Swine Disease Reporting System
Report 28 (June 2, 2020)

What is the Swine Disease Reporting System (SDRS)?

SDRS includes multiple projects that aggregate data from participating veterinary diagnostic laboratories (VDLs) in the United States of America (USA), and reports the major findings to the swine industry. Our goal is to share information on endemic and emerging diseases affecting the swine population in the USA, assisting veterinarians and producers in making informed decisions on disease prevention, detection, and management.

After aggregating information from participating VDLs and summarizing the data, we ask the input of our advisory group, which consists of veterinarians and producers across the USA swine industry. The intent is to provide an interpretation of the observed data, and summarize the implications to the industry. Major findings are also discussed in monthly podcasts. All SDRS reports and podcasts are available at www.fieldepi.org/SDRS. The SDRS projects are:

Swine Health Information Center (SHIC)-funded Domestic Swine Disease Surveillance Program: collaborative project among multiple VDLs, with the goal to aggregate swine diagnostic data and report in an intuitive format (web dashboards and monthly PDF report), describing *dynamics of pathogen detection by PCR-based assays over time, specimen, age group, and geographical area*. Data is from the Iowa State University VDL, South Dakota State University ADRDL, University of Minnesota VDL, and Kansas State University VDL.

Collaborators*:*

Iowa State University: Giovani Trevisan*, Edison Magalhães, Leticia Linhares, Bret Crim, Poonam Dubey, Kent Schwartz, Eric Burrough, Phillip Gauger, Pablo Pineyro, Christopher Siepker; Rodger Main, Daniel Linhares**.

* Project coordinator (trevisan@iastate.edu). ** Principal investigator (linhares@iastate.edu).

University of Minnesota: Mary Thurn, Paulo Lages, Cesar Corzo, Jerry Torrison.

Kansas State University: Rob McGaughey, Eric Herrman, Giselle Cino, Jamie Henningson.

South Dakota State University: Jon Greseth, Travis Clement, Jane Christopher-Hennings.

Disease Diagnosis System: A pilot program with the ISU-VDL consisting of reporting *disease detection* (not just pathogen detection by PCR), based on diagnostic codes assigned by veterinary diagnosticians.

FLUture: Aggregates *influenza A virus (IAV) diagnostic data* from the ISU-VDL and reports results, metadata, and sequences.

PRRS virus RFLP report: Benchmarks patterns of PRRSV RFLP pattern detected at the ISU-VDL over time, USA state, specimen, and age group.

Audio and video reports: Key findings from SDRS projects are summarized monthly in a conversation between investigators, and available in the form of an audio report, and video report through SwineCast, YouTube, Linkedin, and the SDRS webpage (link below).

Advisory Group:
Reviews and discusses the data, providing their comments and perspectives on a monthly: Clayton Johnson, Emily Byers, Mark Schwartz, Paul Sundberg, Paul Yeske, Rebecca Robbins, Tara Donovan, Deborah Murray, Scott Dee, Melissa Hensch, Scanlon Daniels.

In addition to this report, interactive dashboards with aggregated test results are available at www.fieldepi.org/SDRS.

Topic 1 – Detection of PRRSV RNA over time by RT-qPCR.

