SWINE HEALTH INFORMATION CENTER
FINAL RESEARCH GRANT REPORT FORMAT

Project Title and Identification Number: Domestic Swine Disease Surveillance monthly report updates until September 2025.
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Industry Summary:

In 2017 SHIC funded the Domestic Swine Disease Surveillance project under the Swine Disease Reporting System (SDRS, https://fieldepi.org/sdrs/) initiative. Since then, the project has expanded significantly. This proposal aimed to maintain and enhance the SDRS program. Key objectives included: a) maintaining current PCR detection databases for major swine pathogens; b) delivering monthly PDF and audio reports to SHIC; c) updating live interactive dashboards; and d) developing a new structure for confirmed tissue diagnosis data retrieval.

From October 2024 to October 2025, twelve monthly PDF and audio reports were delivered to SHIC, summarizing diagnostic results from participating laboratories. These reports were distributed via email to 631 subscribers from 236 organizations—a 44% increase from the previous year—and reached 21 countries. Audio reports were accessed in 20 countries and distributed through podcast platforms (Spotify, Apple Podcast, Amazon Music, Google Podcast). Video summaries on LinkedIn, YouTube, and Instagram accumulated over 67,000 views.

Major updates included implementing a new PRRSV ORF5 variant classification system in the dashboards and the PRRSV BLAST tool. A new PEDV "facility" category was introduced to monitor pathogen activity in truck washes, packing plants, and vehicles. The Dx code data retrieval system was upgraded from a website query to an API-based structure, improving real-time data access and standardization.

Interactive dashboards were enhanced for usability and continue to be updated daily. SDRS remains the only publicly available source of swine health data from U.S. veterinary diagnostic laboratories, covering all age groups and specimen types. The project supports informed decision-making for veterinarians and producers. It continues supporting pathogens monitoring programs such as the PEDV Elimination Task Force and providing information for the U.S. SHIP program. International collaborations expanded with the training of two Brazilian postdocs and the developing of a Brazilian SDRS-like system (CISS). Discussions with Mexican universities may lead to similar initiatives. These partnerships enhance the U.S. swine industry's ability to monitor global disease trends.

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Scientific Abstract:

Metadata, including site state, receive date, and farm type, along with PCR and RT-PCR test results for nine endemic swine pathogens—PRRSV-1, PRRSV-2, PEDV, PDCoV, TGEV, M. hyopneumoniae, PCV2, PCV3, *Escherichia coli*, and IAV—were continuously updated in the SDRS database. Data were collected from six participating laboratories: ISU-VDL, UMN-VDL, SDSU-ADRDL, KSU-VDL, OH ADDL, and Purdue ADDL. Data were received via HL7, CSV files, and API calls, and stored in a secure relational database hosted behind the Iowa State University firewall. Automated scheduled jobs processed raw data into submission-level PCR, sample-level influenza subtyping, PEDV genotype classification, and PRRSV ORF5 sequence data. Data access was secured through least-privileged permissions and anonymized views for analysis and visualization.

Processed data were visualized using Power BI dashboards and incorporated into monthly PDF reports via R-Markdown scripts. Dashboards were updated daily and made publicly available at https://www.fieldepi.org/sdrs. Enhancements included a new PRRSV variant classification system and adding PEDV facility category data, which provides for PCR cases from truck washes, vehicles, and packing plants. The SDRS project has supported national programs such as the PEDV Elimination Task Force and remains the only publicly available source of swine health data across all age groups. SDRS continues to provide real-time, science-based information on endemic and emerging pathogens, supporting early detection and disease management efforts in the U.S. swine industry.

