sex-specific 95th percentile of the CDC growth charts. Multiple logistic regression was conducted to investigate the association between individual-level food insecurity and obesity. Separate analyses were conducted for non-Hispanic whites, non-Hispanic blacks, and Mexican Americans, and both sexes.

RESULTS: Logistic regression adjusted for age, sex and poverty level showed food insecurity was associated with obesity in Mexican Americans (Odds Ratio = 1.86. 95% Confidence Interval 1.08–3.20). No significant associations were found for non-Hispanic whites or non-Hispanic blacks, or for either sex.

CONCLUSIONS: Food insecurity appears to increase the risk of obesity in young Mexican American children in the U.S. Interventions designed to reduce childhood obesity in Mexican American children might consider strategies to address a child's food insecurity.

KEYWORDS: food insecurity, obesity, young children, National Health and Nutrition Examination Survey

2:30

Changes in Preventative Asthma Medication Use Among Asthmatic Children Following Evidence-Based Treatment Guidelines — United States, 1999–2002 and 2003–2006

AUTHORS: *Brian K. Kit, C. Ogden*

BACKGROUND: Asthma morbidity and mortality in childhood can be reduced by appropriate use of preventative asthma medications (PAM). To improve health outcomes of asthmatic children, the National Asthma Education and Prevention Program (NAEPP) released revised treatment guidelines in 2002. The objective of this study is to describe changes in PAM use following the guidelines.

METHODS: Data from 1,822 asthmatic children aged 1-19 years in the cross-sectional 1999-2002 and 2003-2006 National Health and Nutrition Examination Surveys were analyzed. Asthma was defined by self-report. The primary outcome, PAM use, was defined using the 1997 and 2002 NAEPP definitions Classes of PAM in the NAEPP guidelines include: inhaled corticosteroids, long acting beta agonists, leukotriene receptor antagonists, mast cell stabilizers, and methylxanthines. Data for prescription medications was collected during an in-home interview. Multiple logistic regression was conducted to assess the odds of PAM use based on survey years, controlling for race/ethnicity, age, head of household education, and health insurance.

RESULTS: Among asthmatic children, 21.1% (SE=2.0) in 1999-2002 and 30% (SE=2.9) in 2003-2006 were prescribed PAM. In 2003-2006, after the release of NAEPP, children and adolescents had an increased adjusted odds of PAM use compared to those in 1999-2002 (AOR= 1.55, 95%CI 1.08-2.21) after adjusting for covariates. Non-Hispanic black (NHB) children, when compared to Non-Hispanic white (NHW) children, had a lower adjusted odds of PAM (AOR=0.62, 95%CI 0.46-0.82). Uninsured children had a lower adjusted odds of PAM use compared to insured children (AOR=0.5, 95%CI 0.26-0.94).

CONCLUSIONS: There was an increase in PAM use among asthmatic children following evidence-based treatment guidelines. Public health interventions should be geared towards addressing disparities in PAM use among NHBs and the uninsured population.

KEYWORDS: pediatrics, asthma, quality of health care, healthcare disparities

2:50

Overweight and Obesity Among Third-Graders — New Hampshire, 2008–2009

AUTHORS: *Sherry L. Burrer, L. Anderson, R. Flynn, N. Martin*

BACKGROUND: The prevalence of obesity among U.S. children aged 6–11 years more than doubled from 1980 to 2006; obese children are at greater risk for chronic diseases. We examined obesity and overweight prevalence of New Hampshire (NH) third-graders to establish a baseline, identify correlates, and target interventions.

METHODS: The cross-sectional survey used systematic sampling and was stratified by county and percentage of students participating in the free and reduced lunch program (FRL). During the 2008–09 school year, 3,086/4,725 (65%) third-graders participated at the 81 sampled public schools. Height and weight were measured by trained staff who used identical equipment; sex, birth date, and measurement date were recorded. We documented obesity and overweight status by calculating age- and sex-specific body mass index (BMI) values and by using the BMI-for-age percentile growth chart cutoffs, which define obesity as BMI $\geq 95^{th}$ percentile and overweight as $\geq 85^{th}$–$<95^{th}$ percentile. Prevalence estimates were weighted to represent all NH third-graders and to reflect selection probability and nonresponse.

RESULTS: On preliminary analysis, 18% (95% confidence interval [CI], 16.1%–19.9%) of NH third-graders were obese, and 15.4% (95% CI, 14.1%–16.7%) were overweight. Obesity prevalence was significantly higher among males (20.8%) than females (14.6%) (P= .02) and

among children in schools with >50% of students participating in FRL (27.3%), compared with those in schools with <25% of students participating (16.3%) (*P*<.0001). Obesity prevalence by county ranged from 13.6% to 23.9%.

CONCLUSIONS: During the 2008–09 school year, obesity prevalence exceeded the *Healthy People* 2010 goal of 5%. Obesity was unevenly distributed by sex, FRL category, and county. Identified inequities should be addressed by targeted interventions.

KEYWORDS: New Hampshire, obesity, overweight, body mass index, third-graders

3:10

Perceived Family Support Associated with Decreased Alcohol Use Among Youth — Iowa, 2008

AUTHORS: ***Mary E. Fournier, P. Quinlisk, A. Garvey, J. Goddard, S. Lyss***

BACKGROUND: Adolescent alcohol use has been linked to unintentional injuries and violence, including deaths from homicides, suicides, and motor-vehicle collisions. Whether perceived level of family support that youths receive influences alcohol use is not well-understood. We compared alcohol use among in-school Iowa youths who perceived a high level of support from their families with their peers who perceived less support.

METHODS: We analyzed 2008 data from the Iowa Youth Survey, a census survey of public and private schools. We assessed any alcohol use and binge drinking (≥5 drinks on one occasion) within the previous 30 days. Family support was dichotomized on the basis of responses to questions regarding perceived level of adult family members' involvement in the student's life.

RESULTS: In 2008, a total of 97,741 sixth-, eighth-, and eleventh-grade students participated in the survey. Overall, 62% (n = 60,999) of students reported perceived high levels of family support; 19% (n = 18,543) reported any alcohol use, and 14% (n = 13,592) reported binge drinking. Among eighth graders, any alcohol use was reported by 11% of those with perceived high family support and 26% of those with perceived low family support (odds ratio [OR]: 0.37; 95% confidence interval [CI], 0.35–0.40). Binge drinking was reported by 5% of those with perceived high family support and 15% of those with perceived low family support (OR: 0.32; 95% CI, 0.29–0.35). Associations were in the same direction, although weaker, for sixth and eleventh graders.

CONCLUSIONS: Increased perception of family support by a student has a protective association against alcohol use. School- or community-based programs that teach families to guide and support adolescents might help mitigate alcohol use.

KEYWORDS: adolescent, alcohol consumption, risk factors

3:30

Evaluation of Integration of TB/HIV Surveillance into Tuberculosis Treatment for Children — Ethiopia, 2007–2009

AUTHORS: *Eleanor S. Click, B. Feleke, R. Fantu, T. Gadisa, D. Assefa, Z. Melaku, E. Pevzner, H. Menzies, J. Oeltmann, K. Cain*

BACKGROUND: Tuberculosis (TB) is a leading cause of death among children with HIV. Among children with TB disease, early diagnosis and treatment of HIV can decrease mortality. Unfortunately, TB and HIV care are generally not well integrated, and data on HIV infection in children with TB disease (TB/HIV) are lacking. In 2008, Ethiopia integrated HIV testing variables into its TB treatment registers. We evaluated the impact of the current integrated register on documented HIV testing and assessed how the planned health management information system (HMIS) would impact pediatric TB/HIV surveillance data.

METHODS: From the 11 medium and large TB clinics in three regions, we extracted data for children (aged <15 years) diagnosed with TB during September 2007–September 2009. We compared percentages of children with documented HIV test results in preintegration registers (separate for TB treatment and HIV testing) and postintegration registers (combined). We also interviewed hospital staff about TB/HIV integration and about the HMIS.

RESULTS: In preintegration registers, HIV test results by clinic ranged from 0%–82% complete (median 48%, interquartile range [IQR] 24, 71); integrated registers were 86%–100% complete (median 96%, IQR 93, 100). Of 383 children with test results in the postintegration registers, 26 (7%; range 0%–33%) tested positive for HIV. All six staff members interviewed said that the integrated register facilitated recording of HIV data but that the HMIS will not report data separately on children and adults.

CONCLUSIONS: Integrating recording of HIV test results into TB registers led to consistently complete data and assurance of HIV testing. To ensure accurate surveillance of HIV among children with TB in Ethiopia, the HMIS should report TB/HIV data separately for children.

KEYWORDS: child, tuberculosis, HIV, population surveillance

WEDNESDAY, APRIL 21

CONCURRENT SESSION H1: Freqs and Geeks

Peavy Award Finalists ..... Ravinia Ballroom, 8:30–10:15 a.m.

MODERATOR: ***Owen Devine***

8:35

Novel Metric for Risk-Adjustment of Hip Replacement Surgical Site Infection Frequency at Healthcare Facilities — National Healthcare Safety Network, 2006–2009

AUTHORS: ***Matthew E. Wise, Y. Mu, J. Edwards, T. Horan, M. Jhung, S. Fridkin, S. Berrios-Torres***

BACKGROUND: Over 3,000 hip replacement surgical site infections (SSI) occur annually in the United States, resulting in potentially severe complications. Risk-adjustment, employed in SSI surveillance to ensure comparability across facilities, is currently performed in the National Healthcare Safety Network (NHSN) using a three-variable stratification index of patient and procedure characteristics. We sought to determine whether statistical modeling-based standardized incidence ratios (SIR) using all routinely collected NHSN variables could improve established hip replacement SSI risk-adjustment.

METHODS: We used data on fourteen patient, procedure, and facility candidate variables for hip replacements reported to NHSN for 2006-2008 (n=131,948) to construct a logistic regression model for expected SSI frequency. We contrasted the final model's performance with the NHSN index using area under the receiver operating characteristic curves (AUC). We calculated SIRs comparing observed and expected SSIs for facilities reporting hip replacements to NHSN in 2009.

RESULTS: The final model incorporated seven new variables including replacement revision (OR=1.46, 95% CI=1.27-1.68), partial replacement (1.35, 1.18-1.45), and trauma-associated procedure (1.34, 1.13-1.58), as well as two NHSN index variables (procedure duration and illness severity). The AUC for this model was 7% higher than for the established risk index ($P<0.01$), indicating improved SSI prediction. In 2009, model-based SIRs for 36 (5.3%) of 679 facilities indicated three or more times the number of observed SSI than predicted; these spanned a range facility types and sizes.

CONCLUSIONS: A novel model-based metric improved SSI risk-adjustment relative to established methods. SIRs will be implemented in NHSN effective 2010 and will provide healthcare facilities with a single, risk-adjusted figure to evaluate SSI frequency. This should facilitate SSI prevention program assessment and could increase surgeons' acceptance of SSI surveillance data.

KEYWORDS: risk adjustment, logistic models, surgical wound infection, population surveillance

8:55

That Yeast Won't Cease: Understanding the Significance of Persistent *Candida* Bloodstream Infections — a Multi-Center Prospective Survival Analysis

AUTHORS: *Loretta S. Chang, M. Nucci, A.Colombo, B. Le, T. Chiller, B. Park*

BACKGROUND: *Candida* spp. are the third most common cause of nosocomial bloodstream infection. Outcomes of persistent candidemia (PC), in which hemocultures remain positive for *Candida* despite treatment, are not known. We performed a prospective, longitudinal, multi-center study to assess the effect of PC on survival.

METHODS: We systematically obtained hemocultures on days 0, 3, 5, 7, 14 and 21 on all incident candidemia cases at five Brazilian hospitals during April 2005–June 2007. We defined PC as a hemoculture growing *Candida* ≥ two days after the incident infection. Patients lost to follow-up or deaths before day 3 (before PC status could be ascertained) were censored. We plotted survival, probability density, and hazard functions for the combined cohort. The bivariate relationship between clinical variables and survival were compared via the Kaplan-Meier method. The survivorship function was plotted by PC status and fitted to four common parametric distributions for goodness-of-fit: exponential, Weibull, lognormal, and gamma. Potential risk factors from bivariate analyses were considered for multivariable modeling of the survivorship function via the exponential distribution.

RESULTS: Of 266 detected candidemia cases, 76 (29%) were persistent. Case-patient median age was 63.5 (range, 18-94 years) and 128 (48%) were male; 161 (62%) died. Median time to death was 23.5 (range, 0-96) days. The multivariable model showed that PC (AHR 1.7, 95% CI 1.4-2.2), history of antibiotic use (3.6, 1.3-14.6), age over 65 (1.8, 1.2-2.5), and severity of illness (2.7, 1.9-3.8), were significantly associated with death.

CONCLUSIONS: This analysis, the first to evaluate the outcomes of PC, finds an independent association with mortality. Further studies to determine preventable factors associated with PC are warranted.

KEYWORDS: candidemia, epidemiology, Brazil, mortality

9:15

Effect of Body Mass Index and Weight Change on Epithelial Ovarian Cancer Survival — United States, 1980–1997

AUTHORS: *Crystal P. Tyler, M. Whiteman, L. Zapata, S. Hillis, K. Curtis, J. McDonald, P. Wingo, P. Marchbanks*

BACKGROUND: Ovarian cancer causes more U.S. deaths than any other gynecologic malignancy, approximately 14,900 in 2009. Although body mass index (BMI) has been associated with survival among women with hormonally mediated malignancies such as breast and endometrial cancers, its relationship with ovarian cancer survival is less clear.

METHODS: We conducted a cohort analysis of the relationship between BMI and survival among 425 participants in the Cancer and Steroid Hormone (CASH) study, a population-based case-control study. Cases included women aged 20–54 years in whom epithelial ovarian cancer was diagnosed during 1980–1982. Participants' vital status was ascertained though data linkage with the Surveillance, Epidemiology and End Results system. Using Cox proportional hazards models, we estimated hazard ratios (HRs) for the association between survival and participants' BMI quartiles based on their "usual" adult weight and weight at age 18, both self-reported at diagnosis, and weight change from age 18 to adult.

RESULTS: During a mean follow-up of 9.7 years, 170 women died from ovarian cancer. After adjusting for tumor characteristics, reproductive factors, and the presence of other chronic conditions, we found no association between adult BMI and ovarian cancer survival. Compared with risk for death among women in the lowest adult BMI quartile (<20.7), the HRs for women in the second (20.8-22.5), third (22.6-24.7), and fourth quartiles (≥24.8) were 1.22 (95% confidence interval [CI], 0.77-1.93), 1.17 (95% CI, 0.74-1.86) and 0.87 (95% CI, 0.53-1.42), respectively (*p*-value for trend = 0.40). Similarly, neither age 18 BMI nor weight gain were associated with ovarian cancer survival.

CONCLUSIONS: Although BMI is associated with likelihood of surviving some cancers, we found no evidence of its association with ovarian cancer survival.

KEYWORDS: ovarian neoplasm, cancer, survival, body mass index, BMI

9:35

Age, Period and Cohort Effects on Contraceptive Practices — Honduras and Nicaragua, 1991–2006

AUTHORS: *Andreea A. Creanga, C. Shapiro-Mendoza, D. Williams, P. Stupp*

BACKGROUND: Despite broad availability of other modern contraceptive methods, female sterilization emerged as the most widely practiced method in Honduras and Nicaragua; over one third of reproductive-aged women in these countries are currently sterilized, a 30% increase in both countries since 1991. To determine if this increase and corresponding changes in contraceptive practices are due to age, period or cohort effects, this analysis disentangles the three types of effects.

METHODS: We pooled data from four rounds of nationally-representative cross-sectional reproductive health surveys conducted in Honduras and Nicaragua from 1991 through 2006 and constructed synthetic birth-cohorts of reproductive-aged women (Honduras: n=27,214; Nicaragua: n=30,125). We adopted a hierarchical multi-level approach and specified separate logit cross-classified random-effects models for practice of any contraceptive method, modern methods (pills, condoms, injectables, IUDs, surgical sterilization) and female sterilization. We estimated fixed effects for age, and random effects for periods and cohorts by treating these two variables as level-two factors; models were adjusted for women's residence, education, household wealth and for complex survey design.

RESULTS: After accounting for age and period effects, use of any contraceptive method varied by birth-cohort membership in both countries ($P<0.001$). Period effects affected the use of all modern methods considered together more so than birth-cohort membership (Honduras: coefsc=0.276 vs. coefbc=0.187; Nicaragua: coefsc=0.432 vs. coefbc=0.203; all p-values<0.05). Conversely, birth-cohort positively influenced the practice of female sterilization, more so than period effects.

CONCLUSIONS: Cohort effects have independently contributed to the increase in the use of all contraceptive methods, and disproportionally so to the increase in female sterilization practice in both countries. Strategies such as targeted contraceptive counseling and mass-media campaigns may increase women's use of non-surgical modern contraception.

KEYWORDS: contraception, cohort, Honduras, Nicaragua

9:55

Using Spatial Analysis To Identify Areas of Increased Active Tuberculosis Incidence Among Asians — California, 2005–2008

AUTHORS: *Erin L. Murray, M. Cilnis, J. Westenhouse, S. Kanowitz, T. Shaw, J. Flood, J. Watt*

BACKGROUND: Tuberculosis incidence among U.S.-born Asians in California increased from 2.8 to 3.3 cases/100,000 population during 2005–2008, raising concerns about disease transmission. We studied areas with high tuberculosis incidence among Asians and examined the possibility of recent transmission.

METHODS: We identified active tuberculosis cases during 2005–2008 among Asians from the California Tuberculosis Case Registry, which includes country of birth and U.S. zip code. Census Bureau yearly intracensal estimates of Asians by zip code were used to calculate incidence. A Poisson model and Monte Carlo repetitions were used to identify spatial clusters with significantly higher than expected annual incidence ($P<.05$). Multiple comparisons were accounted for in the analysis. Genotypic diversity in a cluster was defined as the ratio of distinct genotypes to genotyped cases. Statewide genotypic diversity among Asians for all counties was defined as the ratio of the sum of distinct genotypes by county to all genotyped cases.

RESULTS: Six spatial clusters were identified during the study period with tuberculosis incidence ranging from 1.6–4.6 times the statewide Asian rate during 2005–2008. Four of the clusters included U.S.-born Asian cases, comprising 0.7%–4.7% of all cases within their respective clusters. Among the five spatial clusters with genotype data, genotypic diversity ranged from 0.65–0.93, compared with 0.65 for California Asians.

CONCLUSIONS: The low percentage of U.S.-born Asians and relatively high genotypic diversity within the spatial clusters suggest reactivation of latent tuberculosis infections among foreign-born persons was the predominant disease source, although the presence U.S.-born persons probably reflects recent transmission. Confirmation of these findings and efforts to

increase diagnosis and treatment of latent tuberculosis infections within these clusters are recommended.

KEYWORDS: tuberculosis, spatial analysis, Asians, genotype

WEDNESDAY, APRIL 21

CONCURRENT SESSION H2: Big Brother Surveillance ..... Dunwoody Suites, 8:30–10:15 a.m.

MODERATOR: *James Buehler*

8:35

To Test or Not To Test: Influenza-Like Illness Case Definition Versus Antigen Testing for 2009 Pandemic Influenza A (H1N1) in a Pilot Respiratory Virus Surveillance System — New York City, May–June 2009

AUTHORS: *Teeb Al-Samarrai, N. Soulakis, M. Plagianos, C. Greene, L. Thorpe, E. Begier, J. Lurio, T. Briese, I. Lipkin, W. Wu*

BACKGROUND: Influenza causes ~36,000 deaths annually nationwide. In 2004, New York City (NYC) began syndromic surveillance for influenza-like illness (ILI) using ambulatory electronic health records (EHR). In May 2009, NYC implemented a long-planned pilot surveillance system to characterize respiratory viruses causing ILI (fever ≥99.9°F with cough) in the community by linking EHR data with diagnostic testing in nine community health centers. We assessed sensitivity and specificity of the ILI syndromic case definition and of influenza A/B antigen testing (AntigenTest) during the pandemic influenza A(H1N1) virus (pH1N1) peak period in spring 2009.

METHODS: EHR alerts were added to encourage clinicians to perform respiratory virus diagnostic testing by nasopharyngeal specimen collection when influenza-compatible symptoms or diagnoses were entered. Alert triggers included but were not restricted to ILI. Specimens were initially tested using a commercial AntigenTest; later, all specimens underwent MassTag polymerase chain reaction (mtPCR) for 12 respiratory viruses, including pH1N1. Sensitivities and specificities of ILI case definition and AntigenTest for detecting pH1N1 were calculated with mtPCR as gold standard, using May–June 30, 2009 results.

RESULTS: Of 5,775 clinical encounters, 445 (8.3%) were ILI cases. Overall, 108 test results were available; of these, 76 (70%) had an mtPCR-identified respiratory virus, most commonly pH1N1 (91%). Of 69 patients with pH1N1, 20 were AntigenTest positive (sensitivity, 29% [95%CI: 18-41]; specificity, 94% [95%CI: 84–98]); 48 were ILI cases (sensitivity 70% [95%CI: 57-80]; specificity, 39% [95%CI: 29-49]).

CONCLUSIONS: This system characterized circulating respiratory viruses and demonstrated that the ILI case definition is more sensitive than antigen testing for pH1N1. We recommend that this respiratory virus surveillance system discontinue the AntigenTest and send specimens directly for mtPCR for respiratory virus identification.

KEYWORDS: syndromic surveillance, electronic health records, influenza, 2009 pandemic influenza A (H1N1), influenza-like illness, MassTag PCR

8:55

Reasons for the Increasing Hispanic Infant Mortality Rate — Florida, 2004–2007

AUTHORS: *Erin K. Sauber-Schatz, W. Sappenfield, L. Hernandez, K. Freeman, W. Barfield, D. Bensyl*

BACKGROUND: Since 1996, Florida's infant mortality rate (IMR) has been stable; during 2004–2007, Florida's Hispanic IMR (HIMR) increased 55%. In 2005, Florida implemented a revised death certificate with more detailed race/Hispanic ethnicity assessment. We assessed whether the HIMR increase was real or artifactual.

METHODS: We included live births among Florida residents using 2004–2007 linked birth and infant death certificates. Infant race/ethnicity is not collected on birth certificates; therefore, HIMR is traditionally calculated with infant Hispanic classification from death certificates, but maternal Hispanic classification from birth certificates. Using linked data, we classified Hispanic ethnicity of infant decedents and live births based on maternal ethnicity from birth certificates and calculated nontraditional HIMRs, independent of death certificate ethnicity reporting. Hispanic was defined as Mexican, Puerto Rican, Cuban, Central/South American, or other/unknown Hispanic.

RESULTS: From 2004 to 2007 per 1,000 live births, traditional HIMR increased 55% from 4.0 to 6.2 (Chi-square $P<.001$); nontraditional HIMR increased 20% from 4.5 to 5.4 (Chi-square $P=.03$). From 2004 to 2005, traditional HIMR increased by 1.8/1,000 live births; nontraditional HIMR increased by 0.8/1,000 live births. This difference of 1.0/1,000 live births accounts for 55% of the traditional HIMR increase. The revised death certificate did not change maternal and infant Hispanic ethnicity agreement from 2004 (kappa=0.76, $P<.001$) to 2005 (kappa=0.78, $P<.001$).