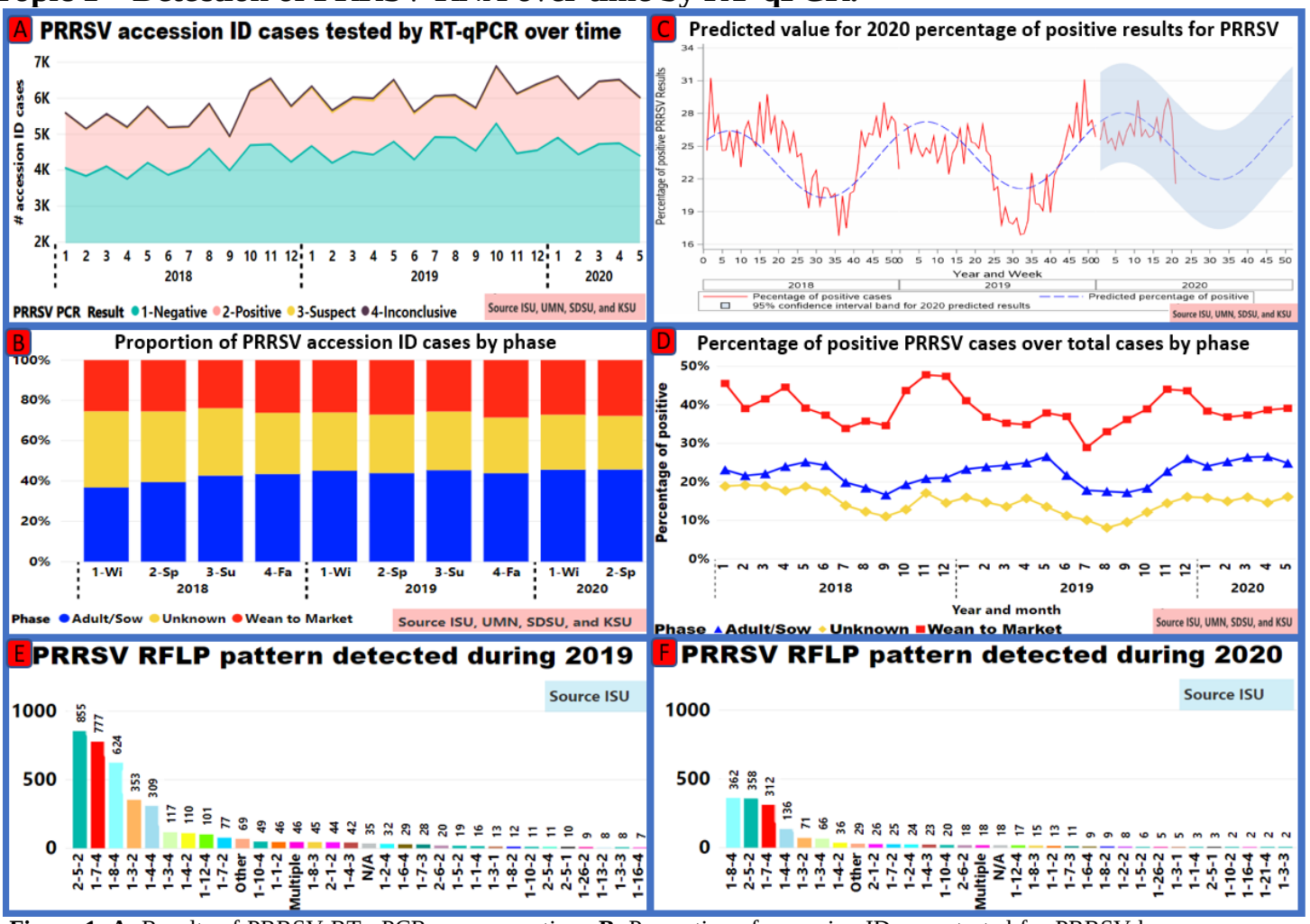

Figure 1. A: Results of PRRSV RT-qPCR cases over time. **B**: Proportion of accession ID cases tested for PRRSV by age group per year and season. **C**: expected percentage of positive results for PRRSV RNA by RT-qPCR, with 95% confidence interval band for predicted results based on weekly data observed in the previous 3 years. **D**: percentage of PRRSV PCR-positive results, by age category over time. Wean to market corresponds to nursery and grow-finish. Adult/Sow correspond to Adult, boar stud, breeding herd, replacement, and suckling piglets. Unknown corresponds to not informed site type or farm category. **E**: RFLP pattern detected during year of 2019. **F**: RFLP pattern detected during year of 2020. RFLPs indicated as N/A represents not detected, or European PRRSV

SDRS Advisory Group highlights:

- The overall percentage of PRRSV-positive cases in May was 26.69% (1,607 of 6,022), similar to 26.81% (1,748 of 6,519) in April;
  - The percentage of PRRSV-positive cases in wean to market cases in May was 39.12% (672 of 1,718), increasing from 38.69% (691 of 1,786) in April;
  - From January to May, the RFLP 1-8-4 moved from the 3rd to the 1st most frequently detected when compared with the year of 2019;
- The average number of monthly cases tested for PRRSV RNA by RT-PCR during the first 4 months (January-April) of 2020 was 6,397, increasing by 6.49% from the first months of 2019 (n=6,007);
- The advisory group pointed out that, despite the stable detection of PRRSV during this month, the increased detection in wean to market is probably associated with winter breaks of sow farms. Furthermore, the increased PRRSV testing may be result of: 1) more pig sites being occupied relative to this time of last year; 2) people wanting to confirm PRRSV status in growing sites after control/elimination projects in sow farms this winter.

Topic 2 – Detection of RNA of enteric coronaviruses by RT-qPCR

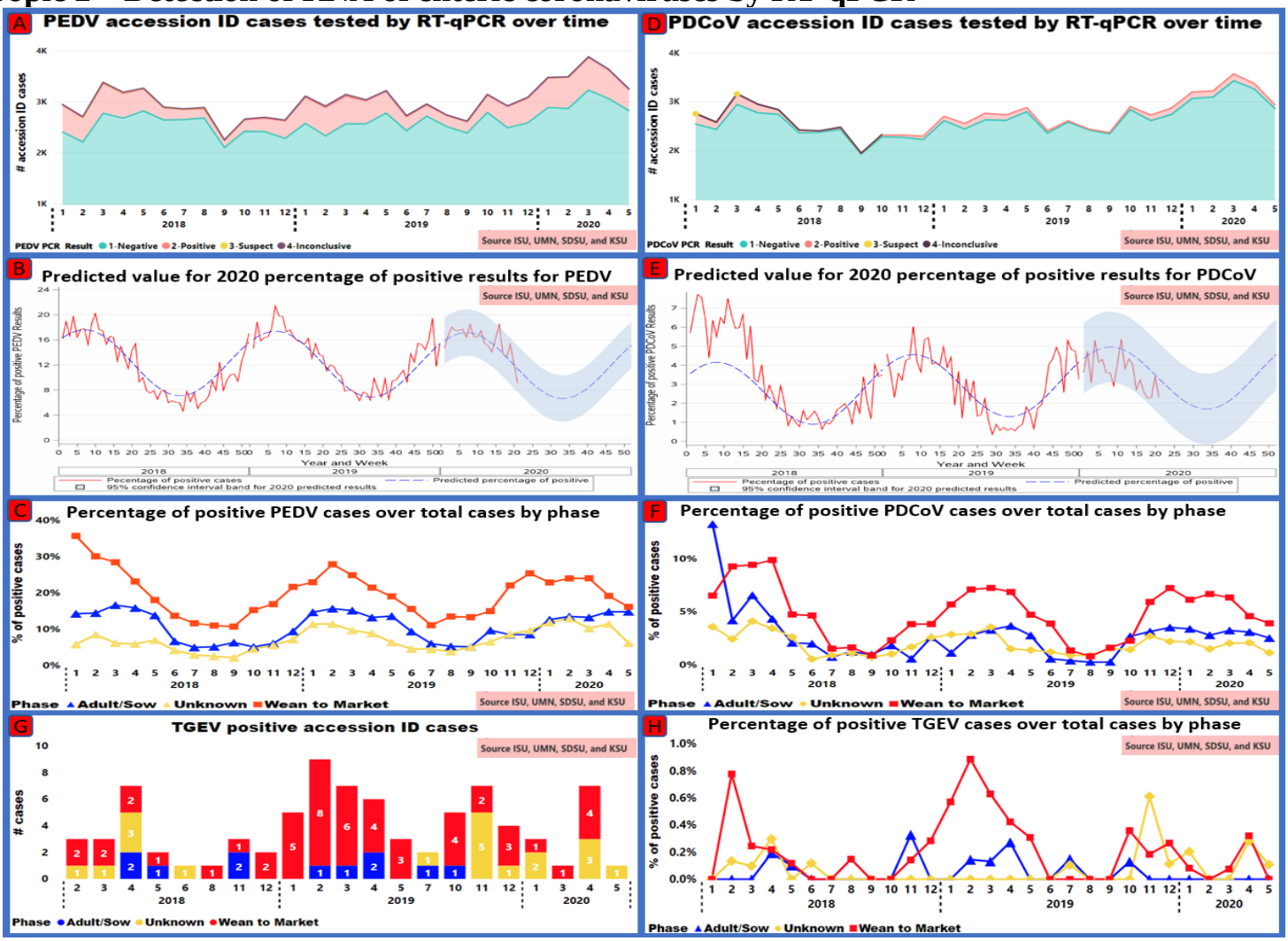

