Table 1. Predictive performance of pneumonia and sepsis scores for severity and mortality in Influenza

Severity								
Score	Sensitivity	Specificity	PPV	NPV	Accuracy	AUC	p value	CI 95%
FluMex	40.4 (25.6-56.7)	86.7 (77.5-93.1)	60.7 (44.3-74.9)	74.2 (68.8-78.9)	71.2 (62.4-78.9)	0.63	0.01	0.52-0.74
CURB-65	11.9 (3.9-25.6)	97.5 (91.5-99.7)	71.4 (33.6-92.5)	68.6 (66.0-71.0)	68.8 (59.9-76.7)	0.55	0.38	0.43-0.66
PSI	9.5 (2.6-22.6)	100 (95.6-100)	100	68.6 (66.4-70.6)	69.6 (60.7-77.5)	0.45	0.38	0.34-0.56
CROMI	46.3 (30.6-62.7)	51.2 (39.9-62.4)	32.2 (24.2-41.4)	65.6 (57.2-73.1)	49.5 (40.4-58.7)	0.49	0.83	0.38-0.60
SIRS	71.4 (55.4-84.2)	39.5 (28.8-50.9)	37.9 (32.0-44.2)	72.7 (60.6-82.2)	50.4 (41.2-59.5)	0.55	0.39	0.44-0.65
qSOFA	14.2 (5.4-28.5)	91.5 (83.3-96.5)	46.1 (23.5-70.5)	67.8 (64.7-70.8)	65.6 (56.5-73.8)	0.53	0.60	0.42-0.64
SOFA	43.9 (28.4-60.2)	57.8 (46.4-68.6)	33.9 (25.1-44.1)	67.6 (60.0-74.3)	53.2 (44.0-62.2)	0.51	0.81	0.40-0.62
ILI	18.9 (10.7-29.7)	55.1 (40.2-69.3)	38.8 (26.5-52.8)	31.0 (25.4-37.2)	33.3 (25.0-42.4)	0.53	0.57	0.42-0.64
Mortality								
Score	Sensitivity	Specificity	PPV	NPV	Accuracy	AUC	p value	CI 95%
FluMex	100 (39.7-100)	80.1 (71.9-96.9)	14.2 (10.4-19.2)	100	80.8 (72.7-87.2)	0.90	0.006	0.83-0.97
CURB-65	75 (19.4-99.3)	96.6 (91.7-99.1)	42.8 (19.7-69.6)	99.1 (95.5-99.8)	96 (90.9-98.6)	0.86	0.01	0.60-1.00
PSI	50 (6.7-93.2)	98.3 (94.1-99.8)	50 (15.6-84.4)	98.3 (95.7-99.3)	96.8 (92-99.1)	0.30	0.10	0.00-0.56
CROMI	50 (6.7-93.2)	52.1 (42.7-61.3)	3.3 (1.2-8.6)	96.8 (91.9-98.8)	52.0 (42.8-61.1)	0.51	0.94	0.22-0.80
SIRS	100 (39.7-100)	36.9 (28.3-46.3)	5.0 (4.4-5.7)	100	39.0 (30.3-48.2)	0.68	0.21	0.49-0.87
qSOFA	50 (6.7-93.2)	90.9 (84.3-95.3)	15.3 (5.5-36.0)	98.2 (95.3-99.3)	89.6 (82.8-94.3)	0.70	0.17	0.39-1.00
SOFA	0 (0-60.2)	55.8 (46.4-64.8)	0	94.3 (93.4-95.1)	54.0 (44.8-63.0)	0.28	0.14	0.10-0.45
ILI	50 (6.7-93.2)	71.4 (62.4-79.3)	5.5 (2.0-14.0)	97.7 (94.0-99.1)	70.7 (61.8-78.5)	0.62	0.40	0.35-0.90

AUC: area under the curve; CURB-65: Confusion, Urea, Respiratory rate, Blood pressure, age > 65 years; PSI: pneumonia severity index; CROMI: C: Comorbidities, Respiratory rate, Oxygen saturation, Mental status change, Infiltrates at chest radiograph; CI: confidence interval; ILI: Influenza-like Illness; NPV: negative predictive value; PPV: positive predictive value; SIRS: Systemic Inflammatory Response Syndrome; qSOFA: quick Sequential Organ Failure Assessment score; SOFA: Sequential Organ Failure Assessment score.