CONCLUSIONS: Differences in Hispanic reporting on revised death certificates accounted for the majority of traditional HIMR increase, indicating IMR increase was primarily artifactual. Using nontraditional HIMR, IMR still increased 20% during 2004–2007. Assessment of ethnicity on birth and death certificates is critical to understanding infant mortality. Use of nontraditional HIMRs, which utilize a consistent source of Hispanic classification, should be considered.

KEYWORDS: infant mortality, Hispanic, Florida, vital records

9:15

Acute Versus Paired Serology for La Crosse Encephalitis Surveillance

AUTHORS: *Rendi Murphree, J. Dunn, W. Schaffner, T. Jones*

BACKGROUND: La Crosse virus (LACV) is the primary cause of arboviral encephalitis among North American children. After a 1997 cluster of serologically confirmed LACV infections in east Tennessee, active surveillance was implemented. Faced with competing priorities, we sought to determine if the surveillance system can be maintained by using data regarding patients with suspected La Crosse encephalitis and a single acute LACV-specific antibody titer.

METHODS: Data regarding patients with suspected La Crosse encephalitis were reported to the Tennessee Department of Health during 1997–2009. Patients with a four-fold rise in LACV antibody titers in paired serum samples were classified as cases; those lacking a four-fold rise were noncases. Using these data as the standard, we calculated sensitivity, specificity, and predictive values of a single acute antibody titer for diagnosis.

RESULTS: During 1997–2009, a total of 108 cases and 258 noncases were reported. Sensitivity of a single acute antibody titer was 75%, specificity 98%, positive predictive value 95%, and negative predictive value 90%. Among cases, median interval between symptom onset and acute serum draw was 4 days (range: 0–20 days). Sensitivity of a single acute antibody titer was 70% among cases with serum drawn <4 days after symptom onset. During 1997–2009, data regarding 37 patients with a single positive acute antibody titer but no convalescent titer were also reported. Their characteristics (age, sex, race, hospitalization rate, and geographic distribution) did not differ from confirmed cases.

CONCLUSIONS: In the absence of paired serology, single positive results appear reliable for diagnosing La Crosse encephalitis for surveillance purposes. Using acute serology for surveillance will increase case ascertainment and promote sustainability and statewide expansion of the system.

KEYWORDS: La Crosse virus, encephalitis, serology, surveillance

9:35

Evaluation of Three School Absenteeism Influenza Surveillance Indicators: Lessons Enabled With the 2009 Pandemic Influenza A (H1N1) — Tri-County (Denver Metropolitan Region), Colorado

AUTHORS: *Nancy J. Williams, T. Ghosh, R. Vogt*

BACKGROUND: The emergence of 2009 pandemic influenza A (H1N1) virus, which disproportionately affects school-aged children, prompted Tri-County Health Department to develop an influenza-like-illness (ILI) surveillance system based on school absenteeism and health office visits to enable timely identification of outbreaks.

METHODS: We performed active surveillance of all-cause school absenteeism, ILI-specific school absenteeism, and ILI-specific school health office visits at 216 schools, and passive surveillance of all-cause absenteeism at an additional 163 schools. We tracked outbreaks, defined as ≥2 consecutive school days where ≥1 of the following was observed: ≥10% all-cause absenteeism, ≥5% ILI-specific absenteeism, or ≥2% ILI-specific health office visits. We compared our different types of surveillance and numbers of outbreaks detected with one another and with counts of laboratory-confirmed hospitalized influenza cases (all ages) within our three counties.

RESULTS: Overall, of 226 outbreaks detected August 31–November 21, all-cause absenteeism, ILI-specific absenteeism, and health office visit surveillance found 88%, 24%, and 0%, respectively; 8 schools accounted for 69 (35%) of the outbreaks defined by all-cause absenteeism. Passive surveillance identified only two (<1%) of the outbreaks. Active surveillance indicated that the number of school outbreaks/week (36) and daily rates of all-cause (7.3%) and ILI-specific absenteeism (2.0%) each peaked during Week 39. Laboratory-confirmed influenza hospitalized cases/week peaked during Week 41. Results are preliminary since surveillance continues.

CONCLUSIONS: Three of our active school surveillance indicators peaked two weeks prior to hospitalizations; schools might be viable alternatives to outpatient sentinel providers for community-level ILI surveillance activity. Passive surveillance was ineffective. There is no nationally accepted definition for a school ILI outbreak and our three definitions produced inconsistent results; work is needed to develop a better definition.

KEYWORDS: 2009 pandemic influenza A (H1N1), primary schools, secondary schools, surveillance, influenza

9:55

Emergency Department Visits for Suspected Medication-Related Angioedema — United States, 2007

AUTHORS: *Elissa Meites, N. Shehab, V. Johnson, D. Budnitz*

BACKGROUND: Angioedema is an allergic reaction characterized by rapid swelling of deep layers of the skin or mucous membranes that can be life-threatening when affecting the oropharynx. Hundreds of medications carry warning labels for angioedema, but population-based data on these reactions are scarce. We sought to describe the clinical epidemiology of medication-related angioedema and identify commonly associated medications.

METHODS: We identified emergency department (ED) visits for suspected medication-related angioedema between January 1–December 31, 2007, from a nationally representative stratified probability sample of 63 U.S. hospitals. Cases included visits for clinically documented angioedema or edema attributed to medication allergy by the treating clinician. We assigned case sample weights based on the inverse probability of selection, and calculated national estimates and 95% confidence intervals (CIs) accounting for complex sample design.

RESULTS: Nationally, there were an estimated 58,625 ED visits (CI=48,227–69,023) for suspected medication-related angioedema in 2007, based on a sample of 982 cases, including 166 with documented angioedema. Most visits were by women (65%; CI=61%–68%) and involved oropharyngeal swelling (60%; CI=55%–64%). ED treatment (e.g., steroids, antihistamines, intubation) and hospitalization were required for 80% and 9% of visits, (CI=73%–87% and 4%–14%), respectively. Antibiotics were most frequently implicated (35%; CI=29%–39%) in these visits overall; renin-angiotensin antagonists were most frequently implicated (43%; CI=27%–59%) only among the subset with documented angioedema. At least 73% of visits were attributed to recently started medications, and 39% to one dose of a new medication (CI=67%–79% and 34%–43%, respectively).

CONCLUSIONS: ED visits for medication-related angioedema are common and often require emergent interventions. Awareness of these serious allergic reactions is recommended, especially when starting new medications.

KEYWORDS: adverse drug reaction reporting systems, angioedema, drug hypersensitivity, emergency treatment

WEDNESDAY, APRIL 21

CONCURRENT SESSION I1: Cougar Town

Zoonoses ..... Ravinia Ballroom, 10:30 a.m.–12:00 p.m.

MODERATOR: ***Tracee A. Treadwell***

10:35

Dirty Chicks: Human *Salmonella* Typhimurium Infections Associated with Exposure to Baby Poultry from Agricultural Feed Stores and Mail-Order Hatcheries — United States, 2009

AUTHORS: ***Anagha R. Loharikar, E. Cavallaro, C. Schwensohn, S. Vawter, E. Hyytia-Trees, P. Lafon, J. Kincaid Adams, B. Le, A. Rhorer, K. Warren, M. Deasy III, M. Moll, C. Sandt, R. Gilhousen, E. Villamil, C. Barton Behravesh***

BACKGROUND: Since 1990, >25 outbreaks of human salmonellosis linked to contact with live poultry from mail-order hatcheries have been reported. Distribution of birds through agricultural feed stores or by mail-order hatcheries occurs with minimal regulatory oversight. We investigated an outbreak of *Salmonella* serotype Typhimurium infections in August 2009.

METHODS: We conducted a case-control study to examine the relationship between illness and contact with baby poultry. A case was defined as *Salmonella* Typhimurium in a Pennsylvania or New York resident with onset between May 1 and October 10, 2009, yielding an isolate indistinguishable from the outbreak strain by molecular subtyping and multiple-locus variable-number tandem repeat analysis. Controls were age- and geographically-matched. Traceback investigations and environmental sampling were completed.

RESULTS: We identified 41 cases; the median age was 8.5 (range <1-70) and 31% (9/29) were hospitalized. Twenty-nine cases and 26 controls were enrolled. Live baby poultry contact was reported by 73% (19/26) of case-patients compared to 4% (1/26) of controls (matched odds ratio [mOR]=17, 95% confidence interval [CI]= 2.6-710.5). Contact with chicks (mOR=14, 95%

CI 2.1-592), ducklings (mOR=8, 95% CI 1.1-355), and visiting Feed Store Chain X (mOR=5, 95% CI 1.1-46.9) were significantly associated with illness. Feed Store Chain X received poultry from Hatchery A, which is supplied by multiple egg sources. Environmental sampling yielded *Salmonella* Typhimurium from a duck flock; PFGE is pending.

CONCLUSIONS: Young live poultry remain an important source of human salmonellosis, particularly among children. The mail-order hatchery industry has caused numerous outbreaks of human salmonellosis, particularly via agricultural feed stores, and poses an ongoing challenge to the public health community.

KEYWORDS: *Salmonella*, baby poultry, agricultural feed stores, mail-order hatcheries, children

10:55

Factors Associated with Patient Delay in Rabies Postexposure Prophylaxis Initiation — Puerto Rico, 2008–2009

AUTHORS: ***Kis Robertson, B. Rivera-García, R. Serrano, A. Oquendo, J. Blanton, J. Rullán, C. Rupprecht***

BACKGROUND: Timely initiation of rabies postexposure prophylaxis (PEP) composed of rabies immune globulin and multiple doses of rabies vaccine is critical to preventing disease in persons exposed to rabid animals. A prior investigation in Puerto Rico by CDC and the Puerto Rico Department of Health (PRDH) revealed that days-to-PEP initiation > 10 days were observed in many victims of animal bites. To elucidate potential barriers to timely PEP, we assessed factors associated with patient-specific delay in PEP initiation.

METHODS: Study cohort consisted of patients who were recommended for PEP by the PRDH and received rabies immune globulin and at least one dose of rabies vaccine between September 1, 2008 and August 31, 2009. Data for each patient was obtained from health department records and through telephone interview. Univariate and multivariate Cox regression analysis was used to examine the relationship between demographics, exposure characteristics, and other variables with the interval of time between PEP recommendation and PEP initiation (defined as patient delay).

RESULTS: By August 31, 2009, 347 patients had initiated rabies PEP within the study period. Median patient delay was 15 days (range: 0-140), with 23% of patients initiating PEP greater than 30 days after recommendation. Exposure to animals other than mongoose was independently associated with longer patient delays (hazard ratio [HR] 0.18, 95% CI 0.10-0.32), while time-to-PEP recommendation 10 days or less was associated with shorter patient delay (HR 1.71, 95% CI 1.43-2.55).

CONCLUSIONS: Patient delay in PEP initiation is an important problem in Puerto Rico. Increasing the number of medical facilities authorized to administer PEP and promoting rabies awareness among physicians who treat animal bite victims are recommended strategies to improve PEP timeliness.

KEYWORDS: rabies, postexposure prophylaxis, delay, initiation

11:15

Evaluation of Hantavirus Pulmonary Syndrome Clinical Findings and Case Definition — United States, 2003–2009

AUTHORS: *Barbara Knust, A. MacNeil, P. Rollin*

BACKGROUND: Hantavirus Pulmonary Syndrome (HPS) is a nationally notifiable disease, and more than 500 cases have been identified in the United States since its first description in 1993. HPS is an acute respiratory illness with a case mortality of approximately 36%. Progression to shock and death are often swift. Clinical presentation can resemble other diseases, which may cloud diagnosis, management, and reporting. By evaluating clinical findings in patients suspected for HPS, we attempt to identify characteristics predictive of HPS.

METHODS: Among patients with samples submitted to the CDC for hantavirus testing between 2003-2009, we compared clinical characteristics between those with positive and negative test results. Sensitivity, specificity, positive and negative predictive values of clinical findings, including presence of fever, thrombocytopenia, elevated hematocrit, elevated white blood cell count, chest X-ray suggestive of acute respiratory distress syndrome, and treatment with supplemental oxygen were calculated.

RESULTS: Of 157 suspected HPS patients tested, 101 were serologically negative and 56 were laboratory confirmed. The clinical finding most sensitive for HPS was thrombocytopenia (95%), while elevated hematocrit was most specific (83%). The combination of thrombocytopenia with at least one other positive clinical finding detected the most positive cases and was moderately predictive of positive test results (Sensitivity= 95%, Positive Predictive Value= 55%). The presence of all six clinical findings had the highest predictive value of a positive test (90%), but only 42% of positive patients met all 6 criteria.

CONCLUSIONS: Thrombocytopenia was a highly sensitive indicator of HPS and should be included in surveillance definitions for suspect HPS. Clinicians should consider HPS in febrile patients presenting with respiratory signs and thrombocytopenia.

KEYWORDS: hantavirus pulmonary syndrome, sensitivity and specificity, epidemiology, disease notification

11:35

It's Not Easy Being Green: A Multistate Outbreak of Human *Salmonella* Typhimurium Infections Associated with Aquatic Frogs — United States, 2009

AUTHORS: *Shauna L. Mettee, L. Capewell, C. Barton-Behravesh, J. Hall, M. Poulson, S. Cosgrove, L. Fawcett, K. Lujan, M. Adams-Cameron, P. Torres, K. Winpisinger, A. Kimura, J. Yaeger, P. Hudecek, N. Garrett, E. Hyytia-Trees., B. Le, G. Ewald, L. Hausman, I. Williams, S. Sodha*

BACKGROUND: *Salmonella* causes approximately 1.4 million infections, 15,000 hospitalizations, and 400 deaths annually in the United States. Reptiles and amphibians are known

Salmonella carriers. While outbreaks of *Salmonella* infections associated with turtle contact have been identified, no outbreak associated with amphibians has been previously reported. During Fall 2009, we investigated a multistate outbreak of *Salmonella* Typhimurium infections predominantly among children.

METHODS: We conducted a matched case-control study. Cases were defined as *Salmonella* Typhimurium infection in a person whose isolates matched the outbreak strain pulsed-field gel electrophoresis and multiple-locus variable-number tandem repeat analysis patterns. Controls were persons with recent infection with *Salmonella* strains other than the outbreak strain and matched by age and county of residence. Environmental samples were obtained from patients' homes with subsequent tracebacks on positive samples.

RESULTS: We identified 85 cases from 31 states; 34% (16/47) were hospitalized and none died. Median age was four years (range = <1-54 years); 79% were <10 years. Among 19 cases and 31 controls, illness was significantly associated with exposure to frogs (63% cases vs 3% controls, mOR=24.4, CI=4.0-infinity). Among 6 case-patients who knew the frog type, all were exposed to a single aquatic frog species, the African Dwarf Frog (ADF). Environmental samples from aquariums containing ADFs in 4 patients' homes yielded isolates matching the outbreak strain. Traceback investigations of ADF's converged to a common breeder. Environmental samples from the breeder's facility yielded the outbreak strain.

CONCLUSIONS: Epidemiologic and laboratory evidence from this investigation identified ADFs as the source of this outbreak. Public education regarding risk for illness associated with turtles and other reptiles should be expanded to include risk for salmonellosis from frogs and other amphibians.

KEYWORDS: amphibians, frog, Ranidae, *Salmonella*, pulsed-field gel electrophoresis, animals, humans, child, infant

WEDNESDAY, APRIL 21

Concurrent Session I2: Just Shoot Me
Vaccines and Preventable Diseases ..... Dunwoody Suites, 10:30 a.m.–12:00 p.m.
MODERATOR: ***Nancy Messonnier***

10:35

Impact of 2-Dose Vaccination on Varicella Epidemiology — Connecticut, 2005–2008

AUTHORS: ***Jessica A. Kattan, H. Bohnwagner, L. Sosa, J. Hadler***

BACKGROUND: Before vaccine licensure in 1995, varicella infection resulted in >10,000 hospitalizations and 100 deaths annually in the United States. In Connecticut, varicella has been reportable since 2001. Incidence remained stable during 2001–2005, indicating that the limits of control had been reached with the 1-dose childhood vaccination program. In 2006, the Advisory Committee on Immunization Practices recommended implementation of routine 2-dose vaccination for children. We assessed this recommendation's initial impact on varicella epidemiology in Connecticut.

METHODS: Connecticut varicella surveillance is passive. Healthcare providers, daycares, and schools are required to report varicella cases; laboratory confirmation is not required. Incidence rates and frequencies were tabulated by using 2005–2008 Connecticut varicella surveillance data.

RESULTS: Varicella incidence decreased from 48.7 cases/100,000 persons in 2005 to 24.5 cases/100,000 persons in 2008. During this period, the number of varicella cases decreased among persons aged 1–4 years (29%), 5–9 years (66%), and 10–14 years (48%). Despite this decrease, children aged 1–14 years accounted for the majority (83%) of cases. The number of cases increased among persons aged <1 year (36%), 15–19 years (9%), and >20 years (82%). In 2008, 63% of cases occurred among 1-dose vaccine recipients, 14% among 2-dose recipients, and 23% among unvaccinated persons.

CONCLUSIONS: Varicella incidence has declined rapidly in Connecticut coincident with implementation of routine 2-dose varicella vaccination for children. However, 2-dose vaccine recipients are experiencing disease, and the number of cases has paradoxically increased among infants, older adolescents, and adults. Continued surveillance is needed to determine the full impact of the 2-dose recommendation for children and to monitor trends and risk factors for possibly increasing incidence among older age groups.

KEYWORDS: varicella, vaccination, epidemiology, Connecticut

10:55

Projected Impact and Cost-Effectiveness of a National Rotavirus Vaccination Program — India

AUTHORS: *Douglas H. Esposito, J. Tate, U. Parashar, G. Kang*

BACKGROUND: Of the world's estimated 527,000 annual rotavirus deaths in children under 5, more than 25% occur in India. With the 2009 WHO recommendation for global use of rotavirus vaccines, immunization may soon be introduced in India. To help policy makers assess the value of rotavirus vaccination in India, we determined the national rotavirus disease and economic burden and estimated the impact and cost-effectiveness of a rotavirus vaccination program.

METHODS: Published and unpublished data and national statistics were used to estimate the annual number of rotavirus deaths, hospitalizations, and outpatient visits and their associated costs among children <5 years of age in India. Impact of a rotavirus vaccination program on these health events and cost-effectiveness, expressed in US dollars per disability-adjusted life-year (DALY), were calculated.

RESULTS: Annually in India, rotavirus diarrhea causes an estimated 122,000–153,000 deaths, 457,000–884,000 hospitalizations, and 2 million outpatient visits in children <5 years of age. India spends $41–72 million annually in medical costs to treat rotavirus diarrhea. Based on available estimates of vaccine coverage and efficacy, a rotavirus vaccination program would prevent 43,963 deaths, 293,086 hospitalizations, and 328,156 outpatient visits and save $20.6

million in medical costs annually. At the Global Alliance for Vaccines and Immunization (GAVI) price of $0.20 per dose, a rotavirus vaccination program would cost $17.3 million but will save the Indian government $3.3 million or $2.44 per DALY averted.

CONCLUSIONS: A national rotavirus vaccination program in India will prevent substantial rotavirus morbidity and mortality and, at the GAVI price, would be cost-saving to the Indian government. Public health officials can use this locally-derived data to advocate for implementation of this very cost effective intervention.

KEYWORDS: rotavirus, disease burden, cost-effectiveness, India

11:15

Comparison of Administration Time Between Seasonal Live Attenuated Influenza Vaccine and Trivalent Influenza Vaccine During Hawaii's Stop Flu at School Campaign — Hawaii, 2009

AUTHORS: *Meera V. Sreenivasan, M. Wong, C. Giles, H. Toiya, R. Okumura, D. Vassalotti, C. Chu, L. Mendez, H. He, S. Park*

BACKGROUND: School-aged children account for 25%–43% of infections during typical influenza seasons. The Hawaii Department of Health vaccinates K–8th graders against influenza through its Stop Flu at School campaign. We evaluated time differences between administering intranasal live-attenuated influenza vaccine (LAIV) and injectable trivalent inactivated influenza vaccine (TIV) to guide planning for school-located mass-vaccination clinics.

METHODS: We conducted a prospective study in three public schools during the 2009 campaign. We videotaped all vaccination encounters and calculated administration time by videotape review. Time started on arrival at a vaccine station and ended after being vaccinated and departing the station; additionally, the vaccinator verified identification and reviewed contraindications. We calculated mean times to administer LAIV and TIV to all students and to the first 30 students in the three clinics to control for group size. We used student's t-test and chi-square to establish significance.

RESULTS: Of 657 students, 213 (32%) received LAIV (mean: 75 seconds; 95% confidence interval [CI], 73–78 seconds) and 444 (68%) received TIV (mean: 86 seconds; 95% CI, 83–90 seconds; $P = .0001$). Therefore, in a 4-hour clinic, 192 children would be vaccinated with LAIV or 167 children with TIV. Mean time for the first 30 students was 78 seconds (95% CI, 75–82 seconds) for LAIV and 89 seconds (95% CI, 82–97 seconds) for TIV ($P = .01$). Two (1%) students receiving LAIV and 25 (6%) receiving TIV required assistance from an additional adult.

CONCLUSIONS: LAIV offered time savings and better ease of administration. LAIV should improve ability to vaccinate healthy children rapidly, but excludes children with contraindications. School-located influenza vaccination clinics are valuable assets for modeling mass-vaccination clinics.

KEYWORDS: influenza, vaccination, live-attenuated influenza vaccine, trivalent inactivated influenza vaccine, school clinic

11:35

Impact of Rotavirus Vaccination on Rotavirus-Coded Hospitalizations — Colorado, 2000–2008

AUTHORS: *Christa R. Hale, K. Gershman, M. Cortese*

BACKGROUND: Rotavirus causes severe acute gastrointestinal illness among children aged <5 years and was responsible for 55,000–70,000 hospitalizations in the United States annually before rotavirus vaccine was licensed for infants in February 2006. We assessed vaccination impact among young Colorado children.

METHODS: Rotavirus causes severe acute gastrointestinal illness among children aged <5 years and was responsible for 55,000–70,000 hospitalizations in the United States annually before rotavirus vaccine was licensed for infants in February 2006. We assessed vaccination impact among young Colorado children.

RESULTS: For the 2007–08 season, 141 rotavirus-coded hospitalizations occurred among children aged <5 years, compared with a mean of 308 hospitalizations/season during 2000–2006 (range, 248–382). RR for postvaccine versus prevaccine period was 0.42 (95% confidence interval [CI], 0.35–0.52). Children aged 4–6 months had the lowest RR (0.26; 95% CI, 0.12–0.54); RR for children aged 36–59 months was 0.68 (CI, 0.29–1.62); RR for other age groups did not differ from the overall RR. During the 2000–2006 seasons, rotavirus-coded hospitalizations began increasing in December; during 2007–08, this increase began in March.

CONCLUSIONS: Postvaccine period was associated with an approximate 60% reduction in the rotavirus-coded hospitalization rates among children aged <5 years. The greatest reduction was among infants aged 4–6 months; reductions were also observed among children too old to be vaccinated. The 2007–08 season onset was delayed by 3 months. Continued monitoring as additional birth cohorts are vaccinated will increase understanding of vaccination impact.

KEYWORDS: rotavirus, rotavirus infections, rotavirus vaccines

WEDNESDAY, APRIL 21

POSTER SESSION 2: Perfect Strangers

Meet the Authors of Posters 16–30..... Ravinia Ballroom, 12:30–1:30 p.m.

