Conclusion. Granger causality tests are commonly used in economic modeling but have not been routinely applied to infectious diseases. Using this test, we found a strong correlation between weekly cases of hospitalized influenza and iGAS septic shock or pneumonia. This approach can provide insight into the potential impact of developing prevention interventions for infections with strong correlation. Further exploration of Granger tests in infectious disease modeling should be considered.

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686. Use of an Influenza-Like Illness School Absenteeism Monitoring System to Identify Seasonal Influenza Outbreaks in the Community: ORCHARDS (Wisconsin, September 2014–June 2017) Jonathan Temte, MD, PhD; Yentil Zheteveya, MD, MPH2; Shari Barlow, BA1; Matthew Gore, BS2; Anber Schafer, BA2; Bryan Berent, MS1; Cristalyne Bell, BA1; Erik Reisdorf, MPH1; Peter Shult, PhD1; Mary Wedig, BS1; Thomas Haupt, MS1; James Conway, MD FAAP1; Ronald Gangnon, PhD1; Ashley Fowlkes, MPH1 and Anma Uzicanin, MD, MPH1; Family Medicine, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin, 2Department of Biostatistics and Medical Informatics, School of Medicine and Public Health, University of Wisconsin - Madison, Madison, Wisconsin, 3Influenza Division, Centers for Disease Control and Prevention, Atlanta, Georgia, 4Communicable Disease Division, Wisconsin State Laboratory of Hygiene, Madison, Wisconsin, 5Bureau of Communicable Diseases, Wisconsin Division of Public Health, Madison, Wisconsin, 6Pediatrics, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin, 7Department of Biostatistics and Medical Informatics, School of Medicine and Public Health, University of Wisconsin – Madison, Madison, Wisconsin, 8Influenza Division, Centers for Disease Control and Prevention, Atlanta, Georgia, 9CDC, Atlanta, Georgia

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Background. Schools are purported to be primary venues of influenza transmission and amplification with secondary spread to communities. We assessed K–12 schools for absenteeism monitoring as a means for early detection of influenza activity in the community.

Methods. We conducted a 3-year, prospective observational study of all-cause (a-TOT), illness-associated (a-I), and influenza-like illness-associated (a-ILI) absenteeism within the Oregon School District, Oregon, WI (OSD; enrollment = 3,900 students). Absenteeism reporting was facilitated by automated processes within OSD’s electronic student information system. Students were screened for ILI and, if eligible, visited at home, where pharyngeal specimens were collected for influenza RT-PCR (IVD CDC Human Influenza Virus RT-PCR Diagnostic Panel) and multipathogen testing (Luminex). The study definition of a-ILI was validated for 700 children with acute respiratory infections using binomial logistic regression. Surveillance of medically attended laboratory-confirmed influenza (MAI) occurred in five primary care clinics in and adjacent to Madison as part of Wisconsin Influenza Surveillance Project using the same laboratory testing. Poisson general additive log linear regression models of daily counts of absenteeism and MAI were compared using correlation analysis.

Results. Influenza A and B were detected in 54 and 51 of the 700 visited students, respectively. Influenza was significantly associated with a-ILI absenteeism (OR = 4.74; 95% CI: 2.78—8.18; P < 0.001) with a 1-day lead time. a-TOT performed poorly (P = 0.472; P < 0.001) with a 15-day lead time. a-ILI was significantly correlated with MAI in the community (r = 0.480; P < 0.001) with a 1-day lead time. a-TOT performed poorly (r = 0.278; P < 0.001), following MAI by 9 days (Figure 1).

Conclusion. Surveillance using cause-specific absenteeism was feasible to implement in OSD and performed well over a 3-year period marked by diverse presentations of seasonal influenza. Monitoring a-ILI and a-ILI can detect influenza outbreaks in the community, providing early warning in time for community mitigation efforts for seasonal and pandemic influenza.

687. Modeling the Impact of Introduction of Influenza Vaccination on ILI Cumulative Case Count in Cameroon Ubald Temoue, MPH, MS1; Nancy Ortiz, MPH, PhD candidate2; Karen Saylor, PhD2; Matt Leffトン, MS3; Viviane Megusa, MS1; Cyrille Djoko, PhD3 and Richard Njouom, PhD1; Metaibota Cameroon, Yaoundé, Cameroon, 2Metaibota, San Francisco, California, 3Mosaic, Yaoundé, Cameroon

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Background. Influenza illness can range from mild to severe, with serious outcomes occurring in children and the elderly. Flu has been studied extensively in geographies where vaccine is often plentiful. The burden of influenza is not well known in tropical regions where vaccine coverage is scant. Our study examines the impact of introducing flu vaccination into Cameroon.