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2322. Etiology, Severity of Illness, and Risk Factors for Patients Hospitalized with Acute Gastroenteritis from Multi-Site Veteran's Affairs (VA) Surveillance, 2016–2018: Results from SUPERNOVA

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Background. The severity of acute gastroenteritis (AGE) in adult populations and the relative contribution of specific pathogens is not well characterized. In 2016, we implemented a multisite AGE surveillance platform in 4 VA hospitals (Atlanta, Bronx, Houston and Los Angeles), collectively serving > 320,000 patients annually.

Methods. Inpatient AGE cases and age- and time-matched non-AGE controls were identified through prospective screening of admissions using standardized case definitions. Stool samples were tested for 22 pathogens using the FilmArray® Gastrointestinal Panel. Medical conditions were analyzed as risk factors for AGE by multivariate logistic regression.

Results. From July 2016 to June 2018, 731 cases and 399 controls were enrolled. Risk factors for AGE cases included HIV-positive status (adjusted odds ratio [aOR] 4.6; 95% confidence interval [CI] 1.6–12.9; $P < 0.01$), severe kidney disease (aOR 4.5; 95% CI 2.0–9.8; $P < 0.01$), and immunosuppressive therapy (aOR 4.0; 95% CI 1.2–13.3; $P = 0.02$). *Clostridioides difficile* and norovirus were the most commonly detected pathogens in cases (18% and 5%, respectively); detection of these pathogens in cases was significantly higher than detection in controls (8% and 2%, respectively; $P < 0.01$ for both). The median duration of hospital stay was longer for *C. difficile* compared with norovirus cases (5 vs. 3 days; $P < 0.01$), and cases with both pathogens had intensive care unit (ICU) stays (*C. difficile*: 18%; norovirus: 8%; $P = 0.2$). Fourteen deaths occurred among AGE cases; 2 were associated with *C. difficile* and 1 with norovirus; the remainder did not have a clear etiology or pathogen detected. *C. difficile* and norovirus were detected year-round with a fall and winter predominance; *C. difficile* prevalence was highest in October, while norovirus prevalence was six times higher in December than in summer months.

Conclusion. This surveillance platform captured cases of severe AGE, including ICU stays and deaths, among hospitalized US Veterans. *C. difficile* and norovirus were leading pathogens in AGE cases. These findings can help guide appropriate clinical management of AGE patients and inform public health efforts to quantify and address the associated burden of disease through targeted interventions.

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2323. Clinical Characteristics and Disease Burden of Epstein–Barr Virus and Four β-Herpes Viruses Infections in Children Visiting Emergency Room

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Background. It is well known that most of infants and young children with primary EBV and CMV infection are inapparent, and primary HHV-6B and HHV-7 infection cause exanthema subitum (ES). However, the precise incidence of apparent infection of these viruses remains unclear. Therefore, we sought to elucidate clinical features and disease burdens of these viral infections in febrile children visiting emergency room (ER).

Methods. Between June 2015 and December 2017, febrile children under 5 years old, who visited ER and received hematological examination, were enrolled in this study. Detection of seven viral DNAs using real-time PCR and measurement of antibody titers in acute-phase serum were carried out. Clinical information was collected from the medical records.