Introduction:

In 2017, SHIC funded the Domestic Swine Disease Surveillance (https://www.swinehealth.org/domestic-disease-surveillance-reports), currently housed under the Swine Disease Reporting System (SDRS) initiative, to aggregate and report veterinary diagnostic data collected from VDLs (Trevisan et al., 2019). The initial program was developed in collaboration between ISU-VDL and UMN-VDL to prove that it is possible to aggregate standardized diagnostic results from multiple labs in the U.S. The project was successful and was expanded to incorporate additional data from SDSU-ARDL, KSU-VDL, OH ADDL, Purdue ADDL, and is currently working on the addition of the UIUC-VDL in Urbana-Champaign, Illinois, through a new SHIC-funded work. In addition, SDRS is the only publicly available source of swine health information from U.S. VDLs, and the only publicly available source of pathogen activity in all age groups, from boar studs to breeding herds to grow-finish pigs, including a wide variety of specimens, including biological, feed, and environmental samples.

The SDRS has provided science-based spatiotemporal information on pathogen activity in the U.S. swine industry. SDRS offers an interactive, free-of-charge benchmarking tool and monthly reports containing the highlights for the most significant changes in the patterns of agent detection and the interpretation from a panel of producers and practitioners, i.e., the advisory group. The U.S. swine industry appreciates this project's ability to provide real-time information on the macroepidemiological aspects of agent

detection in the U.S. Due to its importance and significance in providing real-time analysis and information on swine health data to help protect the North American swine population, there was a need to keep SDRS alive and updated.

Objectives:

a. Keep current the aggregated PCR-based detection databases for PRRSV, PEDV, PDCoV, TGEV, IAV, PCV2, PCV3, *E.coli,* and MHP with diagnostic data from the participating laboratories;

b. Provide monthly PDF and audio (podcast) reports to SHIC;

c. Keep updating the live interactive dashboards;

d. Develop a new structure message for the Health Level 7 (HL7), enabling the SDRS to retrieve confirmed tissue diagnosis cases analyzed by diagnosticians in an automated way.

Materials & Methods:

Specific methods were used for each objective, which resulted in integration and sustainability for the SDRS project data.

Objective A: Keep current the aggregated PCR detection databases for PRRSV, PEDV, PDCoV, TGEV, IAV, PCV2, PCV3, and MHP with diagnostic data from the participating laboratories. Data continued to be imported from the participating laboratories. The ISU-VDL, UMN-VDL, SDSU-ADDL, and Purdue ADDL provided updates using the automated real-time messaging system HL7. KSU-VDL provided weekly data updates using a standardized CSV file. OH ADDL provides updates using an API connection for real-time data sharing with daily data "GET" calls executed by the SDRS office.

Cezar and Rupasinghe worked on data aggregation, data mining, interpretation, summaries, and online content development. Trevisan and Linhares have actively provided interpretation of data summaries and trends. Retrospective and prospective monitoring algorithms were updated and revalidated to scan the agent-specific percentage of positive cases at an overall and state level for 2025. SDRS team was able to leverage current resources and, without the need for additional funding, implemented a new PEDV category was implemented, through a new algorithm created to capture data from truck washes, vehicles, and packing plants, which was denominated "facilities". The new results are incorporated in the SDRS reports.

Objective B: Provide monthly PDF and audio (podcast) reports to SHIC and keep updating the live interactive dashboards. Dr. Cezar coordinated the project and provided leadership to incorporate monthly findings into monthly PDF, audio, and video reports. The project investigators and coordinator kept consulting the SDRS Advisory Group, which consists of a group of veterinarians/producers distributed across different U.S. regions and representing independent and integrated production systems. The SDRS Advisory Group has provided insights and perspectives on the patterns of agent detection results in the SDRS project. Currently, Mark Schwartz, Drs. Megan Niederwerder, Paul Yeske, Deborah Murray, Brigitte Mason, Peter Schneider, Sam Copeland, Luc Dufresne, Daniel Boykin, Corrine Fruge, William

Hollis, Rebecca Robbins, Thomas Petznick, Kurt Kuecker, Laura Glowzenski, and Brooke Kitting serve as SDRS Advisory Group members.

Monthly brief (target 15-20 minutes) audio/video reports were recorded and made available on YouTube, LinkedIn, and Instagram, summarizing takeaways from each month. Moreover, a distribution list for the SDRS podcast is structured to distribute podcasts through different channels (Spotify, Google Podcast, Apple Podcast, and Amazon Music).