Figure 2. A: results of PEDV RT-qPCR cases over time. **B**: expected percentage of positive results for PEDV by RT-qPCR and 95% confidence interval for 2020 predicted value. **C:** percentage of PEDV PCR-positive results, by category over time. **D**: results of PDCoV RT-qPCR cases over time. **E**: expected percentage of positive results for PDCoV by RT-qPCR and 95% confidence interval for 2020 predicted value, based on weekly data observed in the previous 3 years. **F:** percentage of PDCoV PCR-positive results, by age category over time. **G**: number of PCR-positive accession ID results of TGEV by age category. **H**: percentage of PCR-positive results for TGEV by age category. Each color represents one distinct age category.

SDRS Advisory Group highlights:

- The overall percentage of PEDV RNA-positive cases in May was 12.71% (414 of 3,257), decreasing from 15.44% (562 of 3,639) in April;
  - Even though there is an observed decreased detection of PEDV RNA, this was not observed for the age category adult/sow farm, where the detection in May was 14.86% (158 of 1,063), similar to 14.87% (167 of 1,123) in April;
- The overall percentage of PDCoV-positive cases in May was 2.62% (77 of 2,939), decreasing from 3.35% (113 of 3,378) in April;
- The overall detection of PEDV RNA and PDCoV RNA-positive cases is within the forecasted levels for this time of the year.