Results. In total of the 905 cases, EBV, CMV, HHV-6B and HHV-7 were detected in 18 cases (2%), 12 cases (1.3%), 104 cases (11.5%) and 23 cases (2.5%), respectively. No HHV-6A DNA was detected. Primary infection rates among EBV, CMV, HHV-6B and HHV-7-infected patients accounted for 44%, 25%, 91% and 57%, respectively. Admission rates of the primary-infected patients were 88% of EBV, 68% of CMV, 66% of HHV-6B and 42% of HHV-7, respectively. Five of the 8 cases (62.5%) of primary EBV-infected patients demonstrated typical clinical course of infectious mononucleosis (IM); however, no IM patient was seen in 9 patients with viral reactivation. No IM case was observed in CMV-infected patients, regardless of primary infection or reactivation. Clinical characteristics were compared between patients with primary HHV-6B and HHV-7 infections because of similarity of clinical features. Average age (1.5 vs. 2.8 years old; $P < 0.001$), duration of fever (4.5 vs. 2.9 days; $P < 0.001$), the highest body temperature (40.2 vs. 39.6°C; $P < 0.001$), and the frequency of typical skin rash (ES) (87% vs. 54%; $P < 0.001$) were statistically different between the two viral infections. The main reason for admission due to primary HHV-6B and HHV-7 infection was complex-type febrile seizure (58.7 vs. 66.7%; $P = 0.705$).

Conclusion. The clinical features and disease burden of the 5 human herpesviruses infections were elucidated in the febrile children visiting ER.

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2324. Respiratory Viral Coinfection in a Birth Cohort of Infants in Rural Nepal

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Background. Acute respiratory illnesses are a leading cause of global morbidity and mortality in children. Coinfection with multiple respiratory viruses is common. Although the effects of each virus have been studied individually, the effects of coinfection on disease severity or healthcare seeking are less well-understood.

Methods. A secondary analysis was performed of a maternal influenza vaccine trial conducted between 2011 and 2014 in rural southern Nepal. Prospective weekly active household-based surveillance of infants was conducted from birth to 180 days of age. Mid-nasal swabs were collected and tested for respiratory syncytial virus (RSV), rhinovirus, influenza, human metapneumovirus (HMPV), coronavirus, parainfluenza (HPIV), and bocavirus by RT–PCR. Coinfection was defined as the presence of two or more respiratory viruses simultaneously detected as part of the same illness episode. Maternal vaccination status, infant age, prematurity, and number of children under 5 in the household were adjusted for with multivariate logistic regression.

Results. Of 1,730 infants with a respiratory illness, 327 (19%) had at least two respiratory viruses detected on their primary illness episode. Coinfection status did not differ by maternal vaccination status, infant age, premature birth, and number of children under 5 in the household. Of 113 infants with influenza, 23 (20%) had coinfection. Of 214 infants with RSV, 87 (41%) had coinfection. Overall, infants with coinfection had increased occurrence of fever lasting 4 or more days overall (OR 1.4, 95% CI: 1.1, 2.0), and in the subset of infants with influenza (OR 5.8, 95% CI: 1.8, 18.7). Coinfection was not associated with seeking further care (OR 1.1, 95% CI: 0.8, 1.5) or pneumonia (OR 1.2, 95% CI: 1.0, 1.6).

Conclusion. A high proportion of infants experiencing their first respiratory illness had multiple viruses detected. Coinfection with influenza was associated with longer duration of fever compared with children with influenza alone, but was not associated with increased illness severity by other measures.