Objective C: Keep updating the live interactive dashboards. Online interactive dashboards are available at www.fieldepi.org/SDRS and were kept updated daily with the addition of the new PRRSV ORF5 variant classification (VanderWaal et al., 2024) and PRRSV-1 lineage classification (Yim-Im et al., 2025). Both variant and PRRSV-1 lineage classification developments were implemented by the SDRS team with internal available resources without a need for additional funding. Rupasinghe worked as a software developer and information technology staff member overseeing SDRS data integration and security.

Objective D: Develop a new structure message for the Health Level 7 (HL7), enabling the SDRS to retrieve confirmed tissue diagnosis cases analyzed by diagnosticians in an automated way. The project was updated to incorporate a new framework for collecting Dx code data. Challenges with standardizing message formats via the HL7 system led the ISU-VDL to develop an API that allows the SDRS team to retrieve data and perform daily database updates through scheduled calls. This system has been deployed and is in the final validation to compare the old method with the new logic implemented. The API significantly improves the efficiency and accuracy of the Dx code data updates.

Results:

The proposed SDRS database maintenance and PDF/audio/video distribution were accomplished. Monthly reports include information on the new developments made under this proposal. They are available on the SHIC web page https://www.swinehealth.org/domestic-disease-surveillance-reports/ and the SDRS project website at https://www.fieldepi.org/SDRS and online dashboards.

Table 1: Summary of proposed objectives for this project.

Proposed goal	Achievements
(a) Keep current the aggregated PCR-based detection databases for PRRSV, PEDV, PDCoV, TGEV, IAV, PCV2, PCV3, E.coli, and MHP with diagnostic data from the participating laboratories;	Data continued to be imported from the participating laboratories. The ISU-VDL, UMN-VDL, SDSU-ADDL, and Purdue ADDL provided updates using the automated real-time messaging system HL7. KSU-VDL provided weekly data updates using a standardized CSV file. OH ADDL provides updates using an API connection for real-time data sharing with daily data “GET” calls executed by the SDRS office.

(b) Provide monthly PDF and audio (podcast) reports to SHIC;	Twelve PDF and audio reports, covering diagnostic results shared with SDRS from October 2024 to September 2025, were consistently delivered to SHIC every first Tuesday of the month. 631 subscribers from 236 organizations have signed up to receive the reports in their email inboxes, an increase of 44% compared to last year (437 subscribers). The PDF report reaches 21 countries, and since implementing the Podcast platforms (Spotify, Apple Podcast, Amazon Music, and Google Podcast), the audio report has been listened to in 20 different countries (https://rss.com/podcasts/sdrs/). SDRS report is also distributed through video format on LinkedIn (https://www.linkedin.com/in/fieldepi-field-epidemiology-46814a194), YouTube (https://www.youtube.com/@swinediseasereportingsyste2986), and Instagram (https://www.instagram.com/isufieldepi/), summarizing the key takeaways from each month, accumulating over 67,000 views in these social media platforms. Interactive online dashboards continue to be updated daily and are kept current on the project website
(c) Keep updating the live interactive dashboards;	Interactive online dashboards continue to be updated daily and are kept current on the project website with enhancements in their layout, making them more user-friendly to the audience. In addition, the new PRRSV variant classification was incorporated in the previous PRRSV ORF5 sequence dashboard.
(d) Develop a new structure message for the Health Level 7 (HL7), enabling the SDRS to retrieve confirmed tissue diagnosis cases analyzed by diagnosticians in an automated way.	Due to standardization issues with the Dx code database, the project was modified to include the Dx code messaging system through API instead of HL7. The API system was established with ISU-VDL and linked to the SDRS account, which provides the capacity for real-time retrieval of Dx code data. Dx code data has been retrieved through the new system currently.