Topic 3 – Detection of *Mycoplasma hyopneumoniae* (MHP) DNA by PCR

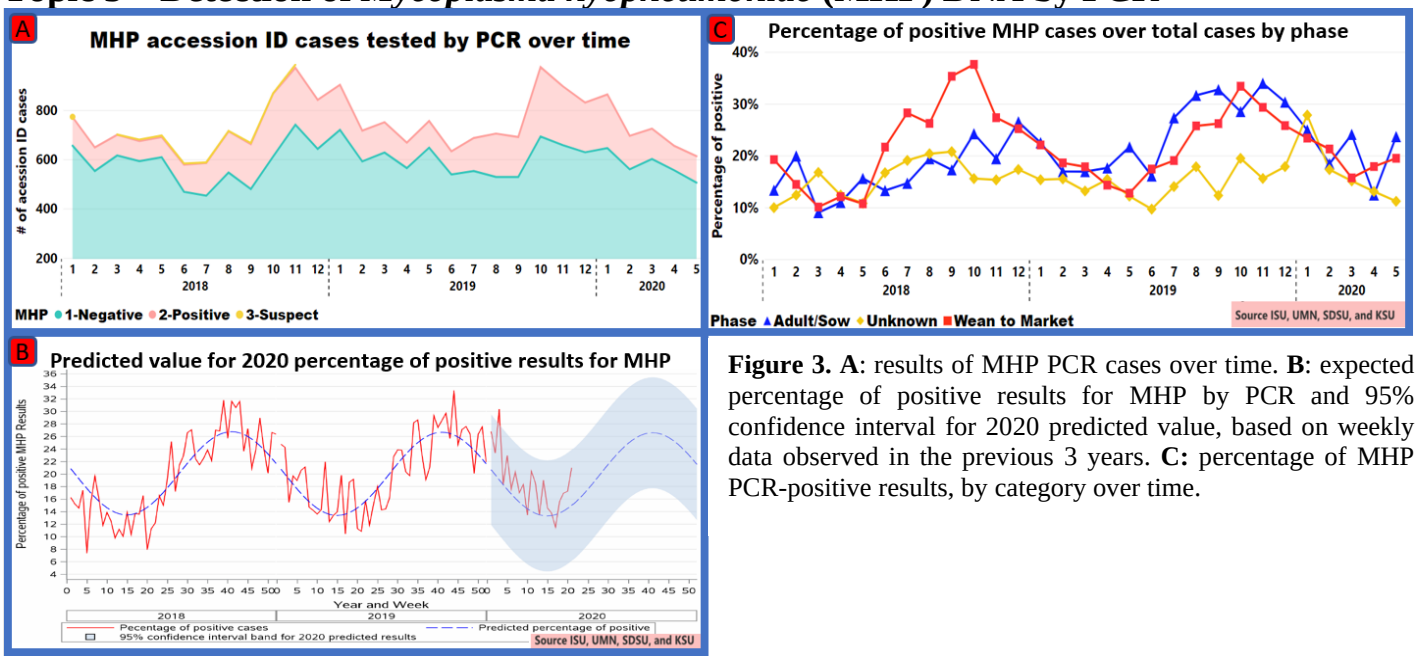

Figure 3. A: results of MHP PCR cases over time. **B**: expected percentage of positive results for MHP by PCR and 95% confidence interval for 2020 predicted value, based on weekly data observed in the previous 3 years. **C:** percentage of MHP PCR-positive results, by category over time.

SDRS Advisory Group highlights:

- The overall percentage of *Mycoplasma hyopneumoniae*-positive cases in May was within the forecasted levels, at 17.43% (107 of 614), increasing from 15.09% (99 of 656) in April;
    - The increase in the percentage of *Mycoplasma hyopneumoniae*-positive cases occurred mainly in Adult/Sow category, rising to 26.23% (32 of 122) in May, compared to 12.40% (15 of 121) in April.