Figure 1. Frequency of monoinfections and coinfections by viral type among infants who tested positive for a respiratory virus (n=1730). RSV=Respiratory Syncytial Virus, HMPV=Human Metapneumovirus, HPIV=Human Parainfluenza Virus.
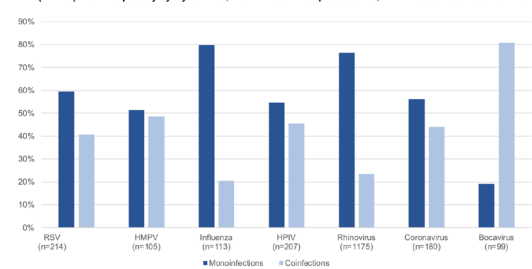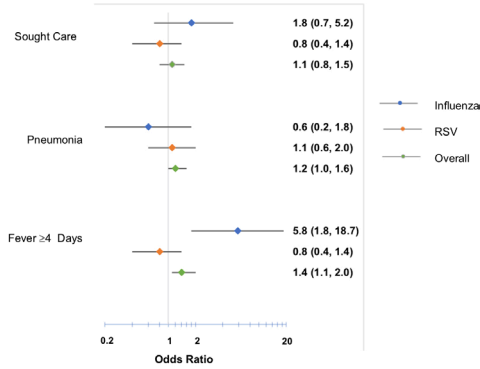
Figure 2. Adjusted odds ratios for associations of coinfection compared to monoinfection on health outcomes, stratified by RSV (Respiratory Syncytial Virus) and influenza, and including 95% confidence intervals.

Outcome	Influenza	RSV	Overall
Sought Care	1.8 (0.7, 5.2)	0.8 (0.4, 1.4)	1.1 (0.8, 1.5)
Pneumonia	0.6 (0.2, 1.8)	1.1 (0.6, 2.0)	1.2 (1.0, 1.6)
Fever ≥4 Days	5.8 (1.8, 18.7)	0.8 (0.4, 1.4)	1.4 (1.1, 2.0)

2325. Relationship Between Neighborhood Census-Tract-Level Poverty and Respiratory Syncytial Virus Infection in hospitalized Adults in the San Francisco Bay area, CA 2015–2017

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Background. In the United States, respiratory syncytial virus (RSV) is a leading cause of admission for adults with respiratory illness. In adults > 50 years of age, it accounts for up to 12% of medically-attended acute respiratory illnesses and has a case fatality proportion of ~6–8%. Poverty can have an important influence on health. Few studies have evaluated the relationship of RSV incidence and poverty level, and no identified studies have evaluated this relationship among adults. We evaluated the incidence of RSV-associated hospitalizations in adults in the San Francisco Bay Area, CA by census-tract-level poverty.

Methods. Medical record data abstraction was conducted for all adults with a laboratory-confirmed RSV infection who were admitted to a hospital within the 3 counties comprising the catchment area (Alameda, Contra Costa, and San Francisco counties) during the 2015–2016 and 2016–2017 RSV seasons. Patient addresses were geocoded to their corresponding census-tract (CT). Census tracts were divided into four levels of poverty based on American Community Survey data of percentage of people living below the poverty level: 0–4.9%, 5–9.9%, 10--9.9%, and [3]20%. Incidence rates were calculated by dividing the number of RSV cases in each CT poverty-level (numerator) by the number of adults living in each CT poverty level (denominator), as determined from the 2010 US census, and standardized for age.

Results. There were 526 RSV case-patients with demographic characteristics as outlined in Table 1. The highest incidence of RSV-associated hospitalization was in CTs associated with the highest levels of poverty (>20%). However, the second highest incidence of RSV-associated hospitalization occurred among adults living in CTs with <5% poverty (Figure 1 and Table 2).

Conclusion. The incidence rate of RSV-associated hospitalization in adults appears to be positively correlated with highest census-tract level of poverty; however, there is a high incidence among adults living in the lowest poverty census-tracts.

Demographic characteristics (n=256)	Number (%)
Sex - male	250 (47.5)
Sex - female	276 (52.4)
Race/Ethnicity	
White	281 (53.4)
Black	69 (13.1)
Asian/Pacific Islander	108 (20.5)
Other/not-reported	67 (13)
Ethnicity - Hispanic	49 (9.3)
Insurance type	
Medicare	344 (65.4)
Medicaid	105 (20)
Private insurance	159 (30.2)
Uninsured	1 (0.2)
Other/not-reported	54 (10.5)
Poverty level	
1 (0-4.9%)	173 (33.4)
2 (5-9.9%)	138 (26.6)
3 (10-19.9%)	135 (26.1)
4 (≥20%)	72 (13.9)
Age category (years)	
18-49	35 (6.7)
50-65	89 (16.9)
>65	402 (76.4)