POSTER 16

Oseltamivir Resistance Among 2009 Pandemic Influenza A (H1N1) Viruses — United States, 2009

AUTHORS: *Samuel B. Graitcer, S. Doshi, L. Gubareva, V. Deyde, M. Okomo-Adhiambo, Z. Moore, N. Dailey, K. Lofy, S. Penfield, J. Louie, S. Marshall, C. Pan, K. St. George, M. Jhung, T. Uyeki, A. Klimov, A. Fry*

BACKGROUND: Early treatment with neuraminidase inhibitors, oseltamivir and zanamivir, reduces morbidity and mortality from severe influenza. Because of contraindications with

zanamivir, widespread oseltamivir resistance would significantly limit treatment options for pandemic influenza A(H1N1) [pH1N1] infections. We describe findings from U.S. surveillance for antiviral-resistant pH1N1 and highlight factors potentially associated with oseltamivir resistance.

METHODS: We tested a sample of pH1N1 virus isolates identified by U.S. WHO collaborating laboratories during 2009 with neuraminidase inhibition assay for zanamivir and oseltamivir resistance. We tested a sample of clinical specimens with pyrosequencing for H275Y, a neuraminidase mutation associated with oseltamivir resistance. Using standardized case forms, we collected epidemiologic information from patients with oseltamivir-resistant pH1N1 infection.

RESULTS: Thirty (0.8%) of 3,903 pH1N1 viruses tested were oseltamivir-resistant, none of 1552 isolates were zanamivir-resistant. Among 28 with epidemiologic information, nine were fatalities. Of 22 that received oseltamivir prior to specimen collection, four received chemoprophylaxis and 18 treatment. Four had contact with other patients with oseltamivir-resistant pH1N1 infections. Two had no known oseltamivir exposure. Twenty-three (82%) patients with oseltamivir-resistant pH1N1 infection had a severe immunosuppressive condition or were taking immunosuppressive medication, including 18 (78%) with leukemia or lymphoma. Median age among patients with oseltamivir-resistant pH1N1 infection was 39 years (range 1-67 years). Among the 18 patients on oseltamivir treatment, the median duration from initiation of oseltamivir until collection of oseltamivir-resistant specimen was ten days (range 1-30 days).

CONCLUSIONS: Infections with oseltamivir-resistant pH1N1 were rare and occurred most often among patients with immunosuppression or prior exposure to oseltamivir. Hygienic measures to reduce the risk of transmission of resistant-viruses during oseltamivir use are important, especially among immunosuppressed patients. Ongoing surveillance to identify community transmission of resistant viruses is critical.

KEYWORDS: antiviral resistance, oseltamivir resistance, 2009 influenza A (H1N1), pandemic influenza, immunosuppressed

POSTERS 17

Outbreak of Salmonellosis Associated with Pulled Pork — Memphis, 2009

AUTHORS: ***Rendi Murphree, J. Dunn, A. Otuka, O. Sawyer, W. Schaffner, T. Jones***

BACKGROUND: *Salmonella* is a leading cause of bacterial foodborne illness, causing approximately 1.4 million cases annually. The Tennessee Department of Health was notified of two family members hospitalized with salmonellosis, leading to rhabdomyolysis and renal failure after eating at Restaurant A on July 10 and gastroenteritis among attendees of a family reunion catered by Restaurant A the same day. We investigated to identify risk factors for illness and strategies to interrupt transmission.

METHODS: We conducted a cohort study among reunion attendees and an environmental health assessment of Restaurant A. Attendees were identified by the reunion coordinator, host

hotel, and other attendees. A case was defined as diarrhea lasting ≥2 days or vomiting during July 10–July 15, or culture-confirmed salmonellosis in a person eating at the reunion.

RESULTS: Respondents (n = 87) lived in 12 states. Of these, 45 (52%) met the case definition; 96% reported diarrhea; 47% reported vomiting. Median incubation time was 27 hours (range: 0.5–118 hours); median duration of diarrhea was 4 days (range: 1–10 days). Twenty-six patients (58%) sought medical treatment; four (9%) were hospitalized. Pulled pork was consumed by 42 patients (93%) and was the only food item statistically associated with illness (risk ratio: 2.32; 95% confidence interval, 1.59–3.37). *Salmonella* Heidelberg was isolated from five patient specimens; the molecular subtype matched isolates from a 2007 outbreak associated with Restaurant A. Samples from food, surfaces, and restaurant employees tested negative for *Salmonella*; implicated pork was unavailable for testing.

CONCLUSIONS: We identified an outbreak of salmonellosis associated with consumption of pulled pork. Restaurant closure, employee education, and 6 months of increased monitoring were implemented to prevent additional illness.

KEYWORDS: *Salmonella*, meat, restaurants

POSTER 18

Referral and Treatment of Persons with a New Diagnosis of Chronic Hepatitis B Virus Infection — Pinellas County, Florida, 2007–2008

AUTHORS: ***Roxanne E. Williams, J. Groeger, M. Denniston, D. Cui, M. Klevens***

BACKGROUND: Chronic hepatitis B virus (HBV) infection affects 1.25 million U.S. residents and causes 2,000–4,000 deaths annually. Although HBV-related morbidity and mortality can be mitigated by new therapies, little is known about referral and treatment after diagnosis. We examined referral and treatment of persons reported as having chronic HBV infection.

METHODS: Through an enhanced surveillance program in Pinellas County, health department personnel collected data on persons reported during 2007–2008 as having received a diagnosis of chronic HBV infection. Percentages referred to care and receiving treatment were determined (chi-square probability significant at the .05 level).

RESULTS: Of 233 persons with chronic HBV infection, 157 had data on referral information available, 96 (61.2%) of whom were referred to care; 153 had data on treatment available, 20 (13.1%) of whom received treatment. Forty-two of 94 persons with an identified clinician were referred by primary care clinicians; 14 received treatment, mainly by gastroenterologists (8).

Percentages referred were similar for males and females (61.3% vs. 60.6%) and those aged <40 years and >40 years (60.3% vs. 61.4%). However, treatment was more common for males than females (14.0% vs. 8.1%; P=.004), and for those >40 years than for those <40 years of age (16.5% vs. 9.5%; P=.09). Of 133 persons with insurance and referral data, similar percentages of uninsured (68.9%) and insured (60.2%) persons were referred (P=.33). Of 135 persons with

insurance and treatment data, a much smaller percentage of uninsured received treatment (2.1% vs. 20.5%; P=.004).

CONCLUSIONS: Fewer than two-thirds of HBV-infected persons were referred for treatment, and few received treatment. Barriers to linking newly diagnosed persons to care and receiving treatment need to be identified and addressed.

KEYWORDS: chronic hepatitis B, referral and consultation/standards, health services accessibility, quality of health care, primary health care, humans

POSTER 19

Outbreak of *Mycobacterium goodii* Surgical Site Infections — Midwest Region, 2007–2009

AUTHORS: ***Parvathy Pillai, M. Williams, H. O'Connell, B. Brown-Elliott, S. McNulty, M. McGlasson, L. Mann, R. Vasireddy, R. Wallace Jr., B. Buss***

BACKGROUND: *Mycobacterium* goodii is a recently identified cause of surgical-site infections (SSIs) but is rarely implicated in outbreaks. In July 2009, a Midwestern state health department was notified of seven *M. goodii* SSIs occurring at one healthcare facility (HCF X) with no previous *M. goodii* SSIs. We investigated to identify the outbreak source.

METHODS: A case was defined as an *M. goodii* SSI occurring in a person within 16 weeks of surgery performed at HCF X during the investigation period (11/01/2007–08/20/2009). Chart review, HCF X staff interviews, and environmental and body-surface cultures were performed. Recovered *M. goodii* isolates underwent pulsed-field gel electrophoresis (PFGE) typing.

RESULTS: The seven *M. goodii* SSI isolates demonstrated indistinguishable PFGE types. Surgeries occurred during November 2007–April 2009. Five cases (71%) involved surgical implants, each involving a different device. No suture materials, surgical packs, water sources, or ventilation sources were common among all cases. Two procedures (29%) occurred in the same surgical suite; five occurred in different surgical suites across four separate surgical theaters. Of 44 healthcare workers (HCWs), only one (HCW A) was present for a portion of all cases' procedures. HCW A, an anesthesiologist, reported no changes in professional or personal habits preceding the outbreak. During the investigation period, HCW A was present for 2,215 surgeries (*M. goodii* SSI attack rate: 0.32%). Body-surface cultures from HCW A and water-source cultures from HCW A's residence were negative for *M. goodii*.

CONCLUSIONS: We report the largest known *M. goodii* outbreak, demonstrating this organism's potential to cause outbreaks. The only commonality identified among cases was an anesthesiologist. No clear mechanism of transmission was identified. Ongoing surveillance at HCF X is warranted.

KEYWORDS: mycobacterium, atypical, surgical wound infection, outbreaks

POSTER 20

Outbreak of *Pseudomonas aeruginosa* Surgical Site Infections Following Arthroscopy — Texas, 2009

AUTHORS: ***Pritish K. Tosh, J. Duffy, G. Heseltine, M. Disbot, M. Boom, A. Srinivasan, C. Gould, S. Berrios-Torres***

BACKGROUND: Arthroscopy is a common, minimally invasive surgical procedure (>600,000 performed annually in the United States). Seven post-arthroscopy organ/space surgical site infections (SSIs) caused by *Pseudomonas aeruginosa* of indistinguishable pulsed field gel electrophoresis (PFGE) patterns occurred at Hospital X between April 22, 2009 and May 7, 2009.

METHODS: Laboratory records were reviewed for case finding. A case-control study was conducted. A case was defined as a patient who underwent knee or shoulder arthroscopy at Hospital X during the outbreak period and subsequently developed organ/space SSI with *P. aeruginosa*. Environmental and surgical equipment cultures were performed, and select isolates underwent PFGE testing. Surgical instrument reprocessing practices were reviewed, and surgical instrument lumens were inspected with a video scope post-reprocessing to assess cleanliness.

RESULTS: The case-control study did not identify any significant risk factors. *P. aeruginosa* grew from 62 of 388 environmental samples. One isolate from the gross decontamination sink had a PFGE pattern indistinguishable from the case-patient isolates. Review of instrument reprocessing practices revealed that some arthroscopic equipment was not being reprocessed according to the manufacturer's instructions. Inspection of reprocessed arthroscopic inflow/outflow cannulae revealed retained tissue. Arthroscopic shaver handpieces were processed according to the manufacturer's instructions but also had retained tissue in their suction cannulae. No further cases occurred after changes in instrument reprocessing protocols were implemented.

CONCLUSIONS: These SSIs were most likely related to surgical instrument contamination with *P. aeruginos*a during instrument reprocessing. Retained tissue in inflow/outflow cannulae and/or shaver handpieces could have allowed bacteria to survive sterilization. Tissue remained in shaver handpieces despite adherence to the manufacturer's cleaning instructions. The FDA and manufacturers are developing validated reprocessing protocols for arthroscopic shaver handpieces.

KEYWORDS: arthroscopy, *Pseudomonas*, disease outbreaks, surgical wound infection, equipment contamination

POSTER 21

Oseltamivir-Resistant 2009 Pandemic Influenza A (H1N1) Among Campers Receiving Chemoprophylaxis — North Carolina, 2009

AUTHORS: *Natalie J.M. Dailey, A. Fleischauer, M. Garrison, L. Weldon, L. Wolf, J-M. Maillard, Z. Moore, M. Davies, T. Sheu, V. Deyde, L. Gubareva, A. Fry*

BACKGROUND: Widespread oseltamivir resistance is of international concern, because it is one of only two antiviral medications for treatment of 2009 pandemic influenza A (H1N1) [2009 H1N1]. Of all 2009 H1N1 viruses tested, >99% have been oseltamivir-susceptible. Oseltamivir-resistant 2009 H1N1 virus infection was confirmed in two cabin mates who were part of a campwide chemoprophylaxis program during an outbreak of 2009 H1N1 in North Carolina (NC). We investigated to determine if transmission of oseltamivir-resistant 2009 H1N1 had occurred.

METHODS: We reviewed camp records and interviewed the cabin mates regarding symptom onset and antiviral medication use. Neuraminidase (NA) gene pyrosequencing was used to detect the oseltamivir resistance mutation, H275Y, and sequencing was used to detect other 2009 H1N1 mutations in nasopharyngeal specimens from the two campers. Pyrosequencing was performed on routine NC surveillance specimens.

RESULTS: Both previously healthy female cabin mates, aged 14 years, had received oseltamivir chemoprophylaxis before symptom onset which occurred on July 8 for one and 11 for the other. The H275Y mutation and I223V, a second NA mutation not previously described in 2009 H1N1 viruses, were detected in specimens from both campers. After detection, a novel pyrosequencing assay was developed to test for I223V. Neither NA mutation was detected in 59 statewide surveillance specimens collected from June 29–August 14, 2009.

CONCLUSIONS: The close proximity of the cabin mates, the interval between illness onset, and the presence of identical NA mutations strongly supports person-to-person transmission of oseltamivir-resistant 2009 H1N1 virus. No evidence of transmission beyond the camp was identified. The emergence and transmission of oseltamivir-resistant 2009 H1N1 viruses highlights the importance of avoiding use of chemoprophylaxis in otherwise healthy individuals in the community.

KEYWORDS: antiviral drug resistance, pandemic influenza A (H1N1) virus, H1N1 subtype, oseltamivir, chemoprevention

POSTER 22

Hantavirus Pulmonary Syndrome in Five Pediatric Patients — Arizona, Colorado, Washington, and California, 2009

AUTHORS: *Barbara Knust, A. MacNeil, P. Rollin, J. Mills, C. Levy, E. Lawaczek, W. Ray, N. Marsden-Haug, C. Fritz, C. Watson*

BACKGROUND: Hantavirus pulmonary syndrome (HPS) is a reportable infectious disease with high case fatality. Typically, 20-40 cases occur annually in the United States. Pediatric cases are uncommon, contributing fewer than 7% of HPS cases overall. Cases under the age of 10 are exceptionally rare. During the summer of 2009, five children were diagnosed with HPS from May to November in Arizona, California, Colorado, and Washington. We examine these unusual occurrences of HPS to highlight clinical findings and likely means of transmission.

METHODS: Medical records and environmental assessments were reviewed for the pediatric cases of HPS reported to the CDC. Patient history, clinical findings, and disease outcomes were compiled.

RESULTS: Three of five children were under 10 years of age. All patients had illness for 2-6 days preceding onset of acute respiratory symptoms. Thrombocytopenia, elevated WBC count, and radiographs with pulmonary infiltrates were observed in all patients, while elevated hematocrit was seen in three children. One case was fatal, and three surviving patients required mechanical ventilation during hospitalization. All five patients had a history of rodents in the home.

CONCLUSIONS: HPS should be considered in children presenting with unexplained acute respiratory distress, especially if recent rodent exposure is noted. Children with HPS have severe disease, and may require intensive supportive care. Preventive measures for hantavirus infection include rodent control in housing and play areas, and children should be advised to avoid contact with rodents. Educational efforts aimed at parents and children, including how to recognize the signs of rodent infestation and take proper precautions and prevent reinfestation are recommended.

KEYWORDS: hantavirus pulmonary syndrome, Sin Nombre virus, respiratory distress, pediatrics

POSTER 23

What Happens in Vegas Doesn't Always Stay in Vegas! A Persistent Outbreak of Travel-Associated Legionnaires' Disease — Nevada, 2001–2008

AUTHORS: *Benjamin J. Silk, N. Kozak, M. Bergtholdt, E. Brown, M. Tha, J. Hulbert, M. Moore, B. Fields, L. Hicks*

BACKGROUND: Legionnaires' disease (LD) is a serious form of pneumonia caused by inhaling water aerosols containing *Legionella*. In the United States, ~25% of LD is travel-associated. In September 2008, two LD cases were reported among guests of a hotel facility in Las

Vegas, Nevada where an LD outbreak occurred in 2001. The Southern Nevada Health District and CDC investigated to identify the source and interrupt transmission.

METHODS: LD cases were defined by laboratory detection of *Legionella* (confirmed) or radiographic diagnosis of pneumonia (probable) among travelers who stayed overnight at the facility during their incubation period. We identified cases by notifying guests (since August 1, 2008) and by querying CDC's travel-associated LD surveillance database (2001–present). We reviewed sampling records and collected 70 samples from the potable water system, swimming pools, whirlpool spa, decorative fountain, and cooling towers. *L. pneumophila* isolates were compared using DNA sequence-based typing.

RESULTS: Five confirmed and 2 probable cases were identified in 2008; overall, 16 confirmed and 19 probable cases occurred (2001–2008). Among the 35 cases, the median duration of stay was 7 days and two known risk factors for LD were common: older age (median=69 years) and smoking (75%). No cases were fatal. In 2008, *Legionella* was isolated from 15 (68%) of 22 samples collected from four guest rooms; six of these isolates were indistinguishable from a clinical isolate (2001) and historical environmental isolates (2001–2002) collected from water heaters and guest rooms at the facility.

CONCLUSIONS: Long-term colonization of a potable water system led to recurrent LD transmission among facility guests. Health officials should recognize the importance of ensuring permanent *Legionella* eradication in hotels where outbreaks have occurred.

KEYWORDS: *Legionella*, pneumonia, persistence, travel

POSTER 24

What's Hiding Within the Pandemic — Analysis of Non-2009 Pandemic Influenza A (H1N1) Fatal Cases — United States, 2009

AUTHORS: ***Dianna M. Blau, A. Denison, C. Drew, C. Paddock, W-J. Shieh, S. Zaki and IDPB Influenza Working Group***

BACKGROUND: Despite many advances in medicine, infectious diseases represent the second most common cause of death worldwide. Evaluation of autopsy specimens often provides an etiologic diagnosis of an infection that was otherwise undiagnosed. During the current pandemic, tissue specimens from undiagnosed fatal respiratory illnesses were submitted for pathologic evaluation and testing.

METHODS: Autopsy specimens were submitted to the Infectious Diseases Pathology Branch (IDPB) for evaluation of suspected influenza infection from April 29–December 1, 2009. Case-patients included in this series, had no confirmatory results or prior influenza testing done and had tissues tested negative for 2009 pandemic influenza A (H1N1) by rRT-PCR in IDPB. Demographic and clinical data were collected if available. Evaluation of tissues for infectious etiologies included examination of the histopathology, special histochemical stains, and molecular and immunohistochemical assays.

RESULTS: Tissues from 322 case-patients were submitted for evaluation of suspected 2009 H1N1 infection and 160 (50%) were found to be negative. Of these, 87 (54%) were male and the median age was 30 years, range of 8 days to 81years. The median duration from illness onset to death was 5 days, range of 1 to 45 days. Of the case-patients with available medical records, 80 (80%) of 100 had at least one underlying condition. An etiologic diagnosis was made in 26% (41/160) of these case-patients, including bacterial (20), viral (19) and fungal (2) infections, most were of public health importance.

CONCLUSIONS: Evaluation of autopsy tissues from patients with a suspect infectious process can provide an etiologic diagnosis that was not available from routine clinical testing. The clinical diagnosis of some infectious diseases, including notifiable conditions, may go undetected during the current influenza pandemic.

KEYWORDS: autopsy, fatal, pathology, infectious diseases, respiratory

POSTER 25

Respiratory Tract Hemorrhage Associated with 2009 Pandemic Influenza A (H1N1) Infection — United States, 2009

AUTHORS: *Erin D. Kennedy, M. Roy, J. Norris, D. Blau, V. Urdaneta, K. Waller, V. Dato, J. Lando, Y. Lo, S. Coffin, W. Shieh, S. Zaki, A. Cohen, S. Ostroff, A. Fry, L. Finelli, M. Jhung*

BACKGROUND: Lower respiratory tract hemorrhage (LRTH) is rarely seen in association with seasonal influenza infections but can be a complication of severe or fatal illness. CDC received several reports of LRTH associated with 2009 H1N1, and intraalveolar hemorrhage has been identified in tissue of multiple patients with fatal 2009 H1N1 infection. To help define its epidemiology and clinical features, we describe the first 2009 H1N1-associated LRTH case-patients identified during an investigation in Pennsylvania.

METHODS: We defined cases as patients with clinical, laboratory, or radiographic evidence of LRTH and laboratory confirmed influenza A infection and beginning October 2009 asked all state health departments to report cases to CDC. We abstracted data, including, patient demographics, medical history, and clinical course, from patient medical records.

RESULTS: Median age of case-patients (n=9) was 24 years (range: 4–57 years), and six (67%) were male. LRTH began a median of five days (range: 0–12 days) following onset of influenza symptoms. All patients received oseltamivir treatment, initiated a median of three days (range: 1–9 days) following influenza symptom onset. Seven patients (78%) had no underlying medical conditions. All patients experienced respiratory failure: three (33%) required invasive mechanical ventilation and six (67%) required extracorporeal membrane oxygenation. All patients developed acute respiratory distress syndrome. Eight (89%) patients died due to their influenza infection. Median duration between illness onset and respiratory failure was three days (range: 0–9 days).

CONCLUSIONS: LRTH is a life-threatening complication of 2009 H1N1 influenza infection that can occur in otherwise healthy, young individuals. Clinical decline can be abrupt. Further study is needed to describe risk factors for 2009 H1N1-associated LRTH and identify appropriate prevention and treatment strategies.

KEYWORDS: influenza, hemorrhage, fatal outcome, acute respiratory distress syndrome, H1N1 virus

POSTER 26

First Documented Multistate Outbreak of *Salmonella* Carrau Infections — United States, 2009

AUTHORS: ***Carrie F. Nielsen, A. Langer, J. Pringle, R. Heffernan, R. Klos, T. Monson, M. Rauch, J. Ball, M. Hoekstra, J. Archer, M. Sotir, J. Davis***

BACKGROUND: *Salmonella* enterica serotype Carrau is a rarely isolated serotype; during 1968–2008, only 235 human *S*. carrau isolates were reported in the United States. In March, the Wisconsin Division of Public Health (WDPH) received reports of multiple *S*. carrau infections among Wisconsin residents; cases in other states were also reported. WDPH, CDC, and other partners investigated this suspected foodborne outbreak.

METHODS: We conducted a multistate matched case-control study; random digit-dialing was used to recruit age-, geographic-, and sex-matched control subjects. A case was defined as S. carrau infection isolated from any body site that was indistinguishable from PulseNet strain JRGX01.0019 by pulsed-field gel electrophoresis in a U.S. resident during February 1–May 1. Tracebacks of suspected food vehicles were conducted by public health and regulatory agencies.

RESULTS: Fifty-two cases from 18 states were identified; 84% occurred among females, and ages ranged from 11 months to 93 years (median: 51 years). Four patients were hospitalized and one died. Approximately 2,000 calls were required to recruit 45 control subjects (52 calls/match); only 14 met the inclusion criteria. Consumption of melon (cantaloupe, honeydew, or watermelon) alone or in fruit salad was reported by 74% (14/19) of case-patients versus 13% (6/45) of control subjects (matched odds ratio: 8.0; P= .03). A single source or type of melon was not identified.

CONCLUSIONS: This is the first documented outbreak of *S*. carrau infections. Conduct of the matched case-control study required numerous calls per control subject. Although melon consumption was significantly associated with illness, neither the epidemiologic study nor traceback was able to distinguish the specific melon type responsible for the illnesses; new strategies for solving such outbreaks are needed.