Methods. The data consists of 1 year of flu surveillance from patients presenting with influenza-like illness at clinics in Cameroon. Samples underwent RT-PCR influenza screening. Analysis was performed in Berkeley Madonna. We developed ordinary differential equations (ODEs) under the SEIR compartmental model and calculated R0. We estimated the proportion of cases the clinics observed to make inferences to the catchment population of these health facilities. We developed another set of ODEs to introduce vaccination using a pulse function with a 50% efficacy and 45% vaccination coverage.

Results. We observed vaccination at 45% coverage (US average). Cameroon would likely achieve reduced coverage. Therefore, we examined introducing vaccination with 10% coverage, and observed that flu cases were cut by over one third.

Conclusion. This analysis demonstrates that introducing vaccination in Cameroon clinics would reduce influenza cases substantially even with only a small proportion of the population vaccinated. Flu vaccination campaigns should be strongly considered as they can reduce case counts which may reduce the likelihood of transmitting flu to those who are at risk.

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688. Impact of Expanded Influenza Post-exposure Prophylaxis on Healthcare Worker Absenteeism at a Tertiary Care Center During the 2017–2018 Season Mireia Puig-Assenjo, MD, PhD; Margaret Douglas, RKT, MPH; Stephanie Holley, MBA, BSN; Mary Beth Kukla, BSN, RN; Oluchi Abosi, MPH, MBChB; Lisa Mascaro, PharmD; Brenda Carmody, BS, Pharm RPh; Courtney Gest, PharmD; Daniel Oey, MD, FIDSA, FSHEA; Patrick Hartley, MD, MPH; Michael Edmond, MD, MPH, MPA, FIDSA, FSHEA and Jorge L. Salinas, MD; University of Iowa Hospitals and Clinics, Iowa City, Iowa

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Background. A severe 2017–2018 influenza season was expected for the United States. We hypothesized that a surge in influenza cases paired with decreased vaccine effectiveness could increase healthcare worker (HCW) absenteeism. Because of a potential public health emergency during the 2017–2018 season, we offered oseltamivir post-exposure prophylaxis (PEP) to exposed HCWs regardless of vaccination status. We describe PEP uptake, cost, and impact on absenteeism at the University of Iowa Hospital and Clinics (UIHHC).

Methods. UIHHC serves as a referral and safety net health system for Eastern Iowa. Influenza seasons were defined as the period between Week 40 from 1 year to Week 13 of the following year. During the 2016–2017 season, PEP (75 mg/day for 7 days) was offered free of charge to unvaccinated exposed HCWs. Exposure was defined as being within 45 minutes of a confirmed influenza-infected person for ≥10 minutes without mask protection, or direct contact with respiratory secretions. During the 2017–2018 season, PEP was expanded to all exposed HCWs regardless of vaccination status. We reviewed surveillance, employee health, pharmacy, and human resources records for the 2016–2017 and 2017–2018 seasons. We defined PEP uptake as prescriptions picked up/all referrals and absenteeism rate as sick-leave requests/scheduled hours.

Results. During the 2016–2017 and 2017–2018 seasons, we detected 373 and 427 confirmed influenza cases among patients at UIHHC. HCW vaccination rates were similar: 89.7% and 90.9%. PEP was recommended in 49 exposures during 2016–2017 and 280 exposures during 2017–2018. A total of 22 (44.9%) and 133 (47.5%) HCWs picked up oseltamivir from the pharmacy during the 2016–2017 and 2017–2018 seasons. The estimated cost of oseltamivir was $1,791 and $10,828, respectively. Overall, 2,187 sick-leave requests (median = 12 hours, absenteeism rate = 3.2%), and 6,174 sickleave requests (median = 12 hours, absenteeism rate = 3.4%) were reported during the 2016–2017 and 2017–2018 seasons.

Conclusion. Influenza case counts mildly increased from the 2016–2017 to the 2017–2018 season. Expanding PEP to all exposed HCWs, regardless of vaccination status, had moderate uptake and was costly. Absenteeism rates remained similar during both seasons.

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689. Narcolepsy During the 2009–2010 H1N1 Pandemic Wan-Ting Huang, MD1; and Tien-Yu Owen Yang, MD DPhil1; 1Office of Preventive Medicine, Centers for Disease Control, Taipei, Taiwan, 2Nuffield Department of Population Health, University of Oxford, Oxford, UK

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Background. In Taiwan, H1N1 vaccination began on November 1, 2009 and coincided with peak H1N1 pandemic activity. Nationwide ecological and case–control studies have identified no substantial association between the use of H1N1 vaccines and narcolepsy; however, wild-type H1N1 virus infection might have triggered narcolepsy onset, or potentially confounded the findings.