Topic 4 – Disease diagnosis at the ISU-VDL

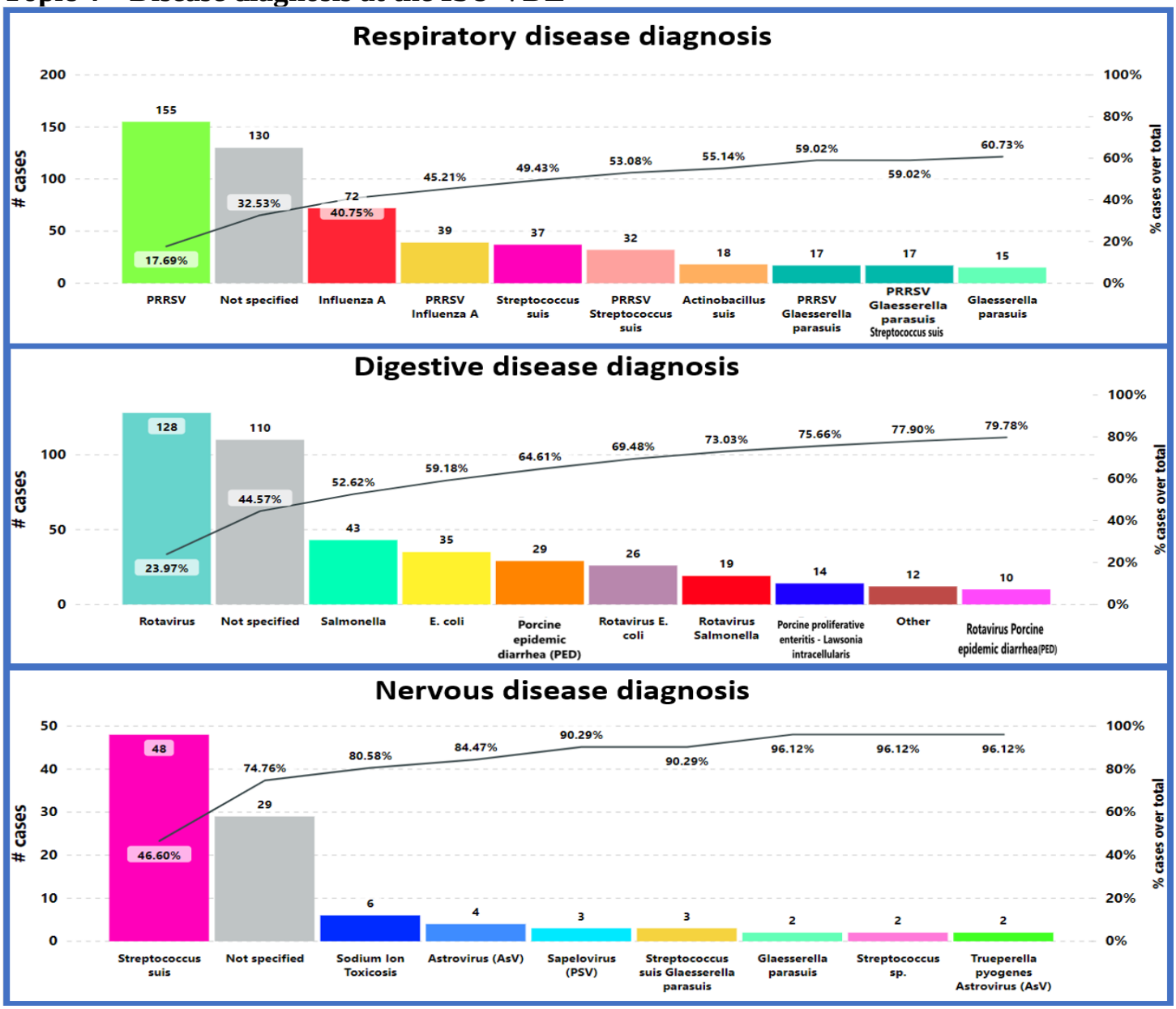

Figure 5. Most frequent disease diagnosis by physiologic system at ISU-VDL . Presented system is described in the title of the chart. Colors represent one agent and/or the combination of 2 or more agents. Only the physiologic systems with historic number of cases per season above 100 are presented in the report.

Note: Disease diagnosis takes one to two weeks to be performed. The graphs and analysis contain data from April 1st to May 17th.

SDRS highlights:

- Even thought there was a signal for increased number of nervous diagnosis from Arpil 26th to May 2nd, there were no significant increases (signals) in the diagnosis of any pathogen or disease syndrome;
- PRRSV (155 of 876) continues to lead the number of respiratory diagnosis, rotavirus (128 of 534) the digestive diagnoses, and *S. suis* (48 of 103) the nervous diagnosis;
- The advisory group highlighted that, due to the COVID-19 situation, stricter biosecurity including limiting non-essential visits, extra disinfection of surfaces, staggering people shifts on farms, use of masks, and stringent procedures for supply entry in farms, there is an expectation of lower disease pressure in the whole-herd.

Bonus page

Monitoring pathogen detection at the state level

Giovani Trevisan, Edison Magalhaes, Rodger Main, Jerry Torrion, Jane Christopher-Hennings, Jamie Henningson, Daniel Linhares.

We are glad to lauch in the SDRS report # 28 a new tool to inform significant changes in pathogen detection at the state level. Monthly changes in the percentage of PCR-positive submissions were accessed by using smoothing models to forecast results for a period of 12 months. The predicted values of percentage-positive results by PCR (by pathogen, month, and state), were substracted to the respective observed values, generating residue values. Thereafter, the residues were scanned by an exponential weighted moving average (EWMA) model to monitor and inform the changes from the expected baseline. The **baseline and the monitoring is constructed based on each state's data**, and there is no comparison across states.

The EWMA findings are reported as changes in standard deviations (STD) from the expected baseline. Changes from baseline are reported as a) *no change* when results were within 2 STD from baseline; b) *changes between 2-3 STD* from baseline; c) *changes of at least 3 STD* above or below the baseline. Information for each state regarding the change from baseline, the number of total, positive submissions, and percent of positive results were recovered from the models and transferred to Microsoft Power BI for geographic visualization. The dashboards can be accessed at www.fieldepi.org/SDRS.