KEYWORDS: *Salmonella*, salmonellosis, foodborne illness, multistate disease outbreak

POSTER 27

Viral Shedding Duration of Pandemic Influenza A (H1N1) Virus During an Elementary School Outbreak — Pennsylvania, May–June 2009

AUTHORS: *Achuyt Bhattarai, J. Villanueva, R. Palekar, R. Fagan, W. Sessions, J. Winter, L. Berman, R. Archer, T. Marchbanks, R. Leap, B. Nygren, M. Moll, X. Xu, A. Fry, A. Fiore, S. Ostroff, D. Swerdlow*

BACKGROUND: Shedding duration of pandemic H1N1 influenza A (pH1N1) virus was unknown but will be important when developing guidance for when ill patients may return to school or work. We evaluated shedding duration after fever onset among elementary school students and their household contacts during pH1N1 virus outbreak in Pennsylvania during May–June, 2009.

METHODS: Elementary school students or household contacts with influenza-like illness (ILI) onset within 7 days of interview were eligible for inclusion. Nasopharyngeal specimens were collected every 48 hours until two consecutive non-positive tests. Specimens were tested by real-time reverse transcriptase polymerase chain reaction (rRT-PCR) for presence of virus genome and viral culture for presence of viable pH1N1 virus.

RESULTS: Twenty-six persons positive by rRT-PCR for pH1N1 virus were included in the analysis. The median duration of positive rRT-PCR was 6 days (range 1-13) after fever onset. The pH1N1 virus was isolated by cell culture from 19 (73%) of 26 rRT-PCR positive persons. The median duration of culture-positivity was 5 days (range 1-7). Twelve (46%) of twenty-six persons in the study continued to shed viable pH1N1 viruses for a median of 2 days (range 0-5) following fever resolution.

CONCLUSIONS: pH1N1 virus was detected by rRT-PCR from patients up to 13 days after onset of fever and viable viruses were detected by virus culture for up to 7 days after fever onset, including those cases after fever resolution. Data obtained from this study provides critical information for public health officials in determining influenza control measures. Future studies should be undertaken to determine the relationship between virus detection and transmissibility in order to inform exclusionary criteria for persons following ILI.

KEYWORDS: H1N1, shedding, influenza, transmission, outbreak

POSTER 28

Viral Shedding of 2009 Pandemic Influenza A (H1N1) Virus Among Healthcare Workers and Implications for Exclusion from Patient Care — Seattle, Washington, 2009

AUTHORS: *Meagan K. Kay, D. Zerr, J. Englund, T. Kwan-Gett, J. Duchin*

BACKGROUND: Because infected healthcare workers (HCWs) can spread disease to patients, CDC recommends that infected HCWs not work until 24 hours after defervescence without using fever-reducing medicines. An outbreak of respiratory infection caused by 2009 pandemic influenza A (H1N1) virus (pH1N1) occurred among medical residents attending a

residency retreat in Seattle, Washington during September 21–25, 2009. We examined the association between viral shedding and presence of fever to inform infection control practitioners in healthcare settings.

METHOD: On September 27, residents who attended the retreat and experienced respiratory symptoms during or following the retreat provided nasal swabs for pH1N1 testing by real-time reverse transcription polymerase chain reaction (rRT-PCR). On September 30, residents with positive test results were requested to record temperature measurements and symptoms daily since the time of symptom onset. Six times during the subsequent 2 weeks, residents provided nasal wash specimens which were tested by both rRT-PCR and culture to assess viral shedding.

RESULTS: Of 32 residents at the retreat, 19 (59%) experienced respiratory symptoms; 17 tested positive for pH1N1 (attack rate, 17/32=53%). Seven (41%) infected residents measured a fever >100.5°F while symptomatic; 5 (29%) others had subjective fever. Eleven of 12 residents with measured or subjective fever provided serial nasal wash specimens; 8 (73%) tested positive by rRT-PCR and 6 (55%) also tested positive by culture >24 hours after defervescence.

CONCLUSIONS: HCWs with influenza infection might test positive by culture or rRT-PCR longer than 24 hours after defervescence. Until more is known about the association of viral detection by rRT-PCR or culture and infectiousness, HCWs should follow CDC guidelines for precautions, such as hand hygiene and respiratory etiquette, when returning to work.

KEYWORDS: influenza, virus shedding, polymerase chain reaction, healthcare worker

POSTER 29

Distribution of Laboratory-Confirmed 2009 Pandemic Influenza A (H1N1) Cases Among Healthcare Workers — Wisconsin, April–July 2009

AUTHORS: *Jevon D. McFadden, E. Suarthana, A. Laney, E. Storey, K. Kreiss, H. Anderson*

BACKGROUND: Healthcare workers (HCWs) are at high risk for exposure to 2009 pandemic influenza A (H1N1) [pH1N1]. Because occupational data is often inconsistently collected and evaluated through public health surveillance systems, knowledge remains limited regarding the role of occupation and work environment in influenza illness. Wisconsin incorporated active follow-up of cases among HCWs into pH1N1 surveillance efforts, affording a unique opportunity to describe the distribution of illness by healthcare professional category and setting.

METHODS: We queried the Wisconsin Electronic Disease Surveillance System for patients aged ≥16 years with confirmed pH1N1 during April–July 2009. We applied the Standard Occupational Classification system to patients identifiable as HCWs for placement into one of three categories: professionals, paraprofessionals, or other HCWs (e.g., housekeeping). We characterized HCWs by work setting: ambulatory healthcare settings, hospitals, and nursing/residential care facilities.

RESULTS: Work status information was available for 744 (38%) of 1,941 laboratory-confirmed pH1N1 cases. Of 489 employed patients, 156 (32%) worked in the healthcare sector. Among these, 110 (71%) were further characterized by professional category: 54%, health paraprofessionals; 34%, health professionals; and 13%, other HCWs. Information on workplace settings was available for 93 (60%) HCWs: 27%, ambulatory healthcare; 46%, hospitals; and 27%, nursing/residential care.

CONCLUSIONS: HCWs in all healthcare settings were represented among pH1N1 cases; the case-ratio of health paraprofessionals to professionals mirrors the ratio of these categories in state and national workforces. Because of the large proportion of missing occupational data, we cannot assess which HCW categories or settings are at greatest risk for pH1N1 infection. Improvements in state-based surveillance of influenza illness are needed to better understand the role of occupation and work environment to create effective prevention strategies.

KEYWORDS: healthcare worker, healthcare setting, 2009 pandemic influenza A (H1N1), Wisconsin

POSTER 30

Blood and Blood Product Donor Fatalities Reported to the Food and Drug Administration — United States, 1984–2008

AUTHORS: *Sanjaya Dhakal, L. Holness, S. Cannon, R. Wise*

BACKGROUND: Public confidence in blood donation safety is essential for this crucial biological product supply but could be jeopardized by reported donor deaths. Methods to assure safety of blood and blood components and their collection include reporting to the Food and Drug Administration (FDA) when a donor dies (21 CFR 606.170(b) and 640.73). Recent increases in plasmapheresis death reports prompted this study.

METHODS: Regulations require reports "When a complication of blood collection/transfusion is confirmed to be fatal ..." and "If a donor has a fatal reaction which, in any way, may be associated with plasmapheresis ...." We reviewed fatality reports (1984–2008), autopsy, and donor screening data to characterize deceased donors through descriptive statistics, to examine reporting system limitations, and to identify potential improvements.

RESULTS: FDA received 112 reports of donor deaths (mean age 47 years, 69% male, 58% Caucasian, average BMI 29.8 kg/m2, 83% repeat donors, and 56.3% plasma donors). Reporters learned of deaths from various sources, including donors' spouses, obituaries, hospitals, and friends. One death was due to donation: an acute hemolytic transfusion reaction after erroneous receipt of another donor's red cells in 1987, prior to current closed circuit plasmapheresis technology. Follow-up discussion with a firm reporting large numbers of plasmapheresis donor deaths verified that increased reports stemmed from variable interpretations of submission requirements; numbers subsequently fell sharply.

CONCLUSIONS: Reported deaths after donations are extremely rare and with one exception in this series could not be attributed to the donation itself. To reduce ambiguity in the surveillance case definition, revisions could specify reporting of deaths within a specific interval after donations, along with procedures to more consistently learn of deaths.

KEYWORDS: blood donors, donor selection, public health surveillance, plasmapheresis

POSTER 31

Typhoid Fever with Neurologic Findings — Malawi-Mozambique Border, 2009

AUTHORS: ***Emily C. Lutterloh, A. Likaka, J. Sejvar, J. Naiene, E. Mintz, R. Manda, M. Humphrys, A. Phiri, R. Lungu, J. Kaphiyo, D. Talkington, K. Joyce, L. Stockman, B. Nygren, K. Schilling, B. Tippett Barr, A. Demby, L. Capewell, S. Lowther, D. Townes, K. Date, Y. Redwood, J. Schier, G. Armstrong, S. Monroe***

BACKGROUND: *Salmonella enterica* serovar Typhi is the agent of typhoid fever, which often presents with fever and abdominal pain and is transmitted by the fecal-oral route. Annually, an estimated 16 million cases and 600,000 deaths occur worldwide. We investigated an outbreak of unexplained febrile illnesses with neurologic findings, determined to be typhoid fever, in villages along the Malawi-Mozambique border.

METHODS: Ill persons were identified through Malawi Ministry of Health surveillance. We gathered demographic and clinical information on ill persons for March–November by interview, examination, and chart review. Suspect patients had fever and at least one complaint from a list of findings; probable patients had fever and a positive rapid IgM antibody test for typhoid (TUBEX® TF); confirmed patients had fever and *Salmonella* serovar Typhi isolated from blood or stool. Isolates underwent antibiotic susceptibility testing.

RESULTS: We identified 229 suspect, 35 probable, and 37 confirmed cases from 18 villages. Median age was 21 years (range: 1–81 years); 56% were female. Forty-two patients had neurologic signs including ataxia, hyperreflexia, and clonus. Of these 42 patients, 13 (87%) of 15 had positive rapid typhoid tests, and four (67%) of six blood cultures yielded *Salmonella* serovar Typhi. Antibiotic susceptibility testing of 21 isolates from the 37 confirmed cases demonstrated that all 21 were resistant to chloramphenicol, ampicillin, and trimethoprim-sulfamethoxazole; three were also resistant to nalidixic acid.

CONCLUSIONS: The unusual neurologic manifestations of certain patients in this typhoid outbreak initially posed a diagnostic challenge. Rapid typhoid antibody testing in the field helped support the diagnosis. Culture confirmation with antibiotic susceptibility testing is important to guide treatment. Recommended control measures include improvements in water quality, sanitation, and hygiene.

KEYWORDS: typhoid fever, serologic tests, neurologic manifestations, antibacterial drug resistance

WEDNESDAY, APRIL 21

SESSION J: Dirty Jobs

Occupational Health ..... Ravinia Ballroom, 1:30–3:35 p.m.

MODERATOR: *Christine Branche*

1:35

Influenza Vaccination Among Nursing Assistants Working in U.S. Nursing Homes

AUTHORS: *Matthew Groenwold, S. Baron*

BACKGROUND: Current estimates place seasonal influenza vaccination coverage among all US health care personnel at 44.4%, well below the Healthy People 2010 goal of 60%. Nursing assistants, in particular, work in close contact with those at the highest risk of severe illness or death from influenza. To estimate vaccination coverage and identify demographic and occupational correlates of vaccination status among nursing assistants, we analyzed nationally representative, cross-sectional data from the 2004 National Nursing Assistant Survey.

METHODS: We analyzed data from 2,873 nursing assistants and calculated population-weighted point estimates of vaccination coverage and their design-adjusted 95% confidence intervals by selected demographic and occupational characteristics. Poisson regression was used to calculate multivariable-adjusted vaccination coverage (prevalence) ratios (ACRs) and their design-adjusted 95% confidence intervals.

RESULTS: Overall, influenza vaccination coverage among nursing assistants was 37.1%. Nursing assistants age 45 and over were significantly more likely to be vaccinated than those age 16–44 (ACR=1.23, 95% CI=1.07–1.41). Non-Hispanic blacks were significantly less likely to be vaccinated than non-Hispanic whites (ACR=0.82, 95% CI=0.70–0.97). Self-perceived lack of respect for their work (ACR=0.85, 95% CI=0.71–1.00), working at a for-profit facility (ACR=0.83, 95% CI=0.72–0.95) and being offered fewer than the sample median number of nonwage job benefits (ACR=0.77, 95% CI=0.67–0.90) were all negatively associated with vaccination status.

CONCLUSIONS: Vaccination coverage among nursing assistants was lower than among health care personnel generally. Our findings that institutional characteristics that may be reflective of nursing assistants' working conditions, as well as individual characteristics, were associated with vaccination status suggest that employer-level interventions to increase vaccination coverage among nursing assistants should be considered as potentially important adjuncts to individual and community-level interventions.

KEYWORDS: nursing assistants, influenza vaccination, working conditions

1:55
Investigation of Mantle Cell Lymphoma Cluster — Virginia, 2009

AUTHORS: *Thomas John Bender; C. Woolard, M. Williams, K. Gateley, C. Halbert*

BACKGROUND: Mantle cell lymphoma (MCL), a cancer with unknown etiology, constitutes 6% of non-Hodgkin lymphoma (NHL) cases, and 3,500 new MCL cases occur in the United States annually. U.S. incidence increased by 6% and mortality by 8% during 1992–2004. In June 2009, the Virginia Department of Health (VDH) was notified of a potential cluster of MCL among at least four current or former employees of a uranium-processing company. Ionizing radiation is known to cause leukemia but not lymphoma. Because of shared employment, rarity of the condition, and temporal and geographic clustering, VDH investigated to identify affected patients and common exposures of concern.

METHODS: VDH coordinated with local oncologists to identify residents of the Central Virginia Health District who had received a pathologically-confirmed diagnosis of MCL during 2004-2009. The Virginia Cancer Registry (VCR) was subsequently reviewed. Detailed interviews using a standard template were conducted in-person for Virginia residents or by telephone and e-mail for nonresidents.

RESULTS: Five patients diagnosed with MCL were identified by local oncologists with no additional patients identified by VCR. During 1997–2008, there were 415 cases reported to VCR statewide, too few to provide reliable expected numbers of cases by health district. All five patients were white males, aged 58–66 years at time of diagnosis, who worked in office settings in different buildings. One patient's diagnosis date occurred during the only 2 years he had lived in Virginia. All patients reported minimal exposure to chemicals, ionizing radiation, other known carcinogens, or suspected causes of lymphoma.

CONCLUSIONS: Despite patients' similar employment histories, common exposures of concern were not identified during detailed interviews. Clusters of rare cancers may defy causal explanation.

KEYWORDS: lymphoma, mantle cell; neoplasms, epidemiology; cluster analysis; occupational exposure, adverse effects; uranium

2:15
Silicosis Mortality with Respiratory Tuberculosis — United States, 1979–2006

AUTHORS: *Muazzam Nasrullah, J. Mazurek, J. Wood, K. Bang, K. Kreiss*

BACKGROUND: Silicosis is a preventable occupational lung disease and a known risk for tuberculosis (TB). Tuberculin-positive persons with silicosis have a 30 times higher risk of developing active TB as compared to a control population without regard to tuberculin test status.

METHODS: For surveillance of silicosis- TB deaths, we used the 1979–2006 National Center for Health Statistics mortality data for decedents aged ≥25 years. We calculated proportion-

ate mortality ratios (PMRs) using available information on the decedents' industry and occupation reported from 26 states for 1985–1999.

RESULTS: Of 7,505 deaths with silicosis, 311 (4.1%) had concurrent TB; 248 (79.9%) were ≥65 years; 306 (98.4%) were males, and 221 (71.1%) were whites. The proportion of silicosis- TB deaths was significantly greater among silicosis decedents aged 25–44 than those aged ≥45 years (8.0% vs. 4.1%; P=0.02) and among blacks than of all other races combined (8.0% vs. 3.5%; P<0.01). Silicosis- TB deaths declined 94.3% (P<0.01 time-related trend) from 21.0 per year during 1979–1983 to 1.2 per year during 2002–2006, with no reported cases in 2006. Ohio (n=35; 11.3%), Pennsylvania (n=33; 10.6%), and Michigan (n=24; 7.7%) accounted for 29.6% of all such deaths. The highest industry-specific and occupation-specific PMRs for silicosis-TB deaths were associated with the miscellaneous nonmetallic mineral and stone products industry (73.7; 95% CI 33.8–139.8) and the crushing and grinding machine operators occupation (142.3; 95% CI 57.2–293.5).

CONCLUSIONS: In the United States, 2006 marked the first year since 1979 with no silicosis- TB deaths. The substantial decline in silicosis-TB comortality likely reflects prevention and control measures for both diseases.

KEYWORDS: silicosis, tuberculosis, occupation, industry, comortality

2:35

What's Work Got To Do With It? Potential Contribution of Occupational Physical Activity Towards Meeting 2008 Recommended Physical Activity Guidelines — United States, 2007

AUTHORS: *Myduc L. Ta, L. Bensley, J. VanEenwyk*

BACKGROUND: Regular physical activity (PA) helps maintain healthy weight and reduces the likelihood of experiencing chronic diseases. National reports of PA are based on nonoccupational PA (non-OPA) yet occupational PA (OPA) counts toward meeting the ≥150 minutes/week of moderate-intensity PA recommended in the 2008 Physical Activity Guidelines for Americans. We examined demographic patterns in PA to determine the potential influence of OPA on meeting these guidelines.

METHODS: Data are from 2007 Behavioral Risk Factor Surveillance System (BRFSS), a state-based random digit-dialed telephone survey of the U.S. civilian, non-institutionalized adult population. Non-OPA was computed as the product of activity frequency and duration. BRFSS does not collect OPA frequency and duration; we considered respondents who did not meet guidelines through non-OPA to potentially meet guidelines if their work involved mostly walking or heavy physical labor. All analyses accounted for the complex sampling design.

RESULTS: Complete non-OPA and OPA data were available for 386,397 respondents from across the United States. Overall, 64.3% (95% confidence interval [CI]=64.0%–64.7%) met guidelines through non-OPA. An additional 6.5% (95%CI=6.3%–6.7%) engaged in work activities requiring mostly walking or heavy labor and could meet guidelines if OPA was considered. The potential increase in meeting guidelines when considering OPA was highest

for Hispanics (10.9%; 95%CI=10.1%–11.8%), males (7.7%; 95%CI=7.4%–8.1%) and non-high school graduates (11.7%; 95%CI=10.7%–12.7%).

CONCLUSIONS: Consideration of occupational activities which require mostly walking or heavy labor potentially increases the proportion of Americans meeting PA recommendations if work activity is at sufficient intensity for ≥10-minute intervals. Collection of OPA time and intensity can help to better quantify OPA contributions to meeting PA recommendations and identify demographic subgroups for programs to improve PA.

KEYWORDS: physical activity, guidelines, public health surveillance, behavioral risk factor surveillance

2:55

Acute Pesticide Illnesses Associated with Off-Target Pesticide Drift from Agricultural Applications — United States, 1998–2006

AUTHORS: *Soo-Jeong Lee, L. Mehler, B. Diebolt-Brown, J. Prado, G. Calvert*

BACKGROUND: Pesticides are widely used in agriculture and off-target drift of agricultural pesticides has raised substantial public concern. Better understanding of drift-related pesticide poisoning incidents is needed to guide regulatory, enforcement, and education efforts. This study estimated the incidence of acute pesticide poisoning from off-target drift from agricultural applications, and identified associated risk factors.

METHODS: Data were obtained from the Sentinel Event Notification System for Occupational Risks-Pesticides Program and the California Department of Pesticide Regulation. Cases were defined as persons who developed acute illness from off-target pesticide drift exposure arising from agricultural applications. Multiple logistic regressions were performed to identify factors contributing to large drift incidents (≥5 cases).

RESULTS: During 1998–2006, 2,945 cases were identified in 11 states. Of these, 47% were exposed at work, 53% were male, 58% were 15– 44 years old, and 92% experienced low severity illness. The incidence rate was highest among agricultural workers (114.3/1,000,000 agricultural workers) compared to 1.6 nonoccupational cases/1,000,000 persons in the general population. Children (<15 years) had the highest incidence (1.9/1,000,000) among nonoccupational cases. The risk for large drift incidents was greatest for soil applications (AOR=14.08, 95% CI 2.12–93.66). Fumigants were used in 91% of soil applications, and were the pesticide class responsible for the largest proportion (45%) of all cases. Common factors associated with drift cases included windy weather, improper measures to prevent fumigant escape, and applicator carelessness.

CONCLUSIONS: The findings support for the need for better training of pesticide applicators, stringent enforcement of existing regulations, and enhanced regulatory efforts to protect the public, especially agricultural workers and children. Special focus should be directed at preventing and minimizing off-target drift from soil fumigations.

KEYWORDS: pesticides, poisoning, surveillance, drift, agriculture

3:15

Outbreak of 2009 Pandemic Influenza A (H1N1) Aboard a U.S. Navy Vessel — San Diego, 2009

AUTHORS: *Christina B. Khaokham, M. Selent, F. Loustalot, S. Mettee, D. Harrrington, E. Hoke, P. Blair, D. Faix, B. Alvarez, N. Almond, K. McMullen, B. Cadwell, T. Uyeki, D. Fishbein, S. Waterman*

BACKGROUND: During June 29–August 3, 2009, a U.S. Navy vessel experienced an outbreak of 2009 pandemic influenza A (H1N1) peaking the first week of July; 124 cases were confirmed by polymerase chain reaction among the 2,319-person crew. Military populations have been reluctant to seek medical care, and we hypothesized that more crew members were ill during the outbreak. We conducted an investigation to estimate attack rates (ARs), characterize illness, and assess risk factors.

METHODS: We retrospectively surveyed a random sample of the crew from the outbreak time period during September–October 2009, and reviewed medical records and infection-control measures. Influenza-like illness (ILI) was defined as cough or sore throat with fever >100°F. Acute respiratory illness (ARI) was defined as cough or sore throat without documented fever. Bivariate analyses were conducted using chi-square tests.

RESULTS: Among 456 enlisted personnel, 25 (5.5%) experienced ILI and 89 (19.5%) ARI, (overall attack rate, 25%). Persons ill with ILI and ARI had a median age of 23 (range, 19–47) years. ARs did not differ significantly by age or sex. Compared with well persons, ill persons reported greater exposure to other ill persons in sleeping, working, meeting, and dining areas (all Chi-square P≤.01). Thirty-seven percent of ill persons (n=114) lost duty time (average: 4 days).

CONCLUSIONS: Despite control measures, ARs among this military population were high. This outbreak demonstrates how easily influenza can spread in a shipboard setting and potential workplace impact. In addition to isolation and empiric antiviral treatment of ill persons, quarantine and antiviral prophylaxis of exposed persons before embarkation into confined working and living settings, might prevent shipboard 2009 H1N1 outbreaks in the absence of vaccine.

KEYWORDS: disease outbreak; influenza, human epidemiology; military personnel; 2009 pandemic influenza A (H1N1) virus, H1N1 subtype classification

WEDNESDAY, APRIL 21

INTERNATIONAL NIGHT

INTERNATIONAL NIGHT
POSTER SESSION ..... Lobby outside Dunwoody Suites, 6:00–7:30 p.m.