Methods. Data collected in the nationwide case–control study was reanalyzed. Confirmed narcolepsy cases (Brighton levels 1–2 for ages 0–15 years and 1–4 for ages at least 16 years) with onset during November 1, 2009–September 30, 2010 were included and ascertained receipt of H1N1 vaccines. We compared incidence of narcolepsy between the H1N1 vaccinated and unvaccinated population and assessed daily cumulative risk throughout the study period, with adjustment for age. We applied population estimates (census data, 2009) and daily doses of H1N1 vaccines administered (Influenza Vaccine Information System) to calculate the number of persons and person-time for each group.

Results. There were 22 narcolepsy cases; five (23%) occurred after H1N1 vac- cineation. The vaccinated population had higher incidence (1.2 vs. 1.0 per million person-years, P = 0.711) (incidence rate ratio 1.24, 95% confidence interval [CI] 0.60–3.83), and higher cumulative risk (1.1 vs. 0.9 per million persons, P = 0.772) (risk ratio 1.16, 95% CI 0.43–3.14) of narcolepsy (figure). These differences, however, were not significant.

Conclusion. We found comparable average and cumulative risk of narcolepsy between the H1N1 vaccinated and unvaccinated Taiwanese population during the 2009–2010 pandemic.

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691. Real-Time Local Influenza Forecasting Using Smartphone-Connected Thermometer Readings

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Background. Information regarding influenza activity can inform clinical and public health activities. However, current surveillance approaches induce a delay in influenza activity reports (typically 1–2 weeks). Recently, we used data from smartphone connected thermometers to accurately forecast real-time influenza activity at a national level. Because thermometer readings can be geo-located, we used state-level thermometer data to determine whether these data can improve state-level surveil- lance estimates.

Methods. We used temperature readings collected by the Kinsa smart-ther- mometer and mobile device app to develop state-level forecasting models to predict real-time influenza activity (1–2 weeks in advance of surveillance reports). We used state-reported influenza-like illness (ILI) to represent state influenza activity for 48 US states with sufficient surveillance data. Counts of temperature readings, fever episodes and reported symptoms were computed by week. We developed autoregressive time-series models and evaluated model performance in an adaptive out-of-sample manner. We compared baseline time-series models containing lagged state-reported ILI activity to models incorporating exogenous thermometer readings.

Results. A total of 10,262,212 temperature readings were recorded from October 30, 2015 to March 29, 2018. In nearly all of the 48 states considered, weekly forecasts of ILI activity improved considerably when thermometer readings were incorpo- rated. On average, 23.8% cold forecasting accuracy improved by 23.9% with baseline time-series models. In many states, such as PA, New Mexico, VA, Virginia, New York and SC, out-of-sample forecast error was reduced by more than 50% when thermometer data were incorporated. In general, forecasts were most accurate in states with the greatest number of device readings. During the 2018–2019 influenza season, the average improvement in forecast accuracy was 24.4%, and thermometer readings improved forecasting accuracy in 41, out of 48, states.

Conclusion. Data from smart thermometers accurately track real-time influenza activity at a state level. Local surveillance efforts may be improved by incorporating such information. Such data may also be useful for longer-term forecasting.

Disclosures. I. Singh: Kinsa Inc.: Member Board, Employee and Shareholder, equity received and Salary. S. Pilewski: Kinsa Inc.: Employee and Shareholder, equity received and Salary. V. Petrowski: Kinsa Inc.: Employee and Shareholder, equity received and Salary.

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692. Effects of Regional Climatic Variability on West Nile Virus Outbreaks in the United States

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Background. Transmission of WNV to humans in the United States typically occurs between June and September since warm temperatures accelerate mosquito life cycle. Precipitation can cause increase in aquatic breeding but outbreaks often depends upon human water management. We examine epidemiology, patterns of WNV disease transmission, and identification of high-risk areas in the United States from 2003 to 2014.

Methods. Trends and relationships of WNV cases and climatic factors were analyzed at the state level. We characterized the periods of the WNV epizootic (2003–2014). We used data from the CDC and state surveillance systems to describe the WNV disease and population density. The CDC page was set to include a moving average of the cases by state, age, gender and reported WNV cases by state and year. The CDC page was also set to include a moving average of the cases by state, age, gender and reported WNV cases by state and year. The CDC page was also set to include a moving average of the cases by state, age, gender and reported WNV cases by state and year.

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Conclusion. Data from smart thermometers accurately track real-time influenza activity at a state level. Local surveillance efforts may be improved by incorporating such information. Such data may also be useful for longer-term forecasting.

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