Table 1: Demographic characteristics of RSV-associated hospitalized adult cases in the San Francisco Bay Area, CA 2015-2017.
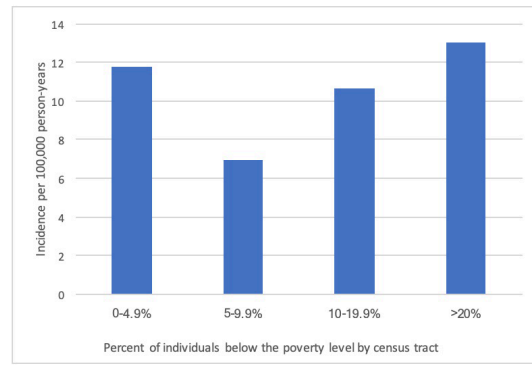

Figure 1: Incidence of RSV-associated hospitalizations of adults by census-tract poverty level in participating San Francisco Bay area counties, CA 2015-2017.

Poverty levels (Northern CA Bay area)	Incidence rate ratio using poverty level 2 as base	Confidence interval
0-4.9%	1.69	1.35, 2.11
5-9.9%	1	--
10-19.9%	1.54	1.22, 1.95
≥20%	1.88	1.41, 2.50

Table 2. Incidence rate ratios for RSV-associated hospitalizations of adults by census-tract poverty level in participating Northern California Bay Area counties, 2015-2017, using poverty level 2 (5-9.9% poverty) for denominator of rate ratio.

2326. Enterovirus-Associated Acute Flaccid Myelitis. Argentina´s Nationwide Surveillance of Acute Flaccid Paralysis 2016–2018

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Background. Acute flaccid paralysis (AFP) surveillance is carried out in Argentina in the frame of the Polio Eradication Program. Acute flaccid myelitis (AFM) is a type of AFP and can be detected in the frame of AFP surveillance. Although many case series of AFM associated to enterovirus (EV) were released since 2014 in many countries, there were no notifications of this entity from Argentina until 2016.

Methods. Descriptive-observational study. AFP cases reported to the National Surveillance System (NSS) between 2016 and 2018 were included.

Results. From January 1, 2016 to December 31, 2018, 610 cases of AFP in children under 15 years old were registered (207 in 2016, 205 in 2017 and 198 in 2018). In 2016, from epidemiological weeks (EWs) 14 to 28, 23 cases of AFM were notified (median age 36 months; range: 3 months to 13 years). No special clustering was observed, and the number of AFM cases did not correlate with an increase in the annual rate of AFP notifications. Main prodromal were respiratory symptoms in 21 cases (91.3%) and fever in 18 (78.2%). One or two limbs were affected in 65%; in 35% mechanical ventilation was required. More than 90% had sequelae at discharge. Stool (ST), nasopharyngeal aspirate (NPA) and cerebrospinal fluid (CSF) samples were processed at the Regional Reference Laboratory facilities. RT nested PCR was employed. All detections are shown in Table 1. To note, In 12 cases (53%), EV D68 was detected (11, out of 16 NPA and 3, out of 11 ST samples). As for 2017, only one case of AFM was detected. Attempt of viral detection was unsuccessful. In 2018, 3 cases of AFM were detected, one EV C105, one Coxsackie B and one case without viral detection.

Conclusion. The occurrence of AFM cases in Argentina since 2016 is similar to the findings in other countries. An association with EV D68 is apparent, notwithstanding the finding of other EV, finding that further points to the causal association between EV D68 and AFM. As NPA is the sample of choice for AFM diagnosis, from 2019 the work-out of every case of AFP includes this sample as mandatory when AFM is suspected. Given the severity and the high rate of permanent sequelae, a high sensitivity of the health team must be sustained to keep with adequate surveillance, which allows prompt outbreak detection of other agents that can cause AFP in the last phase of polio eradication.