INTERNATIONAL POSTER 1

Protective Effect of Hand Washing and Good Hygienic Habits Against Confirmed Influenza, Fujian Province, China, 2009

AUTHORS: *Mingbin Liu, L. Zhang, J. Ou, R. Hong, H. Ma, B. Zhu, R. Fontaine, G. Zeng*

BACKGROUND: Although hand-washing is recommended to prevent influenza, the protective effect of hand washing has not been empirically documented. We conducted a community-based case-control study to estimate the relative importance of community exposures to influenza and the protective effects of hygienic measures.

METHODS: We enrolled 100 laboratory-confirmed seasonal influenza patients from the surveillance system as cases. For controls we recruited 100 persons, individually matched to cases by age, and residence through random digit dialing. We interviewed both persons in each matched pair within one week of case confirmation by telephone about their hand washing and poor hygienic habits (picking nose, touching mouth, rubbing eyes with hand). We created score to represent the relative frequency of hand washing and another to represent the lack of poor hygienic habits. We analyzed these as a dose-response using conditional logistic regression models to estimate the change in odds ratio with improved habits.

RESULTS: Compared with the lowest hand washing level (0-3), odds ratios (ORs) progressively decreased from 0.28 (95% CI: 0.074-1.1) to 0.020 (95% CI: 0.0043-0.11) as hand washing level improved from 4 to >7. Compared with residents with a hygienic habit score of 0-2, ORs decreased from 0.071 (95% CI: 0.0070-0.69) to 0.010 (95% CI: 0.0010-0.092) as hygienic habit scores improved. In a multivariable conditional logistic regression model, hand washing (OR=0.40, 95% CI: 0.23-0.70 per unit of hand washing score), hygienic habits (OR=0.43, 95% CI: 0.27-0.71 per unit of hygienic habit score), having soap or hand sanitizer next to the hand washing basin (OR=0.14, 95% CI: 0.030-0.61), and having received influenza vaccine (OR=0.13, 95% CI: 0.018-0.99) were protective.

CONCLUSIONS: Hand-washing and good hygienic habits are protective against influenza and should be promoted as preventive measures during influenza epidemics.

KEYWORDS: human influenza, hand washing, transmission, matched case-control study, logistic regression

INTERNATIONAL POSTER 2

Dental Caries and Oral Health Knowledge and Practice Among Children in Nairobi West and Mathira West Districts, Kenya

AUTHORS: *Gladwell K. Gathecha, A. Mahokha, P. Wanjala, J. Omolo*

BACKGROUND: Dental caries is a chronic infectious disease that causes demineralization of dental hard tissues. In Kenya approximately 50% of children aged 13-15 year have dental caries. The impact of dental caries includes oral pain which may affect speech, eating, sleeping, swallowing and breathing the altered appearance it causes can lead to low self esteem and undermine social acceptance. A study was undertaken to determine the association between dental caries and oral health knowledge and practice among children in Nairobi West and Mathira West districts.

METHODS: We conducted a cross-sectional study among children aged 12 years attending public primary schools in Nairobi West and Mathira West districts. We used multistage sampling to select the 639 children. An interviewer administered questionnaire was used. Oral screening was performed using WHO recommended methods. Dental caries was measured using the Decayed, Missing, Filled Teeth (DMFT) index.

RESULTS: The prevalence of dental caries in 12 year old children in both Nairobi West and Mathira West was found to be 31.5% and mean DMFT 0.58.The urban region represented by Nairobi West (37.5%) had significantly higher caries prevalence than Mathira West (27%) a rural region (P=0.0003). Drinking sodas three to six times a week (OR 2.8 P=0.0004) was found to be significantly associated with dental caries. Protective factors included having a mother with tertiary or secondary education and having received instructions on how to brush teeth.

CONCLUSIONS: The prevalence of dental caries is higher in the urban area than in the rural area. The school health policy should be used to promote oral health by provision of oral health instructions and educating on harmful dietary practices.

KEYWORDS: dental caries, children, knowledge, practice

INTERNATIONAL POSTER 3

The Danger of Pirated Piped Water Connections: Post-Cyclonic Cholera Outbreak — Sundarban Area of West Bengal, India 2009

AUTHORS: *Rama Bhunia, S. Ghosh*

BACKGROUND: The health authorities of Gosaba block in Sundarban area of West Bengal, India, reported sudden increase in acute watery diarrhoea patients after Aila cyclone. We investigated the outbreak to identify the agent, source and propose control measures.

METHODS: We defined a case as occurrence of acute watery diarrhoea with severe dehydration admitted in health care facilities in a resident of Gosaba block of any age between

3rd week of May 2009 and 4th week of August 2009. We searched for probable cholera patients in health care facilities. We described the outbreak by time, place and person. We conducted a matched case control study to identify the risk factors. We assessed the environment. We collected rectal swabs from case-patients and water specimens from different water sources for laboratory examination.

RESULTS: We identified 1,076 probable case-patients and 14 deaths (attack rate: 44/10,000). *Vibrio cholerae* EL Tor Ogawa was isolated from two of five stool specimens. The outbreak started on 4th week of May 2009 with two peaks on 2nd and 4th week of June and lasted till August 2009. Drinking piped water (Matched odds ratio [MOR]: 16, 95% confidence interval [CI]: 4.9-51, population attributable fraction [PAF]: 58%) and chlorine treated water at household (MOR: 0.06, 95% CI: 0.02-0.20) were associated with the illness. The villagers broke water pipelines near their house for easy access. Piped water specimens and stored drinking water were positive for faecal contamination.

CONCLUSIONS: Contaminated piped water was the probable cause of the cholera outbreak. We recommended repairing of the water pipelines and educating villagers. Repairing the pipelines, educating the villagers regarding danger of pirated connections and chlorination at household controlled the outbreak.

KEYWORDS: cholera, *Vibrio cholerae* El Tor Ogawa, outbreaks, India

INTERNATIONAL POSTER 4

Epidemic of Chilblains in Rural Boarding Schools — Southwestern People's Republic of China, 2009

AUTHORS: ***Bike Zhang, X. Liu, L. Zhang, H. Ma, B. Zhu***

BACKGROUND: Chilblains is a cold-induced inflammatory skin condition that very rarely appears as outbreaks. We investigated an epidemic of chilblains during March 2009 in nine rural boarding schools in Southwestern China to identify risk factors.

METHODS: A chilblains case was defined as onset of erythematous, purplish plaques or nodules on the hands or feet of the students in the rural boarding schools from February 12 to March 5, 2009. We compared meteorological, geographical, and living conditions in the nine schools. In one school, we conducted a case-control study to compare seat location, measures to keep warm, physical activity and other exposures of 93 chilblains case-students to 279 randomly selected, unaffected control-students.

RESULTS: 2.8% of 8770 students had chilblains. 4.1% of 5892 students in schools located in higher altitude, windy areas had chilblains, compared to 0.2% of 2878 students in schools located in lower altitude, protected areas ($P<0.001$). 4.6% of 4356 students in schools with broken windows had chilblains, compared to 0.9% of 4234 students in schools with intact windows ($P<0.01$). In the case-control study, 61% of case-students and 47% of control-students sat near windows (OR=1.8, 95% CI=1.1-2.9). 78% of case-students and 56% of control-students seldom wore gloves (OR=2.8, 95% CI=1.3-4.0). 60% of case-students and 30% of control-students reported >8 hours of daily sedentary position (OR=3.6, CI=2.1-6.0).

CONCLUSIONS: This chilblains epidemic resulted from increased exposure during a prolonged cold and windy weather and poor preparation. Provision of warmer classrooms and student's dormitories, increasing physical activity time and improving student's awareness of cold protection should be implemented.

KEYWORDS: chilblains, epidemics, rural communities, schools

INTERNATIONAL POSTER 5

Investigation and Control of Novel Influenza A H1N1 2009 Outbreak in Two Boarding Schools — Angthong Province, Thailand, August 2009

AUTHORS: *Sanisa Santayakorn , W. Sitthi, V. Wongphruksasoog, S. Al-sihak, N. Prajaksub, B. Ardkam, C. Daraphong, P. Ayood, P. Silaporn, C. Pittayawonganon*

BACKGROUND: In Thailand, the first novel influenza A H1N1 2009 outbreak in school was reported in mid-June 2009 in Bangkok. On August 4, 2009, the local Surveillance and Rapid Response Team notified a cluster of 120 sick students in a boarding school, Angthong Province. An investigation was carried out with objectives to identify risk factors and implement prevention and control measures.

METHODS: Active surveillance was initiated in two boarding schools (A and B) in Angthong. A suspected case was a student/teacher who developed 2 of the following 4 symptoms: fever, cough, rhinorrhea and sore throat between July 27 and August 6, 2009. A confirmed case was a suspected case tested positive pandemic influenza H1N1 2009 virus in nasopharyngeal swabs by RT-PCR technique. A retrospective cohort study was conducted in School A.

RESULTS: Of 1115 students in School A, 382 cases (11 confirmed and 371 suspected) developed symptoms (attack rate 34.3%). The attack rate was 9.2% (32/349) with 2 confirmed cases in School B. No severe and fatal cases were reported. The median ages of cases were 11 years (Range: 6-19 years) and 14 years (Range: 12-19 years) in School A and B, respectively. Dormitory-specific attack rates ranged from 18%-63%. Students in 2 schools lived in the same dormitories. Protective factors for influenza infection included regularly mask use (RR=0.33, 95%CI=0.21-0.50) and using personal water glass (RR=0.72, 95%CI=0.63-0.82).

CONCLUSIONS: Laboratory-confirmed influenza A H1N1 2009 outbreaks occurred in two boarding schools. Influenza transmission between the schools linked to sharing dormitories. Health education including promotion of mask use and no sharing of water glasses, and rapid isolation of new cases contributed to reduced transmissions in both schools.

KEYWORDS: novel influenza A (H1N1), boarding school, dormitory, mask use, Thailand

INTERNATIONAL POSTER 6

Risk Factors for Child Sexual Abuse — Harare, Zimbabwe, 2009

AUTHORS: *Ngoni W. Mashumba; S. Midzi, J. Maradzika, N. Ndlovu*

BACKGROUND: Between 1997 and 2002, family support clinics treating survivors of child sexual abuse (CSA) in Zimbabwe saw approximately 38 cases of CSA a month nationally. Harare clinic alone currently is managing an average of over 100 cases monthly. We evaluated risk factors associated with CSA.

METHODS: A 1:1 case-control study was carried out with 115 cases and 115 controls between 20/06/2009 and 12/08/2009 at Harare Hospital. Cases and controls were frequency matched for age, sex and neighbourhood. A case was any child aged 16 years and below, presenting as a survivor of CSA. A control was any child aged 16 years and below, presenting without a history of CSA.

RESULTS: Nine cases were male; 106 were female. The majority (87.8%) experienced penetrative sexual abuse; 47% of abuse occurred within child's home. Most CSA (71.3%) occurred in high density suburbs. Cases were discovered through someone noticing physical or behavioural changes in the child (57.4%). Risk factors included: single parent caregiver (AOR = 4.89; 95% CI = 1.62 - 14.81), and household size greater than five (AOR = 2.98; 95% CI = 1.46 - 6.03). Attending school (AOR = 0.09; 95% CI = 0.02 - 0.37) was protective. Most (87%) perpetrators were male and ninety-nine (86.1%) were known to child. Among cases, 71.3% had anogenital findings, 11.3% had become pregnant, 6.1% had contracted sexually transmitted infections, 10.4% had genital/physical trauma and 51.3% exhibited behavioural/psychological change. Costs of managing CSA were estimated at US$109 per child.

CONCLUSIONS: Having one parent, large household size and not attending school were significant risk factors. Abuse resulted in behavioural and psychological changes, genital infections and pregnancy. CSA creates significant and preventable burden of cost on the state.

KEYWORDS: child sexual abuse, pregnancy, case, control, Harare

INTERNATIONAL POSTER 7

Desperately Seeking Diarrhea: Outbreak of Hemolytic Uremic Syndrome Caused by Emerging Sorbitol-Fermenting *Escherichia coli* O157 — Germany, 2009

AUTHORS: *Stine Nielsen, A. Fruth, C. Frank, A. Spode, R. Prager, A. Graff , M. Lüttgehetmann , D. Müller-Wiefel , D. Werber*

BACKGROUND: Shiga toxin-producing *E. coli* O157 (STEC O157) primarily causes pediatric diarrheal illness; ~10% of infected individuals develop life-threatening hemolytic uremic syndrome (HUS). A rare sorbitol-fermenting (sf) variant of STEC O157 has emerged in Europe, causing HUS outbreaks with apparently little diarrheal background. On July 23-26, 2009, four young boys residing in a Hamburg suburb developed HUS caused by

sf-STEC O157. Our investigation aimed to stop the outbreak, delineate its extent, and review STEC surveillance.

METHODS: We administered questionnaires and collected stool from household, day-care and playground contacts, sampled the environment, and conducted a case-control study. Cases were defined as residents of the suburb diagnosed with HUS or sf-STEC O157 infection between July 23 - August 25, 2009. Age-matched controls were recruited through day-care centers and community-distributed flyers. Stool and environmental samples were investigated for sf-STEC O157.

RESULTS: We screened 242 persons' stool and identified nine cases: five had HUS, one had only diarrhea, three were asymptomatic. The median age was four years (range 0-13 years) and eight were boys. In the case-control study (four HUS cases, 34 controls), HUS was strongly associated with visiting a specific playground on July 16 (odds ratio=27, 95%CI:2.6-+INF, p-value<0.006); no common meal was identified. All 12 environmental samples tested negative for sf-STEC O157. No increase in community incidence of diarrhea was noticed.

CONCLUSIONS: In this local outbreak, transmission was linked to simultaneous exposure to a playground and was unlikely foodborne. Extensive case finding efforts ascertained just one sf-STEC O157 infected child with diarrhea-only. The reservoir of sf-STEC O157 remains elusive. Only timely HUS surveillance, not in place in most countries, can enable detection and thereby response to similar future outbreaks.

KEYWORDS: Shiga toxin-producing *E. coli* O157, Germany

INTERNATIONAL POSTER 8

Cross-Border Outbreak of Rabies — Upper East Region, Ghana, 2009

AUTHORS: ***Paul N. Polkuu, F. Iddrisah, G. Boateng, V. Burimuah, N.Yebuah, J. Akpabile, T. Anyorikeya, E. Afari, C. Ohuabunwo***

BACKGROUND: Rabies virus causes acute encephalitis and its outcome is usually fatal. It's estimated to cause 55 000 deaths/year worldwide. A suspected outbreak of rabies was reported in Bongo, Upper-East Region (UER), Ghana on November, 10, 2009. We investigated the source and magnitude of the outbreak.

METHODS: Data on exposure history and management of rabies were obtained using a checklist. We interviewed stakeholders in both Ghana and Burkina-Faso, reviewed hospital and veterinary records of reported cases of dog-bites for August - November 2009. A clinical case of rabies was defined as a person presenting with an acute neurological syndrome dominated by forms of hyperactivity or paralytic syndromes progressing towards coma and death within 7-10 days after first symptom, following a history of a bite from a suspected rabid dog in the UER during August - November, 2009. Univariate analyses of outbreak data were expressed as frequencies and percentages.

RESULTS: Dog-human population ratio was 40-106/1000. Of 11 cases of dog bites reported, nine (82%) of the dogs had identifiable owners, but not vaccinated (100%). Nine cases of rabies

with 100% case fatality occurred in three districts. Males aged 20-49 years were the most affected with a peak in October. All case-patients did not receive pre/post-exposure vaccination and had improper wound treatment by herbalist.

CONCLUSIONS: An outbreak of clinically-confirmed rabies with high case fatality occurred in a highly susceptible cross-border population of the UER, Ghana. We recommended free and compulsory vaccination of dogs against rabies, community education on rabies, control of free-roaming dogs and adequate provision of anti-rabies vaccine for high risk communities. As a result, a joint educational campaign and mass vaccination by health and veterinary staff against rabies were initiated.

KEYWORDS: Rabies, outbreak, vaccination, cross-border outbreak, dog bite

INTERNATIONAL POSTER 9

Foodborne Outbreak of Gastrointestinal Disease — Atyrau, Kazakhstan, July 2009

AUTHORS: *Manar A. Kasimzhanova, S. Baymenova, S Ajeilat*

INTRODUCTION: On July 24, 2009, twenty-eight patients were admitted to Atyrau Hospital in Western Kazakhstan with signs of gastrointestinal illness; all worked for a construction company and lived in one of its hostels. We conducted a retrospective cohort study between June 27 and July 1 to identify the disease source and modes of transmission to prevent future outbreaks.

METHODS: All 186 workers residing at the hostel were enrolled in the study. A case-patient was defined as a worker with at least two episodes of vomiting or diarrhea on July 24. The menu for July 22-24 was obtained from the hostel cafeteria. Each worker was interviewed to learn their food consumption history for July 22-24 and their symptoms and signs, if any. Stool and vomitus specimens were collected from case-patients and the skin of cafeteria workers was swabbed for bacteriological study. Logistic regression was used to study the associations between food items and disease.

RESULTS: We identified 30 case-patients; all had disease onset within an 8-hour period in the evening of July 24. The epidemic curve suggested a point source outbreak. In multivariate analysis, the macaroni with meat served on July 24 was strongly associated with illness (OR 53.8, 95% CI=6.7 to 432.2); 29 (94%) of the 30 case-patients reported eating it. Twenty case-patients and three cafeteria workers were positive for *Staphylococcus aureus*. An environmental investigation of the cafeteria revealed that overall sanitation was poor and that proper food handling and storage practices were not always observed.

CONCLUSIONS: The outbreak resulted from the contamination of food that was probably stored improperly before consumption. The cafeteria was closed until sanitation was improved. Cafeteria workers were educated on proper food handling practices.

KEYWORDS: gastrointestinal illness, foodborne outbreak, Kazakhstan

INTERNATIONAL POSTER 10

Leptospirosis Outbreak Associated with Bathing in a Polluted Irrigation Canal — El Salado, Galván, Baoruco, Dominican Republic, November 2009

AUTHORS: *Ronald E. Skewes-Ramm, R. Pimentel, F. Medina, A. Castillo*

BACKGROUND: On October 2, 2009 the epidemiologist from Baoruco Health District notified a possible Leptospirosis outbreak in the rural community of El Salado-Galván-Baoruco, reporting 24 cases, including two deaths. We conducted an investigation to determine the extent and mode of transmission of the outbreak.

METHODS: 1. Descriptive phase: we looked for the cases and geo-referencing them as well as the animals and water sources. 2. Case-control study comparing risk exposures. Case was defined as any person with clinical diagnosis of leptospirosis and positive MAT laboratory result. Controls were 78 residents with no history of fever. Odds Ratio and 95% Confidence Intervals were calculated.

RESULTS: Five serovars of leptospirois were identified in 16 of 34-suspected cases. The median age was 9.5 years, 75% were school age males. The same serovars found in human cases were also present in goats, dogs and pigs samples analyzed. This community lacks of an aqueduct system and 15 cases (94%) and 36 controls (46%) bathed in a channel used for irrigation (OR=12.5; 95%CI=1.6-98). Eight cases (50%) and 17 controls (22%) reported to own goats (OR=3.9; 95%CI=1.3-11.2). Water samples were negative for leptospirosis apparently because this was chlorinated after the outbreak notification. The previous three weeks canal water was contaminated with rainwater that dragged many hillsides contaminates.

CONCLUSIONS: The outbreak was due to bathing practices in the canal, which could be contaminated by the animal faeces dragged by the rain in the weeks prior to the outbreak. The incidence of leptospirosis reduced to zero after banning the access to the canal, living chemoprophylaxis and health education.

KEYWORDS: leptospirosis, ecology, outbreak

INTERNATIONAL POSTER 11

Risk Factors of Reston Ebola Virus (REBOV) Infection Among Abattoir Workers After Its Discovery in Pigs — Philippines, 2009

AUTHORS: *Rolando V. Cruz , J. Pabellon, E. Tayag, F. Malbas, C. Demetria, J. Feliciano, J. Lopez*

BACKGROUND: In July 2007, pig raisers in northern Philippines were alarmed by the unusual number of pig deaths. The Bureau of Animal Industry (BAI) sent pig blood and tissue samples to USCDC where 9 were positive for Reston Ebola Virus (REBOV) RNA. This was the first time that REBOV was discovered in a non-primate food producing animal. Six humans were documented to be positive for IgG antibody with no illness, 2(4%) of 49 were butchers.

The study was done to determine the prevalence of REBOV infection among slaughterhouse workers, assess risk factors and recommend preventive measures for infection of this emerging disease.

METHODS: A cross-sectional study design was used with multi-stage cluster sampling. Forty-six clusters were identified with10 respondents to complete a sample size of 460. Blood samples were tested for REBOV IgG antibody. A nested case-control study was done.

RESULTS: A total of 460 abattoir workers participated in the study. Forty (9%) were positive for REBOV IgG Antibody. Age range 18-56 years (median=36). Only 1 case was female. History of exposure to pig blood in eyes/mouth (65%), injuries (93%), and contact with sick pigs (11%) was seen. Twenty-nine (79%) workers used personal protective equipment (PPE) which was limited to boots. History of illness in the past 6 months was seen in 15 (38%) of IgG positive respondents. Nine (23%) had Influenza-like-illness (ILI). Case-control study showed that backyard slaughtering (OR=3.6, CI=1.64-8.1683, *P*=001), injury (OR=3.93, CI=1.2-13.69, *P*=.022), contact with pig blood in eyes/mouth (OR=2.14, CI=0.905-4.78, *P*=05) an d smoking while working (OR=2.25, CI=1.0-4.72, *P*=03) were risk factors.

CONCLUSIONS: A REBOV infection prevalence of 9% among slaughterhouse workers is higher than the previously documented 4% and also higher than the 6% documented among monkey farm workers in 1996 (Miranda, et al). As a result of the study improved surveillance strategies in pigs are currently being implemented by the BAI and other concerned agencies on animal and human health have started collaboration on a collaborative strategy for emerging infectious disease at all levels of the public health system.

KEYWORDS: Reston Ebola Virus, ebolavirus, REBOV, abattoir, IgG antibody, multi-stage cluster sampling, public health, emerging disease

WEDNESDAY, APRIL 21
SESSION L:
INTERNATIONAL FIELD EPIDEMIOLOGY
Translating Science into Practice Around the World.....Dunwoody Suites, 7:30-9:45 p.m.
OPENING REMARKS: ***Thomas Frieden***
MODERATORS: ***Patricia Simone and Paul Kelly***

7:35
Impact of Trained Social Entrepreneurs on Access to Health Products in Impoverished Rural Populations — Nyanza Province, Kenya, 2007–2009

AUTHORS: ***Minal K. Patel, J. Harris, B. Nygren, P. Juliao, C. Ochieng, A. Obure, V. Were, P. Suchdev, L. Ruth, R. Quick***

BACKGROUND: Children <5 years old in rural Kenyan villages have high diarrhea and malnutrition rates, with poor access to preventive interventions. The Safe Water and AIDS Project (SWAP) is a Kenyan organization that since 2005 has taught entrepreneurial skills to HIV self-help group members who then generate income by selling health products in

their communities. We evaluated SWAP-trained entrepreneurs' impact on villagers' access to evidence-based products.