Additional SDRS contributions during 2024-2025 include:

- Following a request from stakeholders, the SDRS report included the PEDV-PCR facility category. This addition provides information about the positivity of PCR submissions coming from truck washes, packing plants, and vehicles. The new information helps producers and veterinarians to understand the PEDV detection dynamic outside of the farm, raising alerts for enhanced biosecurity when the activity of this pathogen is high in the facility category. Developments were implemented by the SDRS team with internal available resources without the need for additional funding.
- Implementation of the new PRRSV variant classification (VanderWaal, 2024) and PRRSV-1 lineage classification (Yim-Im et al., 2025) in the online dashboards, SDRS database, and Blast tool.

This addition aids in the epidemiological investigation of PRRSV variants and also keeps track of new variant emergence as the L1C.5.32 that started to have a clonal expansion in 2024. An educational material to help interpret the new PRRSV ORF5 sequence data was published on the YouTube channel (https://www.youtube.com/watch?v=_0TaPxhl8Gw&list=PL13f_xmvc5_FwYQAfqdRi1eJbBXV-iQVW&index=7). Developments were implemented by the SDRS team with internal available resources without the need for additional funding.

- A new SDRS survey was created and is available on the SDRS website. The new tool allows the audience to provide input about potential needs and ideas for continued SDRS improvements and expansions (https://iastate.qualtrics.com/jfe/form/SV_cMGf18M7V1x2qTc). It is now possible for any person to anonymously offer suggestions for the SDRS team, creating a new channel for feedback from the industry, in addition to the advisory group, to suggest new SDRS implementations.
- Revamped SDRS state-level monitoring and PRRSV ORF5 sequence dashboards were updated on the SDRS website (https://fieldepi.org/sdrs/). The state-level monitoring had an update in the layout and the development of an internal analytical tool to analyze state-level changes with more granularity. This work was developed in partnership with a USDA funded project.
- New education material published in the SDRS playlist on YouTube for aiding people to use the PRRSV Blast tool (https://www.youtube.com/watch?v=rf_t0irEt30&list=PL13f_xmvc5_FwYQAfqdRi1eJbBXV-iQVW&index=8)

Educational Initiatives:

- Dr. Elisa De Conti obtained her Master of Science degree entitled "*Detection of Escherichia coli Virulence Factors in Swine Under Field Conditions: Meta-analyses and Macro-Epidemiological Trends*" in July 2024, using SDRS data.
- Jai Tatineni, a Master's Student at Iowa State University's Information Systems and Business Analytics Department, defended his thesis "*Automating Statistical Model Selection for Multistate Swine Disease Forecasting Using PCR Data: A SAS Macro-Based Approach to Enhance Timeliness and Accuracy in Epidemiological Monitoring*".
- Dr. Daniel Moraes obtained his PhD degree, with one of his chapters using SDRS data entitled "*Macroepidemiological trends of Influenza A virus detection through reverse transcription real-time polymerase chain reaction (RT-rtPCR) in porcine samples in the United States over the last 20 years*" published in April 2025 at the Frontiers in Veterinary Science (https://doi.org/10.3389/fvets.2025.1572237).
- Two international post-docs were trained under the SDRS project Drs. Rafael Nicolino (Professor at Federal University of Minas Gerais - Brazil) and Janice Zanella (Embrapa Swine and Poultry – Brazil)

Extension Initiatives:

The SDRS has continuously demonstrated the importance of sharing information on endemic and emerging diseases affecting the swine population in the U.S., assisting veterinarians and producers in making informed decisions on disease prevention, detection, and management. During this project, SDRS information, including results from this funded project, was shared at:

- North America PRRS Symposium.
- ISU James Dr. McKean Swine Conference.
- American Association of Veterinary Laboratory Diagnosticians.
- American Association of Swine Veterinarians.
- U.S. Swine Health Improvement Plan (house of delegates).
- International Symposium of the World Association of Veterinary Laboratory Diagnosticians.
- Asociación de Médicos Veterinarios Especialistas en Cerdos (AMVEC-México).
- Simpósium Internacional de Suinocultura (SINSUI – Brasil).