The project included the states where the participant VDLs are located, and those having a swine inventory equal or great of 2 million pigs.[1]

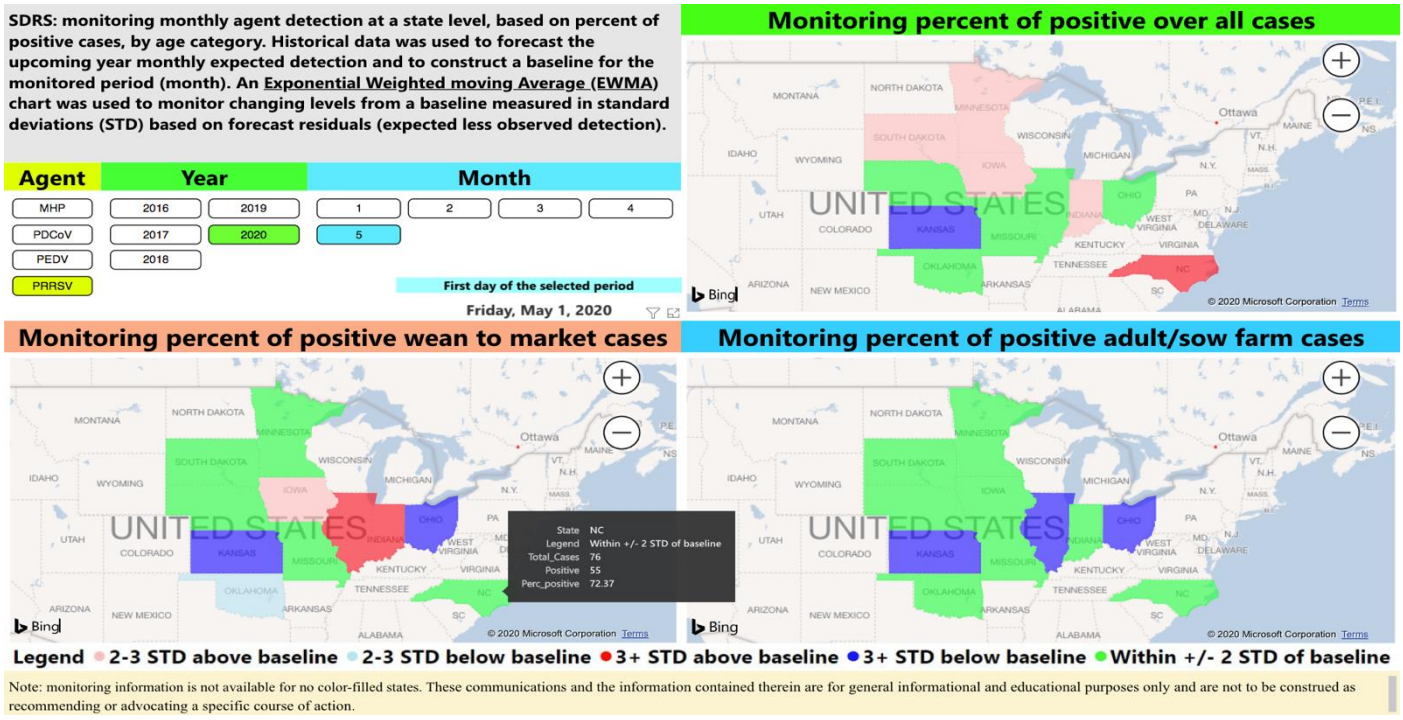

Figure 6. Monitoring monthly pathogen detection at the state-level dashboard. Top left: project description. Middle left: filtering buttons. Top right: colored map informing changes from baseline for the overall state detection. Bottom left map: colored map informing changes from baseline for the wean-to-market. Bottom right: colored map informing changes from baseline for adult/sow farms. The black box between wean-to-market and adult/sow farm maps provided information when the mouse was placed on top of North Carolina. Bottom.

[1] **NASS Quarterly Hogs and Pigs:** https://www.nass.usda.gov/Publications/Todays_Reports/reports/hgpg0619.pdf. Accessed on 06/27/2019.