METHODS: We enrolled 1,104 households with children 6-35 months old from 30 randomly selected intervention villages and 30 comparison villages with no SWAP groups. In 2007, we conducted a baseline survey evaluating purchasing of two SWAP products (WaterGuard bleach solution and micronutrient Sprinkles). Then, SWAP trained entrepreneurs to work exclusively in 30 intervention villages. In 2008, we conducted a follow-up household survey of product purchases; subsequently, SWAP trained entrepreneurs for 30 comparison villages. In 2009, we performed a second follow-up household survey.

RESULTS: At baseline, SWAP-trained entrepreneurs had visited 3% of 572 intervention households and 2% of 532 comparison households; 2% of intervention and 1% of comparison households had purchased WaterGuard from entrepreneurs. Sprinkles were unavailable for purchase. At first follow-up, SWAP-trained entrepreneurs had visited 40% of 514 intervention and 9% of 484 comparison households ($P<0.01$). Intervention households were more likely than comparison households to have purchased WaterGuard (14% vs. 2%, $P<0.01$) and Sprinkles (36% vs. 6%, $P<0.01$) from SWAP-trained entrepreneurs. At second follow-up, 327 intervention and 322 former comparison households were equally likely to have been visited by a SWAP-trained entrepreneur (47% vs. 41%), purchased WaterGuard (27% vs. 21%) and purchased Sprinkles (39% vs. 33%).

CONCLUSIONS: SWAP-trained entrepreneurs increased access to two proven health products in Kenyan villages.

KEYWORDS: social marketing, Kenya, micronutrients, diarrhea prevention and control

7:55

Shigellosis Outbreak in an Elementary School — Sichuan Province, People's Republic of China, June 7–16, 2009

AUTHORS: ***Ke Han, F. He, H. Ma, B. Zhu, L. Zhang, R. Fontaine***

BACKGROUND: In rural China, wells are frequently constructed near stagnant pools that are often contaminated by sewage, causing recurring waterborne communicable disease outbreaks. We investigated a shigellosis outbreak in an elementary school in western China to identify the source of infection, mode of transmission and risk factors for infection.

METHODS: A probable case had onset of diarrhea (>3 times/day) plus >1 of the following symptoms: Fever (≥37.5 ^{0}C), vomiting, or abdominal pain among teachers or students of the elementary school and residents around the school during June 2-16, 2009. A confirmed case was a probable case plus culture or serological confirmation of genus *Shigella* from the stools or rectal swabs. In a case-control study, we compared exposures to sources of water, consumption of untreated well water and suspected food items, and hygienic habits of 84 probable or confirmed cases, and 71 controls, frequency-matched by class.

RESULTS: 18% of the 533 students and no teachers developed disease. 52% of cases (n=44) and 17% (n=12) of controls had drunk untreated well water (OR=5.3, 95% CI=2.5-11); 47% (n=39) of cases and 14% (n=10) of controls had drunk untreated water from Well A (OR=5.6, 95% CI= 2.5-13). The odd ratio increased with the amount of untreated Well A water consumed (*P*=0.035, chi-squared test for trend). Consumption of various food items was not significantly associated with disease risk. Rectal swabs from 5 of 6 cases and Well A water yielded *Shigella flexneri* 2b. Well A was located near a sewage lagoon.

CONCLUSIONS: This shigellosis outbreak was caused by untreated drinking water from Well A polluted by *Shigella flexneri* 2b. We recommend that the use of Well A water be discontinued in this school.

KEYWORDS: bacillary dysentery, *Shigella flexneri*, outbreaks, case-control study

8:15

Cholera Outbreak: The Importance of Hand Washing with Soap — Bashuri, Jigawa State, Nigeria, September 2009

AUTHORS: ***Saheed O. Gidado, E. Awosanya, S. Haladu, H. Ayanleke, P. Nguku, K. Sabitu, I. Mamuda, H. Akpan***

BACKGROUND: In Nigeria, cholera outbreaks are associated with high morbidity and mortality. Effective interventions to control these outbreaks require the identification of the source and risk factors for infection. In September, 2009 we investigated a cholera outbreak in Bashuri community in Jigawa State, Nigeria to identify the risk factors for infection and institute control measures.

METHODS: We conducted an unmatched case-control study. A case was defined as any resident of Bashuri community two years and above with acute watery diarrhea with or without vomiting from 3rd September, 2009; and a control as any resident of Bashuri community two years and above without acute watery diarrhea and vomiting. We recruited 80 hospital-based cases and 80 neighborhood controls. We used structured questionnaire to collect data on demographic characteristics, clinical information and risk factors. Data were analyzed with Epi-Info software. We collected and analyzed 10 stool samples and 14 open-well samples using thiosulfate-citrate-bile-sucrose agar to culture *Vibrio* organism.

RESULTS: Median age was 25 years for cases and 30 years for controls; 38/80 (47.5%) of cases and 60/80 (75%) of controls were males. Compared to the controls, cases were less likely to have washed hands with soap before eating (age-adjusted odds ratio (AAOR) =0.27, 95% confidence interval: 0.10-0.72) and less likely to have washed hands with soap after using the toilet (AAOR=0.34, 95% confidence interval: 0.15-0.75). *Vibrio cholerae* 01 was isolated in 6/10 (60%) of stool samples analyzed; none of the open-well samples yielded growth of *Vibrio cholerae*.

CONCLUSIONS: Unhygienic hand washing practices was identified as the key risk factor for infection in this outbreak. We conducted an intensive health education with emphasis on the importance of hand washing with soap.

KEYWORDS: cholera, case-control study, thiosulfate-citrate-bile-sucrose agar, Nigeria

8:35

Determinants of Nondisclosure of HIV Status Among Women Attending the Prevention of Mother to Child Transmission Programme — Makonde District, Zimbabwe

AUTHORS: *Pride Mucheto, W. Nyamayaro, D. Jones*

INTRODUCTION: The 2007 United Nations General Assembly Report on HIV/AIDS in Zimbabwe reported nondisclosure of HIV status as a challenge in the PMTCT programme. Preliminary investigations on nondisclosure among 21 women tested for HIV at Chinhoyi Hospital showed that only six had disclosed their HIV status. We investigated the determinants of nondisclosure of HIV status.

METHODS: A cross sectional analytic study was conducted at six health facilities in Makonde district. The Theory of Planned Behaviour was adapted to guide socio-cultural variables assessed. Antenatal and postnatal women tested for HIV in the PMTCT program who consented to participate were interviewed.

RESULTS: We enrolled 334 women. Thirty four percent (114) did not disclose their HIV status. Among HIV positive respondents, 43% (25) did not disclose their status. Women who believed disclosure caused physical abuse [OR=1.81, 95% CI 1.17-2.90], caused divorce [OR=2.01, 95% CI 1.25-3.22] and was unimportant [OR= 2.26, 95% CI 1.33-3.87] were two times less likely to disclose their status. Respondents who received group HIV pre-test counseling were 2.4 times more likely not to disclose. Receiving ANC HIV education at least twice and referral for psychosocial support were significantly protective [OR 0.54 (95% CI 0.24-0.63) and 0.16 (95% CI 0.06-0.41)] respectively. Independent determinants of nondisclosure among HIV positive women were perception that disclosure would cause divorce [AOR=7.82, P=0.03], living with an extended family [AOR=10.3, P=0.01] and needing spousal approval of HIV testing [AOR= 0.11, P<0.001].

CONCLUSIONS: Lack of psychosocial support and counseling for women and belief that disclosure causes divorce, abuse or is unimportant contributes to nondisclosure. Identifying women with social challenges and strengthening their referral for psychosocial support can improve disclosure of HIV status and reduce mother to child transmission of HIV.

KEYWORDS: nondisclosure, Zimbabwe, PMTCT

8:55

Severity and Factors Associated with Road Traffic Injuries in Patients — Thika District Hospital, Kenya, 2009

AUTHORS: *Eric M. Osoro, Z. Ng'ang'a, J. Oundo, J. Omolo*

BACKGROUND: Developing countries account for more than 85% of the world's road fatalities and the economic cost of road traffic crashes (RTC) in Kenya is about 5% of the Gross Domestic Product (GDP). The occurrence and health impact of road traffic injuries in Kenya has not received much attention. We carried out a cross-sectional study to determine factors associated with severe injury in victims of road traffic crashes attending Thika district hospital.

METHODS: We recruited all consecutive RTC victims attending the hospital from August to November 2009. Epidemiologic and clinical data were obtained through interviews and review of medical charts. Injuries were graded as severe, moderate or mild based on the Injury Severity Score (ISS). Severe injury was defined as an ISS above 15, moderate injury an ISS from 9-15 and mild injury an ISS of below 9. Participants with moderate or severe and those with mild injury were compared to determine factors associated with moderate or severe injury.

RESULTS: Of the 300 participants, 225(75%) were aged between 20-49 years and 216(72%) were male. Vulnerable road users (pedestrians and two-wheel users) comprised 99(33%) of the participants. Fifteen (5%) had head injury while 115(38%) had fractures. Fifty-six (18%) of the participants had moderate or severe injury. Vulnerable road users (OR=2.0, 95%CI=1.02-3.92), road crashes in rainy weather (OR=2.9, 95%CI=1.33-6.51) and night time crashes (OR=2.0, 95%CI=1.10-3.92) were risk factors for sustaining moderate or severe injury.

CONCLUSIONS: In this study, moderate or severe injury was associated with vulnerable road users, rainy weather and night time crashes. We recommend that policies and efforts that protect vulnerable road users and mitigate the risks associated with adverse weather and night time driving be developed and implemented.

KEYWORDS: road traffic crashes, severe moderate injury, Kenya

9:15

Sustained Multi-State Outbreak of Hepatitis A Associated with Semi-Dried Tomatoes — Australia, 2009

AUTHORS: *Ellen J Donnan, K. Lalor, J. Gregory, S. Rowe, P. Goldsmith, L. Tracy, G. Hogg, A. Tan, J. Fielding, H. Vally*

BACKGROUND: In 2009 a large outbreak of hepatitis A of over ten months duration affected several Australian states. This resulted in 550 notifications for 2009, representing a two-fold increase on the previous year, with approximately 45% of patients hospitalised, representing a considerable burden to public health. Two peaks of infection occurred (April-May and September-November) with surveillance data suggesting infections were locally acquired and from a widely distributed food product.

METHODS: Two separate unmatched case control studies were conducted. Genotyping was conducted on patient serum and food samples. Intensive product traceback and food sampling was undertaken. Control measures included public health warnings, a public health order requiring sanitation or pasteurisation in semi-dried tomato production in Victoria, and a trade level recall on an implicated batch of imported semi-dried tomatoes. Prophylactic immunoglobulin or vaccine was provided for close contacts.

RESULTS: The first case control study found an association between illness and consumption of semi-dried tomatoes (OR 3.62, 95% CI 1.59-8.26, $P<0.001$), particularly those purchased from two supermarket chains. The second study also implicated semi-dried tomatoes (OR 10.32, 95% CI 4.73-22.73, $P<0.001$), but with consumption mostly at restaurants or cafés. Hepatitis A RNA was detected in 11 samples of semi-dried tomatoes. Hepatitis A virus genotype 1b was identified in 134 (94%) of 142 patients tested, which was indistinguishable from the genotype found in an epidemiologically implicated food sample.

CONCLUSIONS: Both case-control studies and food testing implicated the novel vehicle of semi-dried tomatoes as the cause of this hepatitis A outbreak. The outbreak was extensive and sustained despite public health interventions, the design and implementation of which were complicated by limitations in food testing capability and complex supply chains with changing distribution patterns.

KEYWORDS: hepatitis A, outbreak, case-control studies, Australia

THURSDAY, APRIL 22
SESSION M: CSI Atlanta

Mackel Award Finalists ..... Ravinia Ballroom, 8:30–10:15 a.m.

MODERATOR: ***Mitchell L. Cohen***

8:35

Mucormycosis Outbreak Associated with Hospital Linens — Louisiana, 2009

AUTHORS: ***Jonathan Duffy, J. Harris, E. Newhouse, A. Balajee, J. Noble-Wang, L. Sehulster, S. Gilbert, M. Howard, H. O'Connell, E. Stanley, C. Rao, T. Chiller***

BACKGROUND: Mucormycosis is an invasive fungal infection caused by several types of molds, including *Rhizopus* species. Infections occur in immunocompromised persons and > 50% are fatal. We investigated an outbreak of mucormycosis among Hospital A patients to prevent further infections.

METHODS: A case was defined as a hospital-onset illness consistent with mucormycosis confirmed by culture or histopathology. Case-patient medical records were reviewed for clinical course and exposure to items and locations within the hospital. Cultures were collected from air and surfaces at Hospital A. Fungal species isolated from patients and the environment were identified using DNA sequencing and subtyped using Inter-Simple Sequence Repeat methods.

RESULTS: Five patients developed cutaneous mucormycosis from August 2008 to July 2009; all died. No previous cases were identified. Cases occurred on multiple wards with different air handling systems. Hospital linens (sheets and gowns) were the only items common to the cases. Environmental cultures grew *Rhizopus* species from 26 (40%) of 65 swabs of clean linens and associated areas, and from 1 (4%) of 25 samples from non-linen-related items. All specimens available for testing (13 environmental and 4 patient) were identified as *Rhizopus oryzae*. One patient isolate was available for subtyping and was genotypically related to an isolate from a clean linen transport cart. Hospital A replaced all linens and disinfected linen storage areas. Air and surface cultures (n=29) taken three weeks later were negative.

CONCLUSIONS: Hospital linens likely acted as a vector exposing susceptible patients to *Rhizopus*. *Rhizopus* might have contaminated linens at the off-site laundry facility or during delivery to the hospital. Hospital linens should be laundered, shipped, and stored in a manner that minimizes exposure to environmental contaminants.

KEYWORDS: mycoses, mucormycosis, zygomycosis, cross infection, bedding and linens

8:55

Investigation of Autochthonous Dengue Fever Outbreak — Key West, Florida, 2009

AUTHORS: ***Christopher J. Gregory, E. Radke, K. Weis, E. Sauber-Schatz, G. Gallagher, E. Hunsperger, K. Tomashek, B. Biggerstaff, L. Stark, J. Muñoz, C. Blackmore***

BACKGROUND: Three cases of autochthonous dengue fever were identified in Key West, Florida after a 70–year absence. An outbreak investigation to determine the incidence of recent dengue infection and the prevalence of past infection in Key West was conducted by the Florida Department of Health and the CDC's Dengue Branch.

METHODS: A stratified random sample of households within 1 kilometer radius of the index cases was selected. At each household, residents were asked to provide blood samples and medical and travel histories. Blood was tested for anti-dengue IgM and IgG antibodies. Antibody-positive samples were tested with a plaque-reduction neutralizing test (PRNT) to determine the infecting flavivirus serotype. For participants with fever in the past 7 days, samples were tested for dengue virus (DENV) by RT-PCR and non-structural protein-1 (NS-1) assay. Mosquitoes were collected from the area and tested for DENV by RT-PCR.

RESULTS: Blood was collected from 240 persons in 175 households. Eight (3.3%) participants who had not recently traveled had evidence of recent dengue infection by IgM, RT-PCR, or NS1; 5 were identified as having DENV-1. Ninety-one (37.9%) participants were IgG positive, indicating past flavivirus infection. Of these, 5 (2.1%) persons with a dengue-like illness in the past 3 months were classified as having probable recent dengue infection by PRNT. Mosquitoes were positive for the same Mexican DENV-1 strain as human cases.

CONCLUSIONS: Approximately 5% of Key West residents tested positive for recent dengue infection, making this the largest dengue outbreak in the continental United States in 60 years. With increasing international travel and ample Aedes aegypti mosquito populations, Key West and southern Florida may be at risk of future dengue outbreaks.

KEYWORDS: dengue, community outbreak, disease transmission, epidemiology

9:15

The Perfect Storm: Investigation of a Suspected Pertussis Outbreak — Colorado, Summer 2009

AUTHORS: *Sema Mandal, P. Cassiday, A. Faulkner, M. Griffith, M. Jackson, K. Tatti, L. Pawloski, D. Woods-Stout, M. Barnes, B. Wagner, K. Lujan, M. Bonkosky, M. Martin, K. O'Connell, A. Schmidtke, CDC Unexplained Respiratory Diseases Outbreak Working Group, M. Tondella, A. Cohn, T. Clark, S. Martin*

BACKGROUND: Verifying pertussis outbreaks is difficult because clinical diagnosis is challenging and laboratory testing is suboptimal. Exclusive use of polymerase chain reaction (PCR) increases the likelihood that false positives will prompt unnecessary or ineffective interventions and response.

METHODS: We investigated a prolonged pertussis outbreak characterized by atypical cases confirmed only by PCR that persisted despite high vaccine coverage and routine control measures. We conducted case ascertainment using modified CSTE case definitions, and performed confirmatory pertussis testing (PCR, culture, serology) and alternate pathogen testing. We observed clinic practices, sampled clinics for environmental pertussis DNA, and reviewed laboratory PCR quality indicators to evaluate the potential for false positives.

RESULTS: Between November 2008 and August 2009, 127 cases were reported, of which 91 (72%) were PCR positive. In cases occurring after April (n=78; 61%), we observed a shift to fewer classic pertussis symptoms (84% to 53%; $P<0.01$), smaller amounts of detected pertussis DNA (mean PCR cycle threshold value: 33.7 to 40.8, $P<0.01$), and an increase in the proportion of PCR positive results among all tests (6% to 36%; $P<0.01$). Cultures and serology for Bordetella pertussis were negative, but evidence of other common respiratory pathogens was detected. We identified factors which likely resulted in specimen contamination at the point of collection and subsequent false positives: clinic contamination with pertussis DNA from true cases and/or vaccine; lapses in appropriate specimen handling; use of liquid transport media; and lack of clinically relevant PCR interpretation criteria.

CONCLUSIONS: Our results suggest a multi-factorial "pseudo" pertussis outbreak. Based on these findings, recommended changes in clinic specimen collection and cleaning protocols were implemented. Cautious interpretation of epidemiologic, clinical and laboratory data should inform outbreak responses.

KEYWORDS: pertussis, outbreaks, false-positive reactions, polymerase chain reaction

9:35

Fatal Case of Laboratory-Acquired Infection with an Attenuated *Yersinia pestis* Strain of Plague — Illinois, 2009

AUTHORS: ***Andrew Medina-Marino, M. Schriefer, S. Black, P. Mead, K. Weaver, K. Metzger, B. King, S. Gerber, W-J. Shieh, S. Zaki, S. Cali, C. Conover, K. Soyemi, K. Ritger***

BACKGROUND: In September 2009, a researcher working with KIM-D27, *a Yersinia pestis* strain attenuated by deletion of iron-acquisition genes, died of acute septicemia. *Y. pestis*, the cause of plague, was isolated from blood cultures. We investigated the source of infection, strain virulence, and contributing host factors.

METHODS: We conducted an environmental assessment, interviewed laboratory personnel, and reviewed autopsy and medical records. Laboratory investigation included histopathologic and immunohistochemical analysis of autopsy samples, genetic testing, plasmid DNA profiling, and polymerase chain reaction (PCR)-based characterization of the strain isolated from the deceased; virulence studies were conducted in mice.

RESULTS: No deficiencies were identified in required laboratory maintenance. Interviews with coworkers identified inconsistencies in the deceased's biosafety practices. Immunohistochemistry revealed *Y. pestis* within blood vessels of all organs but not alveolar airspaces. Histopathology identified abnormal liver iron deposits. Markedly elevated pre-mortem serum iron levels were identified postmortem. Genetic testing confirmed hereditary hemochromatosis, an iron-overload disease. Plasmid DNA and PCR analysis identified the infecting strain as KIM-D27. Of mice inoculated with KIM-D27 stock strain, 2/64 (3%) died versus 0/64 inoculated with the deceased's strain (P=.15); 19/24 (79%) mice inoculated with unattenuated *Y. pestis* died.

CONCLUSIONS: This is the first reported laboratory-acquired infection and fatality caused by attenuated *Y. pestis*. Histopathology and immunohistochemistry indicate septicemic, not pneumonic plague, indicating percutaneous or mucocutaneous exposure. Although mouse inoculation studies confirm that the infecting strain was attenuated, hemochromatosis-induced iron overload might have contributed to host susceptibility by creating an environment conducive to pathogenesis. Studies to assess the pathologic contribution of iron overload are being conducted in hemochromatosis-mutant mice. Hemochromatosis might represent a new risk factor for infections with bacteria attenuated by iron-acquisition defects.

KEYWORDS: plague, laboratory-acquired infections, hemochromatosis, risk factor

9:55

Cookie Monster: Multistate outbreak of *Escherichia coli* O157:H7 Infections Associated with Consumption of Prepackaged Raw Cookie Dough — United States, 2009

AUTHORS: ***Karen P. Neil, G. Ewald, K. MacDonald, E. Hyytia-Trees, S. Stroika, C. Medus, P. Lafon, G. Gómez, M. Humphrys, N. Comstock, M. Sotir and the E. coli O157:H7 Investigation Team, OutbreakNet, Enteric Diseases Laboratory Branch***

BACKGROUND: *Escherichia coli* O157:H7 (O157:H7) causes approximately 73,000 infections annually in the US. Very young children and the elderly are more likely to develop severe illness and hemolytic uremic syndrome (HUS). We began investigating a multistate outbreak of O157:H7 infections in May 2009.

METHODS: We defined a case as O157:H7 infection yielding an isolate indistinguishable from the outbreak strain by Pulsed-Field Gel Electrophoresis (PFGE) and Multi-Locus Variable-Number Tandem Repeat Analysis (MLVA). We developed hypotheses using questionnaires and open-ended interviews and conducted a case-control study using age, gender, and state-matched controls. Food products were tested for Shiga toxin-producing *E. coli* (STEC).

RESULTS: Seventy-seven case-patients with illness onsets during March 16–July 8 were identified in 30 states: 66% were <19 years and 69% were female. Thirty-five patients were hospitalized; 10 developed HUS. Ground beef consumption was considered as an initial hypothesis when a PFGE-matched ground beef sample produced in March was identified. Subsequent MLVA testing indicated this sample did not match the outbreak strain. After considering exposures that might be consistent with young, predominately female cases, iterative opened-ended interviews found many had consumed Brand X prepackaged raw cookie dough (PRCD). In a case-control study, eating Brand X PRCD was significantly associated with illness, [38 (81%) of 47 cases versus none of 42 controls, matched odds ratio=45.6, p-value<0.0001)]. Three non-outbreak strains of STEC were isolated from Brand X PRCD. Company X recalled all PRCD products on June 19.

CONCLUSIONS: This is the first O157:H7 outbreak linked to PRCD and highlights the importance of not eating raw food products that are intended for cooking before consumption. MLVA testing provided critical information to exclude ground beef as a source.

KEYWORDS: Shiga-Toxigenic *Escherichia coli*, outbreak, food

THURSDAY, APRIL 22
SESSION N: The Tick
Vectorborne Diseases ..... Ravinia Ballroom, 10:30–11:55 a.m.
MODERATOR: *Paul Mead*

10:35

Evaluation of Health Facility Versus Household Surveys for Measuring Malaria Burden — Tanzania, 2002, 2004, 2006

AUTHORS: *Kimberly E. Mace, J. Skarbinski, R Khatib, J. Gutman, B. Elling, A. Malila, A. Ngadjilo, L. Causer, H. Williams, M. Lynch, E. Kahigwa, P. Bloland, S. Abdulla, S. Kachur*

BACKGROUND: Malaria causes approximately 250 million illnesses and 1 million deaths annually. Recent scale-up of malaria interventions in endemic countries has intensified the need for reliable and timely information for impact assessment and program management. Household surveys (HHS), an established method for estimating malaria burden, are resource intensive and performed every three to five years. Ongoing health facility surveys (HFS) assessing quality of care are a possible alternative data source, but have not been validated against malaria burden at the community level. In Tanzania, we assessed HFS data validity by comparing concurrently generated data from HFS and HHS performed biennially from 2002 to 2006.