International Collaborations:

In 2024, SDRS welcomed two postdoctoral researchers: Dr. Janice Zanella from EMBRAPA and Dr. Rafael Nicolino from the Federal University of Minas Gerais (UFMG). They received training from the SDRS team on methods for integrating and analyzing veterinary diagnostic data. This collaboration led to the developing of a Brazilian counterpart to SDRS, CISS (Central of Swine Health Intelligence). The initiative strengthens ties between the U.S. and Brazil by enabling the exchange of epidemiological insights and disease detection trends, which can be compared across countries. Additionally, discussions are underway with faculty from Mexican universities about launching a similar initiative. If successful, this could lead to a joint training program and a collaborative project between the U.S. and Mexico, offering valuable access to swine pathogen surveillance data from Mexico. These international partnerships enhance the ability of U.S. swine producers to monitor and understand disease dynamics in other major swine-producing regions.

SDRS Numbers:
In addition, all the SDRS numbers in terms of audience increased in the year 2024-2025. In the table below, you can see the project metrics evaluated in this year compared with the previous year.

Table 2: SDRS information distribution channel and audience coverage.

Distribution channel / Platform	**Cumulative numbers**	**Growth rate compared to 2024**	**Units**
Monthly PDF report distribution	631	42.11%	Email receivers
	236	22.91%	Organizations
	21	90.09 %	Countries
SDRS Website visits	2,427	31.83%	IP visitors
LinkedIn	58,273	15.63%	Views
YouTube	6,659	38.15%	Views
Podcast	3,853	27.9%	Downloads
Producer meeting and conference presentations	45	40.62%	Meetings and presentations

Discussion:

The Domestic Swine Disease Surveillance, housed under the SDRS initiative, supported by SHIC, has successfully provided real-time swine health data information for U.S. swine endemic agents. SDRS is the only publicly available source of swine health information from U.S. VDLs that is continuously updated in real time. SDRS stands out on integration, monitoring, and sharing information regarding emerging and re-emerging animal health threats. The SDRS aligns well with SHIC's mission *"to protect and enhance the health of the United States swine herd through coordinated global disease monitoring, targeted research investments that minimize the impact of future disease threats, and analysis of swine health data."*

The procedures implemented under this proposal allowed the continuity of the SDRS project and captured and integrated diagnostic data from six participant VDLs. Procedures were implemented in a structured format and created a basis for sustainability. Data integration and monitoring capabilities allow for identifying meaningful information for trends in detecting endemic agents, e.g., changes in PRRSV lineages or RFLPs. Historical data generates valuable information, but the real value in protecting U.S. swine production lies in the ability to monitor diagnostic data in real-time and inform stakeholders of changes in detection patterns. Knowledgeable stakeholders can use this information and tools for many applications, including warning signals or indicators to reinforce or implement biosecurity and biocontainment practices to reduce the spread of agents and diseases among farms and regions.

Interactions with the Advisory Board are key components for the maintenance and continuous improvement of the project. Advisory Board feedback was key to incorporating new *Escherichia coli* data and the new PRRSV variant classification and PRRSV-1 lineage in the report. The Advisory board has met in person at the 2024 American Association of Swine Veterinarians, and it will participate in the SDRS Winter Preparedness call, where the SDRS team will provide trends of pathogen detection for the upcoming Winter of 2025. The Advisory Board kept engaged on the monthly preliminary reports and communications shared by email. The advisory continuously encourages the development of international partnerships with Canadian and Mexican laboratories to help understand the trends of diseases and correlations between the North America countries. Also, in the AASV meeting, the Advisory group ranked priorities for SDRS developments. The top priorities were the inclusion of Seneca Valley Virus (SVV) PCR data and PEDV sequencing data. The advisory group was very interested in the detection trends of SVV, focusing on the regional differences regarding this pathogen. It was also asked if changes had occurred over time, with the virus changing from its epidemic phase in 2015, where it caused increased pre-weaning mortality, to a more endemic pathogen causing vesicle lesions. Proposals for inclusion of both SVV and PEDV sequences have been submitted to funding agencies, but SVV once and PEDV twice have been denied funding.

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