



## HERD HEALTH MANAGEMENT & ECONOMY

HHM-057

### **SPATIAL AUTOCORRELATION AND WHAT IT MEANS FOR SWINE SURVEILLANCE**

M. Rotolo<sup>1</sup>, C. Wang<sup>1</sup>, M. Haddad<sup>1</sup>, Y. Sun<sup>1</sup>, M. Hoogland<sup>2</sup>, R. Main<sup>1</sup>, J. Zimmerman<sup>1</sup>.

<sup>1</sup>Iowa State University, Ames, United States; <sup>2</sup>Smithfield Foods, Algona, United States.

#### **Introduction**

Spatial autocorrelation is based on Tobler's 1st law of geography: *"everything is related to everything else, but near things are more related than distant things."* This simple concept has huge implications for the way we conduct disease surveillance. In a recent study, spatial patterns associated with the spread of PRRSV were explored using oral fluid sampling data.

#### **Materials & Methods**

Oral fluids were collected from every occupied pen (108 pens; ~25 pigs per pen) in 3 commercial wean-to-finish barns on one finishing site for 8 weeks for a total of 972 OF samples. Oral fluid samples were completely randomized, tested for PRRSV by RT-rtPCR, and then analyzed for the presence of spatial autocorrelation.

#### **Results**

Moran's *I*, a quantitative measure of spatial autocorrelation calculated using GeoDa 1.10, showed positive global spatial autocorrelation in the distribution of PRRSV RT-rtPCR results within barns. LISA (Local Indicators of Spatial Association) analysis identified PRRSV clusters within barns and showed that the spatiotemporal pattern of clusters differed among barns.

#### **Discussion & Conclusion**

Contagious diseases move from pig-to-pig and pen-to-pen, i.e., spatially. With this in mind, the fact that PRRSV exhibited spatial autocorrelation is not surprising. However, this outcome is important because of its implications for the surveillance methods we have relied on since the mid-1980s. Current surveillance methods are based on "hypergeometric distribution" which assumes that the target (disease) is randomly distributed within the population. This assumption is violated when the target demonstrates a spatial pattern, i.e., shows positive spatial autocorrelation.

Spatial autocorrelation appeared as the swine industry modernized. That is, as the industry shifted from extensive herds to intensive, technified herds. Surveillance methods have not evolved with the industry. In particular, the presence of spatial autocorrelation signals the need to reevaluate and explore new surveillance methodologies that account for positive spatial autocorrelation.