METHODS: Eight facilities were selected for the HFS. Fever history and blood smears were obtained on all patients presenting for sick visits. HHS were conducted on a random sample of census-enumerated households in these health facilities' catchment areas. Surveyors recorded history of fever, and collected blood smears. We compared prevalence of self-reported fever and parasitemia between HFS and HHS.

RESULTS: Prevalence of fever was higher among subjects in HFS than in HHS (60% vs. 12%, $P<0.0001$). Parasitemia prevalence varied between HFS and HHS by approximately 5% over all years (2002, 29% vs. 24%; 2004, 26% vs. 21%; 2006, 10% vs. 15%), and was not different after adjusting for known confounders of parasitemia (age and year, $P=0.07$).

CONCLUSIONS: Parasitemia prevalence was similar in both HFS and HHS, overall and over time. These findings should be interpreted cautiously, but suggest that prevalence of certain malaria indicators observed in HFS closely track those observed in HHS. HFS might be a valid data source for the evaluation of community malaria burden.

KEYWORDS: malaria, surveillance, parasitemia, health facilities, community surveys

10:55
Epidemiology of Babesiosis — New Jersey, 2006–2009

AUTHORS: *Andria Apostolou, F. Sorhage, C. Robertson, C. Tan*

BACKGROUND: Babesiosis is a zoonotic vectorborne infection caused by Babesia parasites. *B. microti* is transmitted by *Ixodes scapularis* ticks. Babesiosis can result in severe disease and death, especially among immunocompromised and older persons. Babesiosis cases resulting from receipt of contaminated blood products are increasingly being reported for all *Babesia* species. We investigated cases reported with onset during 2006–2009 to understand the epidemiology of babesiosis and to implement control measures.

METHODS: We defined cases as clinically compatible illnesses with identification of *Babesia* in blood smear or by animal inoculation (confirmed), or by demonstration of *Babesia*-specific antibody (probable). Data were collected through the New Jersey (NJ) Communicable Disease Reporting and Surveillance System.

RESULTS: Between 2006 and October 2009, a total of 291 confirmed (96%) and probable (4%) cases were identified in NJ residents, with a two-fold increase of cases in 2009 (126 cases), compared with 2008 (54 cases). Most cases had onset during summer and were from central and coastal regions. Among the 291 patients, median age was 66 years (range: 1 month–96 years); 69% were male; 71% were white and 61% were non-Hispanic. For cases with available data, 28 (10%) of 273 patients had been admitted to an intensive care unit; six (2%) of 290 patients died. Provisional data indicate that eight cases, including one fatal case, might have been linked to blood transfusions.

CONCLUSIONS: Babesiosis is an emerging disease in NJ. Given the increase in cases and increased recognition of transfusion-associated cases, we recommend development of laboratory methods to screen for Babesia-contaminated blood products. Public and physician education regarding babesiosis might increase behaviors that prevent this and other tickborne diseases.

KEYWORDS: babesiosis, blood-transfusion, vectorborne

11:15
Practices Regarding Treatment of Rocky Mountain Spotted Fever Among Healthcare Providers — Tennessee, 2009

AUTHORS: *Kristina M. McElroy, L. Carpenter, M. Lancaster, J. McQuiston, T. Ngo, S. Dahlgren, J. Dunn*

BACKGROUND: Rocky Mountain spotted fever (RMSF), caused by *Rickettsia rickettsii*, is the most commonly fatal tickborne illness in the United States. Doxycycline is the treatment of choice for RMSF, even for children. Use of non-tetracycline antibiotics is associated with increased risk of severe outcome. We sought to understand healthcare provider practices regarding RMSF treatment in Tennessee, where the annual incidence is four times the national average (16.6 per million) and outcomes are particularly severe.

METHODS: A cross-sectional survey was conducted among 8,200 health professionals with active Tennessee licensure.

RESULTS: Of 1139 (14%) completed surveys; responses were analyzed for 588 (60%) physicians and 394 (40%) physician extenders (PE [physician's assistants and advanced practice nurses]) who indicated a primary practice role. Doxycycline was reported more commonly as a first choice for RMSF treatment in persons aged ≥8 years (95%) compared to children aged <8 (45%) (Prevalence Ratio [PR]=2.1, 95% CI=1.9-2.3). Physicians were significantly more likely than PEs to report choosing doxycycline in children (50% and 38%, respectively) (PR=1.3, 95% CI=1.1-1.6). Providers in a pediatric specialty were more likely to report choosing doxycycline to treat RMSF in children than those in a family medicine specialty (PR=2.0, 95% CI=1.7-2.4). Providers working in hospitals and academic centers were more likely to treat children with doxycycline than private practitioners (PR=1.3, 95% CI=1.1-1.6).

CONCLUSIONS: Despite practicing in a high incidence region, over half of Tennessee healthcare providers reported RMSF treatment knowledge that is inconsistent with current recommendations. Lack of knowledge regarding doxycycline as a first choice for RMSF in children aged <8 years, especially among family practice providers and PEs, demonstrates a need for targeted education regarding national recommendations.

KEYWORDS: Rocky Mountain spotted fever, survey, Tennessee, physician

11:35

Old Face in a New Place: La Crosse Encephalitis Virus Infection — Missouri, 2009

AUTHORS: ***Yi-Chun Lo, S. Patrick, G. Turabelidze, K. Gibney, R. Nasci***

BACKGROUND: La Crosse encephalitis virus (LACV), the most common cause of pediatric arboviral encephalitis in the United States, is endemic in upper-Midwestern and mid-Atlantic states. Although the natural vector, *Aedes triseriatus*, and accessory vectors, *Aedes canadensis* and *Aedes albopictus*, are distributed throughout lower-Midwestern states, LACV infection was last reported in Missouri in 2002 and has never been reported in Kansas. In August 2009, LACV meningoencephalitis was suspected in a male aged 8 years in northwestern Missouri, near Kansas. We conducted an investigation to verify the diagnosis and examine associated environmental risk factors.

METHODS: Chart reviews and family interviews were conducted. Cerebrospinal fluid (CSF) was tested at CDC for LACV-neutralizing antibodies. Convalescent serum was tested for LACV-specific IgM and IgG, LACV-neutralizing antibodies and Jamestown Canyon virus (JCV)-neutralizing antibodies (to exclude cross-reactivity). The household was visited to identify environmental characteristics associated with risk and to collect mosquito larvae for identification.

RESULTS: The male presented with fever, headache, nausea, and vomiting, which was diagnosed as acute meningoencephalitis. LACV infection was confirmed by positive CSF and

serum LACV-neutralizing antibodies, positive serum LACV-specific IgM and IgG, and negative JCV-neutralizing antibodies. The male reported mosquito bites while playing in the woods the week before symptom onset. Fourteen tree holes and 8 discarded tires, characteristic *Aedes triseriatus* larval habitats, were identified within 300 feet of the house. *Aedes triseriatus* and *Aedes albopictus* larvae were collected from a tire.

CONCLUSIONS: Emergence of LACV infection near the Missouri-Kansas border increases concern for changing LACV epidemiology in lower-Midwestern states. Physicians should include LACV in differential diagnoses for pediatric meningoencephalitis. Ecologic changes that might facilitate expansion of LACV transmission into this area should be investigated.

KEYWORDS: La Crosse encephalitis virus, Missouri

THURSDAY, APRIL 22
SESSION O: General Hospital Healthcare-Associated Illness ..... Ravinia Ballroom, 1:30–3:15 p.m.

MODERATOR: ***Denise Cardo***

1:35
Acute Hepatitis B Virus Infections in a Psychiatric Skilled Nursing Facility — Los Angeles, California, 2008

AUTHORS: ***Matthew E. Wise, K. Katz, U. Sharapov, S. Tolan, P. Marquez, S. Hathaway, A. Beaton, D. Hu, J. Drobeniuc, J. Perz, N. Thompson, E. Bancroft***

BACKGROUND: Effective measures exist to prevent healthcare-associated hepatitis B virus (HBV) transmission, yet outbreaks continue to occur in the United States. In October 2008, the Los Angeles County Department of Public Health (DPH) identified a cluster of acute HBV infections among residents of a psychiatric skilled nursing facility and invited CDC to assist with investigation and develop recommendations for control.

METHODS: We reviewed HBV serology and DPH surveillance records to classify residents as acutely infected, chronically infected, susceptible, and immune. A retrospective cohort study was conducted to identify potential modes of HBV transmission using data on healthcare and behavioral risk factors abstracted from medical charts. Further, we observed infection control practices, interviewed facility residents and staff, and performed genetic characterization of HBV DNA specimens.

RESULTS: During June–December 2008, nine (11%) of 81 susceptible residents developed acute HBV infection. Observation of the consulting podiatrist highlighted opportunities for cross-contamination of instruments with blood. Six (25%) of 24 susceptible residents receiving podiatric care after one resident with chronic HBV infection (Resident A) developed acute infection (RR=6.4, 95% CI: 1.4, 29.3). Other acutely infected residents had other possible exposures to Resident A including shared blood glucose monitoring equipment and sexual activity. All three acutely infected residents with HBV specimens available for characterization were infected with a strain matching that of Resident A. Susceptible residents

were offered HBV vaccine by DPH. Infection control recommendations were made to the podiatrist and facility.

CONCLUSIONS: Among multiple potential transmission modes identified, exposure to contaminated podiatric instruments was considered the dominant mode of HBV transmission in this cluster. Long-term care facilities should ensure compliance with infection control standards, including consultation with healthcare providers.

KEYWORDS: hepatitis B, podiatry, long-term care, disease outbreaks

1:55

Staphylococcus aureus Infections Associated with Epidural Injections at a Pain Clinic — West Virginia, 2009

AUTHORS: ***Rachel A. Radcliffe, E. Meites, J. Briscoe, G. Fosheim, S. McAllister, B. Jensen, J. Noble-Wang, M. del Rosario, R. Gupta, J. Hageman, P. Patel***

BACKGROUND: *Staphylococcus aureus* infections cause approximately 639,000 U.S. hospitalizations annually. In May 2009, West Virginia health departments were notified of three patients hospitalized with methicillin-susceptible *S. aureus* (MSSA) infections after receiving injections at an outpatient pain clinic. We investigated to determine the outbreak source and implement control measures.

METHODS: We conducted a cohort study of clinic patients who received injections April 27–May 13, 2009. Confirmed cases were defined as culture-confirmed MSSA infections from blood, cerebrospinal fluid, or epidural abscess. Probable cases were defined as clinical signs of infection (e.g., fever or leukocytosis) ≤14 days after injection. Proportions were compared by using Fisher's exact test. Clinic infection control procedures were assessed. MSSA isolates from two patients and three clinic staff nasal swabs were genotyped by using pulsed-field gel electrophoresis (PFGE).

RESULTS: Eight (7%) of 110 cohort patients were cases; six (75%) were confirmed. Among cases, median patient age was 65 years. Seven (88%) were hospitalized; all survived. Eight (12%) of 69 patients who received epidural injections were cases compared with none of the other 41 patients (P= .02). Clinician A performed all epidural injections. Specific medications and underlying conditions were not associated with case status. During procedures, staff mask use and patient skin preparations were irregular; epidural injection syringes were reused to access shared medication vials. Both patient isolates and Clinician A's isolate were indistinguishable by PFGE.

CONCLUSIONS: Infection control breaches during epidural procedures likely facilitated MSSA transmission from Clinician A to patients. Laboratory and epidemiologic findings led the clinician to improve clinic procedures and retrain staff. Following proper infection control practices in outpatient settings is critical to prevent disease transmission and hospitalizations.

KEYWORDS: *Staphylococcus aureus*, pain clinics, outbreaks, epidural injections

2:15

Outbreak of Hepatitis C Virus Infections at an Outpatient Hemodialysis Facility — Maryland, 2009

AUTHORS: *Agam K. Rao, E. Luckman, M. Wise, T. MacCannell, Y. Lin, L. Wilson, G. Xia, J. Drobeniuc, J. Noble-Wang, M. Arduino, N. Thompson, P. Patel, D. Blythe*

BACKGROUND: Hepatitis C virus (HCV) infection affects 3.2 million Americans and is the leading reason for liver transplantation nationally. HCV transmission in hemodialysis facilities has been associated with poor infection control practices. In March 2009, several incident HCV infections were identified among patients in hemodialysis Facility A. We conducted an investigation to identify the source and recommend control measures.

METHODS: We reviewed medical records and HCV antibody (anti-HCV) results for the 170 Facility A patients treated between January 2008 and April 2009. HCV status was determined using anti-HCV and HCV polymerase chain reaction; the hypervariable (HVR1) region was sequenced for relatedness. A case was defined as HCV seroconversion in a patient after admission. A previously infected patient was one HCV-infected upon admission or before 2006. Infection control practices were evaluated.

RESULTS: Of 163 Facility A patients with known HCV status, 56 (34.4%) were previously infected with HCV. Eight incident cases were identified among 107 susceptible patients (attack rate 7.5%). Incident infections occurred in 1 (2.3%) of 44 susceptible patients treated on shift 1 vs. 7 (11.4%) of 61 on later shifts (P= 0.13). HVR1 sequencing showed that four incident cases were each closely related to one of three previously infected patients (97.2-100% maximum nucleotide identity). Previously infected patients preceded their related incident case-patients by one shift and underwent treatment at the same or a nearby dialysis station. Lapses in hand hygiene, access cleansing, and parenteral medication handling were documented.

CONCLUSIONS: Patient-to-patient transmission of HCV occurred at Facility A and may have resulted from observed infection control breaches. Recommendations to correct infection control practices and retrain facility staff were made. No further seroconversions have occurred.

KEYWORDS: disease outbreaks, hepatitis C, hemodialysis, infection control

2:35

Management of a Vancomycin-Resistant Enterococci Outbreak in a Neonatal Intensive Care Unit — Indiana, 2009

AUTHORS: *Matthew D. Ritchey, J. Svendsen, A. Kallen, W. Staggs*

BACKGROUND: Enterococci are a leading cause of nosocomial colonization and infection among newborns. Enterococcal infection can be further complicated by the presence of vancomycin-resistant strains (VRE), which pose considerable treatment challenges. Hospital A notified the Indiana State Department of Health that, during January 28–February 24, 2009, passive surveillance had identified three patients with VRE infection in their neonatal intensive

care unit (NICU). All clinical isolates had indistinguishable pulsed-field gel electrophoresis (PFGE) patterns. We recommended control measures and assessed their effects.

METHODS: We defined a case as culture-confirmed VRE colonization, with a PFGE pattern indistinguishable from the initial isolates', in an infant treated in Hospital A's NICU during February 25–June 9, 2009. We reviewed records and infection-control policies and compared performance of active surveillance cultures (ASCs) and incidence of colonization (per 100 patient-days) between two intervention periods by using z-tests. Period A (February 25–March 18) included weekly ASCs, enhanced cleaning practices, and Contact Precautions for case-patients. Period B (March 19–June 9) included twice-weekly ASCs, more rigorous diaper-handling and isolation practices, and cohorting of nursing staff.

RESULTS: Of 93 infants screened, 35 (37.6%) were colonized, with peaks in number of newly identified cases occurring at the beginning of each period as surveillance efforts changed. Active surveillance cultures increased between Periods A and B (22.1 versus 27.2 cultures/100 patient-days, respectively), although incidence decreased (5.0 versus 1.7 cases/100 patient-days, respectively; $P<.05$). No additional cases were identified after May 12.

CONCLUSIONS: Active surveillance identified a high level of VRE colonization. Intensified surveillance and infection-control measures were associated with a decrease in incident VRE colonization. Timely implementation should be considered when VRE infections are detected in NICUs.

KEYWORDS: enterococcus, neonatal intensive care units, vancomycin, infection, outbreak

2:55

Cluster of Oseltamivir-Resistant 2009 Pandemic Influenza A (H1N1) Infections on a Hospital Ward Among Immunosuppressed Patients — North Carolina, 2009

AUTHORS: *Natalie J.M. Dailey, A. Rao, L. Chen, J. Duffy, P. Brantley, L. Wolf, E. Lamb, J-M. Maillard, M. Davies, A. Fleischauer, C. Wolfe, V. Deyde, L. Gubareva, A. Srinivasan, A. Fry, Z. Moore*

BACKGROUND: Oseltamivir and zanamivir are the only licensed antiviral medications available to treat 2009 pandemic influenza A (H1N1) virus (pH1N1) infection. Although rare, antiviral resistance is of concern because of limited treatment options. During October 2009, four immunosuppressed patients on one North Carolina hospital ward received diagnoses of pH1N1 infection later identified as oseltamivir-resistant. We investigated this cluster during November 2009 to determine the mode and extent of resistant virus transmission.

METHODS: We reviewed patients' medical records and interviewed exposed healthcare personnel (HCP). Resistant viruses were compared using genome sequencing. Respiratory specimens previously obtained from pH1N1 patients in other hospital areas and statewide surveillance specimens underwent pyrosequencing for H275Y, a neuraminidase mutation associated with oseltamivir resistance, to assess transmission magnitude.

RESULTS: The patients, aged 43–67 years, experienced illness onsets October 6–11. All ambulated around the ward while symptomatic. Symptoms inconsistent with influenza-like illness (ILI) delayed diagnosis, treatment, and droplet isolation for these patients by ≥3 days. Only one patient, the likely index case, was exposed to oseltamivir before detection of resistant virus. Complete genomic homology existed among the four patients' viruses. Of 242 exposed HCPs, 190 (79%) were interviewed. Twelve reported ILI during September 29–November 25, but none were confirmed. Pyrosequencing of 174 state and hospital specimens identified no additional pH1N1 viruses with the H275Y mutation.

CONCLUSIONS: The spatiotemporal proximity of cases and virus homology support transmission of oseltamivir-resistant virus; no evidence of transmission beyond the four patients was found. Similar outbreaks might be prevented by prompt institution of droplet precautions among immunosuppressed patients with fever or respiratory symptoms and by requiring them to use a surgical mask when outside the room.

KEYWORDS: antiviral drug resistance, 2009 pandemic influenza A (H1N1) virus, H1N1 subtype, oseltamivir, immunosuppression

THURSDAY, APRIL 22
SESSION P: Cold Case
Respiratory Illness.....Ravinia Ballroom, 3:30–4:55 p.m.
MODERATOR: ***Matt Moore***

3:35
Does Group A Streptococcal Strain Predict the Severity of Invasive Disease?

AUTHORS: ***Benjamin J. Silk, T. Pondo, K. Gershman, P. Cieslak, D. Kirschke, G. Dumyati, K. Angeles, R. Lynfield, D. Blythe, M. Farley, S. Petit, A. Reingold, D. Stevens, E. Zell, B. Beall, C. Van Beneden for the ABCs Team***

BACKGROUND: Group A streptococcal (GAS) infections range from mild pharyngitis to life-threatening illnesses such as necrotizing fasciitis (NF). In 2008 12,000 invasive cases and 1,500 deaths occurred in the United States. Multivalent vaccines are being developed and should include strains causing severe disease. We assessed associations between invasive GAS syndromes and bacterial strains as manifested by emm types, the bacterial gene sequences specific for individual M virulence protein serotypes.

METHODS: Invasive disease was defined by GAS isolation from a normally sterile site (e.g., blood). We reviewed cases from 10 population-based Active Bacterial Core Surveillance sites from 1995 through 2008. We analyzed emm types for associations with cellulitis and other mild soft tissue infections and more severe pneumonia, streptococcal toxic shock syndrome (STSS), NF, and pregnancy-related infections (PRI). Logistic regression was used to calculate adjusted odds ratios (aORs) and control for confounders (sex, age, race, and underlying conditions).

RESULTS: Eighty-six emm types were identified among 10,143 (81%) isolates from 12,476 cases. Although five common emm types (emm1: 22% of total, emm12: 9%, emm28: 9%, emm3: 8%, emm89: 5%) caused half of soft tissue infections, they were not more likely than

other types to cause these infections. In contrast, emm1 was associated with pneumonia (aOR=1.9), STSS (aOR=1.9), and NF (aOR=1.8), causing one-third of each severe syndrome ($p \leq 0.001$), while emm3 was also associated with STSS (aOR=2.3; $P<0.001$). One-quarter (25%) of PRIs were caused by emm28, which more frequently manifested as a PRI than other types (aOR=3.0; $P<0.01$).

CONCLUSIONS: In the United States, several common emm types were more likely to cause severe GAS invasive disease. These findings can guide vaccine development and further our understanding of disease severity.

KEYWORDS: streptococcus group A, emm, syndrome, severity

3:55

Hospital-Associated Measles Outbreak — Pennsylvania, March– April 2009

AUTHORS: *George S. Han, R. Voorhees, J. Lando, J. Lute, V. Dato, P. Lurie, V. Urdaneta, P. Kutty, H. McLean, L. Stockman, W. Bellini, P. Rota, G. Wallace*

BACKGROUND: Although endemic measles transmission has been interrupted in the United States, importations continue to occur. On March 28, 2009, the Pennsylvania Department of Health (PADOH) was notified of measles in an unvaccinated toddler evaluated in a children's hospital emergency department (ED). Investigation focused on identifying the source and additional cases and preventing further spread.

METHODS: A case was defined as febrile rash illness confirmed by detection of measles-specific IgM antibodies. Contact tracing was performed for exposed persons. Employee health records of exposed hospital personnel were reviewed for serologic evidence of measles immunity.

RESULTS: Four additional measles cases were reported to PADOH; all five were present at the ED on March 10. Targeted review of electronic ED records for patients experiencing fever and rash identified a school-aged child who recently arrived from India with unknown vaccination history; the child received an ED diagnosis of viral exanthem on March 10. PADOH confirmed measles from serum obtained on April 3. Of 181 hospital employees exposed to any case, 73 (40%) had no documented measles immunity, thus requiring simultaneous testing and vaccination. No additional cases were identified despite calling >4,000 contacts in multiple medical facilities and child care centers and widespread publicity throughout the medical community and general public.

CONCLUSIONS: This outbreak highlights continued occurrences of measles in the United States, which is often attributable to importation and not immediately recognized by clinicians. Despite only five secondary cases, the investigation placed a substantial strain on private and public health resources. To decrease the possibility of measles transmission in healthcare settings, patients presenting with fever and rash should be isolated immediately, and healthcare personnel should have documented measles immunity.

KEYWORDS: measles, outbreaks, vaccination, travel, health personnel, nosocomial infections

4:15

Epidemiology and Outcomes of Adults with Asthma Hospitalized for 2009 Pandemic Influenza A (H1N1) — California, 2009

AUTHORS: *Eva Mortensen, J. Louie, C. Pertowski, E. Weiss, M. Acosta, K. Winter, C. Jean, B. Matyas*

BACKGROUND: Asthma is the most common chronic medical condition among adults hospitalized for 2009 pandemic influenza A (pH1N1), affecting approximately 28%. We described the epidemiology and factors associated with severe outcomes among adults with asthma who were hospitalized or died from pH1N1 in California.

