**Surveillance of respiratory illness using pathogen specific diagnostic test utilization: an alternative to influenza-like illness**

**Introduction**

In the United States (US), epidemiological reporting of respiratory illness typically focuses on influenza-like illness (ILI), which is used by healthcare professionals to monitor seasonal disease onset, duration, and severity. We have developed the Test Utilization Rate Normalized (TURN) metric using FilmArray® Trend, a cloud-based epidemiology system, to measure generalized respiratory illness based on the rate at which physicians order FilmArray® Respiratory Panel (RP) tests. RP tests are used broadly on patients with respiratory symptoms, making TURN a more general respiratory disease surveillance system. RP tests for 20 pathogens, therefore TURN is more comprehensive than ILI, which focuses on influenza and may mask other etiologies of respiratory disease.

**Methods**

The RP test frequency is used as an indicator of respiratory illness; however, increased adoption of FilmArray products may increase utilization unrelated to disease severity. We use a linear regression model to normalize the rate at which physicians ordered over 300,000 RP tests starting in 2013. TURN is overlaid with ILI and legacy Google Flu to evaluate differences. We performed a multiple regression of TURN with pathogen detection to determine which pathogens contribute most significantly to respiratory disease.

**Results**

TURN varies annually, corresponding to traditional influenza seasonality; however, upticks in the metric can potentially identify outbreaks that ILI cannot, such as non-Polio Enterovirus (EV-D68) in 2014. TURN cross-correlates with ILI better than Google Flu (R = 0.83 and 0.80, respectively), with RSV, Influenza A, and Human Rhinovirus/Enterovirus contributing most significantly to test utilization in the dataset.

**Conclusion**

TURN can be used to monitor respiratory season in the US due to an array of pathogens, a departure from current surveillance focusing on few pathogens. This has implications for the diagnosis, treatment, and epidemiology of respiratory illness, as we have identified that pathogens other than influenza are stronger contributors to test utilization and respiratory illness prevalence.