METHODS: We reviewed California Department of Public Health pH1N1 mandatory case-reports submitted during April 23–August 11, 2009. Cases were defined as laboratory-confirmed pH1N1 infection by PCR among adults with asthma aged ≥18 years who were either hospitalized or had died. We used chi-squared tests to identify factors associated with severe outcomes (intensive care unit [ICU] stay or death).

RESULTS: Among 744 adults who were hospitalized or had died from pH1N1, 170 (23%) had asthma. Of those, the median age was 43.5 years (range 18-80) and 63% were female. Thirty-four percent were Hispanic, 69% white, 18% black, 11% Asian/Pacific Islander, and 2% other. One hundred twenty-five (74%) had one or more additional chronic medical conditions; 13 of 51 (25%) women of child-bearing age were pregnant. One hundred twenty-one (71%) received antiviral therapy, 45 (26%) within 48-hours of symptom onset. Overall, 81 (48%) had pneumonia. Fifty-four (33%) experienced severe outcomes, including 13% who died and 20% who required ICU admission but survived. Severe outcomes were significantly more common among adults with asthma who were also diagnosed with pneumonia (54% versus 15%; $P>.001$), chronic neuromuscular disease (52% versus 30%; $P=0.047$), or renal disease (64% versus 31%; $P>.001$).

CONCLUSIONS: One-third of adults with asthma hospitalized for pH1N1 experienced severe outcomes. To minimize complications, interventions to encourage vaccination and improve early antiviral therapy should be targeted for patients with asthma.

KEYWORDS: 2009 pandemic influenza A (H1N1), asthma, surveillance, demographics, risk factors, treatment, outcomes

4:35

Modes of Transmission and Risk Factors for *Mycoplasma pneumoniae* During an Outbreak at a Child and Adolescent Residential Treatment Center — New Mexico, 2009

AUTHORS: *Megin C. Nichols, J. Baumbach, C. Avery, J. Winchell, A. Aragon*

BACKGROUND: *Mycoplasma pneumoniae* is the leading cause of pneumonia among U.S. school-age children. Outbreaks in residential institutions are difficult to control. In July 2009, an eight-unit residential treatment center for children with behavior and psychiatric problems

reported pneumonia among residents. *M. pneumoniae* was suspected because of residents' age, symptoms, and setting. We investigated to confirm etiology, modes of transmission, and risk factors.

METHODS: A retrospective cohort study was conducted among facility residents and staff. Oropharyngeal (OP) or nasopharyngeal (NP) swabs collected from staff and residents were tested for M. pneumoniae. Among staff or residents, confirmed cases included fever, cough or sore throat, and radiographic pneumonia or positive polymerase chain reaction (PCR); probable cases included fever, cough, and sore throat, without pneumonia.

RESULTS: Nineteen confirmed (10 by PCR) and six probable cases occurred among 77 residents (attack rate: 32%). Attack rates were higher in units allowed to comingle than in relatively isolated units (67%–100% versus 0%–43%). Three confirmed (all by PCR) and 24 probable cases occurred among 197 staff (attack rate: 14%). Attack rate among residents was significantly higher than among staff (risk ratio=2.4;P>.005). In five of the six units with cases among residents, staff illness onset preceded resident illness onset. Forty-six percent of all staff, and 98% of staff in the unit with the highest attack rate, worked in multiple units.

CONCLUSIONS: *M. pneumoniae* caused this outbreak. Resident comingling between units likely resulted in higher attack rates in those units. Despite a low staff attack rate, transmission into relatively isolated units likely resulted from ill staff working in multiple units. Decreasing resident comingling and limiting multiple-unit staffing might decrease transmission during institutional outbreaks.

KEYWORDS: *Mycoplasma*, outbreak, children, pneumonia, institutions

FRIDAY, APRIL 23
SESSION Q: Third Rock from the Sun

Environmental Health ..... Ravinia Ballroom, 8:30–9:55 a.m.

MODERATOR: ***Mike McGeehin***

8:35

Community Needs Assessment for Public Health Emergency Response Following the Earthquake and Tsunami — American Samoa, 2009

AUTHORS: ***Ekta Choudhary, T. Chen, C. Martin, T. Bayleyegn, J. Roth, S. Vagi, R. Noe, M. Kiem, S. Lemusu, A. Wolkin***

BACKGROUND: An 8.3 magnitude earthquake followed by a tsunami devastated American Samoa on September 29, 2009, resulting in 32 deaths and widespread loss of municipal water, electricity, and sanitation services. The American Samoa Department of Health (ASDOH), with assistance from CDC, conducted initial and follow-up Community Needs Assessments for Public Health Emergency Response (CASPER), 5 days and 3 weeks after the tsunami, respectively. We describe findings from the follow-up CASPER.

METHODS: We used a modified cluster-sampling method to conduct the CASPER. We administered a household questionnaire eliciting information about medical and basic needs

illnesses and injuries, and mental health concerns. In order to assess response efforts, we calculated the difference in percentages of basic and medical needs between the initial and follow-up CASPER.

RESULTS: Three weeks after the tsunami, households (N=207) reported increased mosquito breeding sites (49.8%), unsafe housing structure (40.4%), an ill family member (35%), need for clothes (28%), and no electricity (11%). Food (26%), financial help (14%), and water (13%) were identified as self-reported greatest need. Households reported increased mental health concerns (trouble sleeping: 46.9%; anxiety: 12.6%; difficulty concentrating: 13%). We compared the initial and follow-up CASPER and observed decreases in electricity (-40.4%), water (-16.4%), clothing (-10.2%) needs; as well as illnesses (-4.3%), and injuries (-6.3%) and an increase in medical care needs (+10.6%) was observed.

CONCLUSIONS: Findings helped ASDOH and other agencies to assess response efforts and identify additional needs. Based on these findings, ASDOH received funding to address community needs (e.g. mosquito repellent, medical supplies), established long- and short-term mental health programs, and proposed programs to increase community education to prevent vector-borne diseases.

KEYWORDS: CASPER, disaster epidemiology, rapid needs assessment, tsunami

8:55

Are Formaldehyde Levels in Portable and Traditional Classrooms a Cause for Concern? Georgia, 2009

AUTHORS: *Isabela C. Ribeiro, P. Kowalski, J. Malilay, D. Moffett, D. Callahan, G. Noonan, P. Garbe, S. Moore, S. Metcalf, M. McGeehin*

BACKGROUND: Elevated formaldehyde levels in FEMA-supplied trailers and mobile homes used in recent hurricane events have prompted similar assessments in portable classrooms (350,000 in use in U.S.), where school-aged children spend significant time. This pilot investigation assessed formaldehyde levels and potential factors that could affect formaldehyde levels in portable (PCs) and traditional classrooms (TCs).

METHODS: Cross-sectional evaluation of formaldehyde levels in TCs and ≤ 3 years old (new or refurbished) PCs in one school district in Georgia, May 2009. Consecutive day and overnight continuous indoor air samples were collected from three TCs and nine PCs. Teachers and facility managers answered a questionnaire addressing classrooms' characteristics.

RESULTS: Five of nine PCs were refurbished units; none had indoor carpeting or HVAC units replaced in the past 3 years. Six teachers (50%) considered the classrooms' environmental quality adequate, and only two reported frequently turning off the AC because of excessive noise. Formaldehyde levels ranged from 7–36 ppb. In both TCs and PCs, overnight formaldehyde median levels (19 and 18 ppb, respectively) were higher than day median levels (16 and 11 ppb, respectively). No significant differences were found for indoor temperature (F) and

humidity (%) between the two types of classrooms. Carbon Dioxide (CO2) levels ranged from 509–1405 ppm; medians were higher at night (942 ppm) than during the day (749 ppm) and higher in TCs (1106 ppm) than in PCs (710 ppm).

CONCLUSIONS: This study did not identify levels of formaldehyde that are associated with adverse health effects. However, the observed CO2 levels were found to be elevated (>1100ppm), particularly in TCs. Recommendations to reduce CO2 levels in the classrooms, by improving ventilation, have been made.

KEYWORDS: indoor air quality, schools, formaldehyde, carbon dioxide

9:15

Lead Poisoning in U.S.-Bound Burmese Refugee Children — Thailand-Burma Border Refugee Camps, May–June 2009

AUTHORS: *Tarissa Mitchell, E. Jentes, L. Ortega, P. Bajcevic, V. Parr, K. Caldwell, M. Brown, J. Painter*

BACKGROUND: Lead poisoning has permanent neurocognitive sequelae, and its prevalence is approximately 1% among children in the U.S. However, refugee children resettled to the U.S. have had a higher prevalence. CDC recommends screening resettled refugee children after arrival, but the prevalence and risk factors for lead poisoning before resettlement have not been described. We sought to determine these factors among Burmese refugee children living in camps in Thailand.

METHODS: During May– June 2009, capillary blood from Burmese refugee children in Thailand aged 6 months– 14 years was analyzed for lead and hemoglobin, using portable instruments. Children with elevated (EBLL, 10 μg/dL) or undetectable (<3.3 μg/dL) lead levels were enrolled in a case-control study to determine risk factors.

RESULTS: Of 645 children tested, 33 (5.1%) had EBLLs; 65 (10.1%) had undetectable levels. Of children <2 years old, 14.4% had EBLLs. Multivariate analyses showed that car battery exposure (odds ratio [OR] 44.7; 95% confidence interval [CI] 1.7–57.2; P=0.03; % exposed [%E] 66.7), hemoglobin <10 g/dL (OR 43.6; CI 1.8–49.4; P=0.02; %E 66.7), and mouthing non-food items (OR18.6; CI 0.95–36.2; P=0.1; %E 91.7) were associated with EBLLs in children <2 years of age.

CONCLUSIONS: The prevalence of EBLLs among Burmese refugee children in Thailand was at least 5 times the U.S. prevalence. Exposures uncommon in U.S. children, such as car batteries, and poorer nutritional status may account for this difference. Testing before departure for the U.S. provided an opportunity to identify refugee children with EBLLs, remediate lead exposures and alert public health officials in the U.S. Portable lead testing instruments may be valuable screening tools for rapid evaluation of children in refugee camps.

KEYWORDS: lead poisoning, refugees, anemia, settlement and resettlement

9:35
Outbreak of Acute Pesticide-Related Illness — Bangladesh, April 2009

AUTHORS: *Ellen E. Yard, A. Siston, E. Gurley, J. Thomas, M. Hossain, M. Rahman, M. Hussain, J. Schier, A. Chang, D. Birkholz, C. Skinner, A. Wolkin, L. Lewis, C. Martin*

BACKGROUND: Approximately 500,000 cases of pesticide poisoning occur in developing countries annually. In Bangladesh, three-quarters of the workforce engages in agricultural practices; pesticide use is widespread and increasing. In April 2009, Bangladesh health officials identified a cluster of children with sudden onset of severe illness in two neighboring rural villages that resulted in three fatalities. Bangladesh requested CDC epidemiologic and laboratory support to investigate potential pesticide poisoning.

METHODS: We conducted a retrospective cohort study of all children ≤10 years old in both villages. Case-patients were those presenting with ≥2 symptoms characteristic of cholinergic inhibition during the outbreak period (April 2-22). Village-specific risk ratios (RR) and 95% confidence intervals (CI) were calculated. Serum was collected from 7 cases and 13 non-cases and screened for organophosphate and carbamate pesticides.

RESULTS: Eleven case-patients and 29 non-cases were identified (attack rate=27.5%, case fatality rate=27.3%). Case-patients experienced cold skin (90.9%), excessive sweating (81.8%), frothy oral discharge (81.8%), limb weakness (72.7%), and loss of consciousness (63.6%). For three case-patients, serial plasma cholinesterase measurements indicated that levels were initially depressed on presentation, but increased >20% after 30 days. The symptoms and depressed cholinesterase both suggested poisoning with a cholinesterase inhibitor. The carbamate insecticide carbofuran was detected in the two cases with serum collected <10 hours following symptom onset. In one village, potential pesticide-related exposure routes included eating mangoes (RR=undefined, all cases reported consuming mangoes) and contact with mud (RR=7.43, Approximate 95% CI=1.0-54.3).

CONCLUSIONS: Case-patients' clinical presentations, depressed plasma cholinesterase, and serum pesticide analyses suggest carbofuran poisoning. Recommendations include improved pesticide regulation, community education regarding safe pesticide usage and food handling, and further study to confirm the outbreak's source and exposure routes.

KEYWORDS: unintentional poisoning, pesticides, acute cholinergic syndrome, carbamate, carbofuran

FRIDAY, APRIL 23
SESSION S: The Closer
Food- and Waterborne Diseases in the International Setting
Ravinia Ballroom, 1:30–3:15 p.m.

MODERATOR: *Michael J. Beach*

1:35

Evaluation of Pot-Chlorination of Wells During a Cholera Outbreak — Bissau, Guinea-Bissau, 2008

AUTHORS: *Elizabeth C. Cavallaro, J. Harris, J. Santos Barrado, A. Nóbrega, J. Sobel, E. Mintz*

BACKGROUND: Waterborne cholera epidemics are a major public health problem in sub-Saharan Africa. Guinea-Bissau has experienced five cholera epidemics since 1994. The most recent epidemic occurred in 2008, causing >14,000 cases and 225 deaths; in Bissau, UNICEF-designed pot-chlorinators were used to disinfect shallow wells, a common source of drinking water. We evaluated the ability of pot-chlorinators to achieve free residual chlorine (FRC) levels in well water adequate to inactivate *Vibrio cholerae*.

METHODS: Thirty wells were randomly selected from six neighborhoods. Pot-chlorinators - bottles filled with gravel, sand, and calcium hypochlorite granules - were placed in each well. FRC was measured before and 24, 48, and 72 hours after placement and compared with WHO-recommended levels of ≥1 mg/L during cholera outbreaks and 0.2-5mg/L in non-outbreak settings. Presence of well covers, distance from wells to latrines, and rainfall were noted.

RESULTS: Complete post-chlorination data were collected from 26 wells; 15 (58%) were <2 meters deep, with well volumes from 0.6-8.0 m3. Twenty-four (92%) wells had a latrine <30 meters away. Four (15%) wells were covered on all observation days; rain fell on the second night at all wells. At baseline, no wells had FRC >0.09 mg/L. Four (15%), one (4%), and no wells had FRC ≥1 mg/L and 16 (62%), 4 (15%), and 1 (4%) wells had FRC between 0.2-5 mg/L at 24, 48, and 72 hours post-chlorination, respectively. Several families reported stopping household water chlorination after wells were treated with pot-chlorinators.

CONCLUSIONS: Pot-chlorinators failed to achieve WHO-recommended FRC levels in wells during a cholera outbreak, and conveyed a false sense of security to local residents. Pot-chlorination should be discouraged and alternative approaches to well-water disinfection promoted.

KEYWORDS: *Vibrio cholerae*, well chlorination, pot-chlorinators

1:55

Rapid Assessment of Aflatoxin Contamination in Food Commodities–Bangladesh, 2009

AUTHORS: *Monika Roy, J. Harris, S. Afreen, S. Balajee, E. Deak, L.Gade, B. Park, S. Luby, T.Chiller*

BACKGROUND: Aflatoxin, a toxic metabolite produced by Aspergillus spp. fungi, can cause liver failure, hepatocellular carcinoma, and death in humans. In acute aflatoxicosis outbreaks, animal deaths often precede human disease. Recent reports of poultry deaths due to aflatoxicosis in Bangladesh raised concern about potential human exposure. To address this, we performed a rapid cross-sectional study to investigate the burden of aflatoxin contamination in common Bangladeshi foods.

METHODS: We collected human food and poultry feed samples in three cities in Bangladesh: Dhaka, Chittagong, and Sirajganj. Sites were selected based on location of poultry aflatoxicosis deaths and climatologic data indicating a high risk for fungal crop contamination. Eight commonly ingested commodities (rice, lentils, wheat flour, dates, betelnut, red chili powder, ginger, groundnuts), and poultry feed were collected from two main market sites in each city. Aflatoxin levels were quantified in pooled subsamples of each commodity using fluorescence high-performance liquid chromatography.

RESULTS: Aflatoxin levels were highest in dates and groundnuts, with maximum levels of 623 and 423 parts per billion (ppb), respectively (U.S. human food standard, <20 ppb). Betelnut (mean 30.6, range 5.1-63 ppb), lentils (mean 21.2, range 4.8-43 ppb), and red chili powder (>20 ppb) also had very high aflatoxin levels. Rice, wheat flour, and ginger had mean aflatoxin levels of 0.28 (range 0-0.85 ppb), 1.38 (range 0.92-1.6 ppb), and 3.21 (range 0-6 ppb) ppb, respectively. Mean aflatoxin level in poultry feed was 73 ppb (range 70-77 ppb).

CONCLUSIONS: Aflatoxin levels were above the US standard in five of eight commonly-ingested foods tested. The effect of elevated aflatoxin levels in these foods and its association with human health require further investigation.

KEYWORDS: aflatoxins, Bangladesh, poultry, food

2:15

Changing Water Treatment Practices in People Living with HIV/AIDS in Response to Diarrhea Prevention Programs — Gonder, Ethiopia, 2008–2009

AUTHORS: *Ethel V. Taylor, A. Bhattarai, C.E. O'Reilly, S. Alemayehu, R. Fantu, V. Cuellar, B. Marston, Y. Belayneh, T. Sewnet, T. Kebede, A. Mekonnen, J. Ahmed, R. Quick*

BACKGROUND: In Ethiopia, people living with HIV/AIDS (PLWHA) have an increased risk of diarrheal diseases. Household drinking water chlorination reduces diarrhea risk in PLWHA. Several organizations in Ethiopia have provided free locally-produced "WuhuAgar" for water chlorination to clients in antiretroviral treatment (ART) programs. In 2009, free national distribution of basic care packages (BCP) containing WuhuAgar and other proven

interventions, was initiated. We evaluated changing WuhuAgar use patterns in response to these programs.

METHODS: We surveyed ART clinic clients in the hospital in Gonder, Ethiopia about water treatment practices and confirmed WuhuAgar use by testing stored water for residual chlorine in clients' homes at three time points: in December 2008 among 77 clients (Survey 1), in September 2009 among 405 clients as a baseline before BCP distribution (Survey 2), and in October-November 2009 among the same 405 clients' following BCP distribution (Survey 3).

RESULTS: Survey respondents were predominantly female (72%), 67% had no income, and 31% had no education. From Survey 1 to Survey 3, there were sequential increases in the percentage of respondents who reported obtaining free WuhuAgar (3% to 28% to 100% [$P<0.01$]), receiving counseling on proper use of WuhuAgar (22% to 55% to 100% [$P<0.01$]), and treating their stored water with WuhuAgar (18% to 28% to 98% [$P<0.01$]). Significant sequential increases were also found from Survey 1 to Survey 3 in observation of WuhuAgar bottles (7% to 23% to 95% [$P<0.01$]) and detection of residual chlorine in stored drinking water (4% to 17% to 66% [$P<0.01$]) in respondents' homes.

CONCLUSIONS: Free distribution of WuhuAgar and counseling on proper use, both before and during BCP dissemination, significantly increased drinking water treatment behavior of PLWHA.

KEYWORDS: HIV/AIDS, safe water, diarrhea, diarrheal disease

2:35
Excess Mortality During Epidemic Cholera — Cameroon, 2009

AUTHORS: ***Emily J. Cartwright, M. Patel, R. Djao, F. Mbopi-Keou, E. Mintz, R. Quick***

BACKGROUND: Epidemic cholera can be rapidly fatal, and occurs frequently in Cameroon. From September-December 2009, cholera caused 717 cases and 85 deaths in Cameroon (case fatality rate [CFR] =12%). With appropriate treatment, the cholera CFR should be <1%.

METHODS: We conducted a retrospective cohort study of cholera mortality by interviewing cholera survivors and relatives of decedents in villages with at least one cholera survivor and one death. We defined cholera as acute, watery diarrhea in a person ≥2 years old with onset after August 31, 2009. In local health facilities, we abstracted medical charts and interviewed healthcare workers (HCWs).

RESULTS: We identified 109 cholera patients, including 29 decedents and 80 survivors in 14 villages. The median age was 25 years (range 2-90); 39% were male. Only 3% of cholera decedents and 12.5% of survivors used oral rehydration salts (ORS) at home ($P=0.17$). Cholera decedents were less likely than survivors to have sought care outside the home (69% vs. 95%, $P=0.0008$) and to have lived ≤15 minutes of a health facility (14% vs. 51% $P=0.02$). Among those who sought care at a health facility, survivors were more likely to spend the night (91% vs. 33%, $P<0.0001$) and receive ORS (91% vs. 55%, $P<0.001$) or IV fluids (76% vs. 55%, $P=0.03$).

Five (42%) of 12 health facilities with cholera decedents exhausted rehydration supplies compared with none of nine facilities without decedents (P=0.006). Only 44% of HCWs had received cholera training before the epidemic.

CONCLUSIONS: To reduce cholera mortality, authorities should increase the availability of ORS in communities, urge those with cholera symptoms to seek care promptly, train HCWs on appropriate cholera management, and assure adequate rehydration supplies.

KEYWORDS: cholera, diarrhea, mortality, ORS

2:55

Trends in Diarrheal Disease Mortality and Use of Household Water Treatment, Kisumu Health and Demographic Surveillance System (KHDSS) — Nyanza Province, Kenya, 2003–2007

AUTHORS: *Kashmira A. Date, R. Quick, D. Feikin, K. Laserson, S. Ogwang, M. Hamel*

BACKGROUND: Diarrheal diseases are a leading cause of death in children <5 years old in Kenya. In 2003, a nationwide campaign was initiated to reduce the risk of diarrhea through local sale of chlorine solution for household water treatment. To measure the impact of this program on trends in diarrhea-associated mortality and use of chlorine products in Nyanza Province, Kenya, we examined data from the Kisumu Health and Demographic Surveillance System (KHDSS), a longitudinal, population-based health and vital event registration system designed to monitor health and demographic dynamics in 385 villages in Nyanza province in rural western Kenya.

METHODS: We examined the KHDSS demographic, socioeconomic and verbal autopsy data from 2003–2007. We determined household demographic and socioeconomic characteristics, including water treatment practices; and, annual trends in diarrheal disease mortality among children <5 years and persons ≥15 years old.

RESULTS: From 2003–2007, 532 (12%) of 4,587 deaths among children <5 years old, and 307 (4%) of 7,969 deaths among persons ≥15 years old were determined to be diarrhea-specific. During this period, the population under KDHSS surveillance increased from 134,990 to 204,000, and diarrhea-specific mortality decreased from 7.6 to 1.4 deaths per 1,000 children <5 years old, and from 1.4 to 0.2 deaths per 1,000 persons ≥15 years old. Among 65,104 households with available water treatment data, the use of chlorine water treatment products steadily increased from 4% in 2003 to 27% in 2007.

CONCLUSIONS: Preliminary data analyses show a substantial reduction in diarrhea-specific mortality and a simultaneous increase in utilization of water treatment products. Further study is warranted to determine whether household water treatment practices have contributed to declining diarrhea mortality rates.

KEYWORDS: diarrhea-associated deaths, Health and Demographic Surveillance System, water treatment, population-based

3:15

Closing Remarks and Adjournment ..... Ravinia Ballroom

Stephen B. Thacker, **Deputy Director for Surveillance, Epidemiology and Laboratory Services, CDC**

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