



CEZD Annual Performance Report

April 2021 - March 2022

Executive Summary

This annual performance report covers the period from 1 April 2021 – 31 March 2022 and provides statistics on: Knowledge Integration using Web-based Intelligence (KIWI) technology signal filtration, information source signal production, signal relevancy, community development, and disease trends. The report is provided to all CEZD members in an effort to promote awareness on system performance, community engagement, notable disease events, and future direction.

The following highlights provide a quick overview of CEZD's growth and development over the last year, as well as any notable events that occurred.

Highlights:

- As of May 30, 2022, the CEZD consists of 489 members, a total growth of ~30% (34% increase in new members, 4% member loss to retirement/job change)
- CEZD members are located in 9/10 provinces, no representation from territories
- 97% of respondents to the annual survey indicated that CEZD provided them value in their work
- From 1 April 2021 to 31 March 2022, the KIWI technology filtered through 46,240 Individual Information Pieces and produced a total of 298 Early Warning Signals in 51 weekly intelligence reports
- Throughout 2021-22, 24 ping questions were sent out to community members
- CREs accounted for the largest amount of relevant signals, followed by Poultry Med, EMPRES-i, Avian Flu Diary, Outbreak News Today, the Poultry Site, Pig Progress, and ProMed
- From April 2021 to March 2022 KIWI received Anticipatory Intelligence Signals from 155 different countries; the majority of which occurred within the USA (1055) followed by Canada (224) and China (194)
- COVID-19 was the most frequently reported health condition, followed by Highly Pathogenic Avian Influenza and African Swine Fever
- The most notable events from 2021-22 include: HPAI in Canada and the USA; ASF in domestic swine in Germany, the Dominican Republic and Haiti; imported canine rabies in Ontario; virulent Porcine Reproductive and Respiratory Syndrome in the USA; and ASF in wild boar in Italy
- Two scoping meetings were held this year, one on Yezo virus and one on Porcine Deltacoronavirus (PDCoV). An intelligence brief on PDCoV was published.
- The CEZD website had 2204 unique users accessing the site over the course of the past year, with the Rapid Qualitative Risk Assessment pages garnering the most views

TABLE OF CONTENTS

EXECUTIVE SUMMARY	2
DEFINITIONS	4
INTRODUCTION	5
CEZD DEMOGRAPHICS	5
CEZD ACTIVITY UPDATE	8
REPORTING:	8
PING QUESTIONS:.....	8
MONTHLY COMMUNITY TELECONFERENCES:	8
WORKING GROUPS:	8
DOMESTIC PILOT:	8
SCOPING MEETINGS:	8
JOINT RAPID QUALITATIVE RISK ASSESSMENT (RQRA):	9
FACE-TO-FACE ENGAGEMENT MEETING:	9
CEZD'S ONLINE PRESENCE:	9
ANNUAL MEMBER SURVEY	10
RESPONDENT DEMOGRAPHICS:	10
CEZD VALUE & SUPPORT:.....	10
KIWI TECHNOLOGY	12
INFORMATION SOURCE ANTICIPATORY INTELLIGENCE SIGNAL PRODUCTION.....	12
ANTICIPATORY INTELLIGENCE SIGNAL SPECIFICITY & SENSITIVITY	13
ANTICIPATORY INTELLIGENCE SIGNAL RELEVANCY.....	14
GEOGRAPHIC DISTRIBUTION OF ANTICIPATORY INTELLIGENCE SIGNALS	14
ANTICIPATORY INTELLIGENCE SIGNAL TRENDS.....	15
DISEASE FREQUENCY TRENDS.....	16
NEW NOTABLE DISEASE EVENTS OF THE YEAR	17
CEZD GOING FORWARD	18

Definitions

Anticipatory Intelligence Signal (AIS)	A disease event that originates from the list of Individual Information Pieces and is to be rated by the community.
Automatic AIS	A disease event automatically selected by KIWI's sense making algorithm from the list of Individual Information Pieces.
Manual AIS	A disease event that was not identified automatically by KIWI's sense-making algorithm from the list of Individual Information Pieces but rather by analysts.
CEZD CNPHI-account member	A CEZD member who has signed up for CNPHI and has access to the KIWI technology and CEZD Collaboration Centre.
CEZD consumers	A CEZD member who has not signed up for CNPHI and only receives the CEZD Weekly Intelligence Reports.
Community Reported Event (CRE)	A disease event submitted into the KIWI technology from an outside information source by a member, to be rated by the community.
Early Warning Signal (EWS)	An anticipatory intelligence signal that achieves an average community rating equal to or greater than 2.8.
False-negative	An individual information piece that was not identified as an anticipatory intelligence signal by KIWI's sense making algorithm but is relevant to emerging and zoonotic disease.
False-positive	An anticipatory intelligence signal that achieves an average rating of 1 "not relevant".
Individual Information Piece (IIP)	A disease event that enters the KIWI technology via RSS feeds from a subscribed information source, which has yet to be filtered through the KIWI algorithm.
Information Source	An open website that provides disease event news.
Knowledge Integration using Web-based Intelligence (KIWI) Technology	The Knowledge Integration using Web-based Intelligence technology within CNPHI filters through the vast amount of open disease event information on the web by applying a sense making algorithm. KIWI enables users to monitor global disease events and evaluate their relevance to Canada.
Outreach Engagement Workgroup (OEW)	A working group of CEZD members dedicated to the recruitment of new members and engagement of existing members.
Reporting & Analysis Workgroup (RAW)	A working group of CEZD members dedicated to refining reporting procedures and identifying new opportunities for reporting and analysis.

Introduction

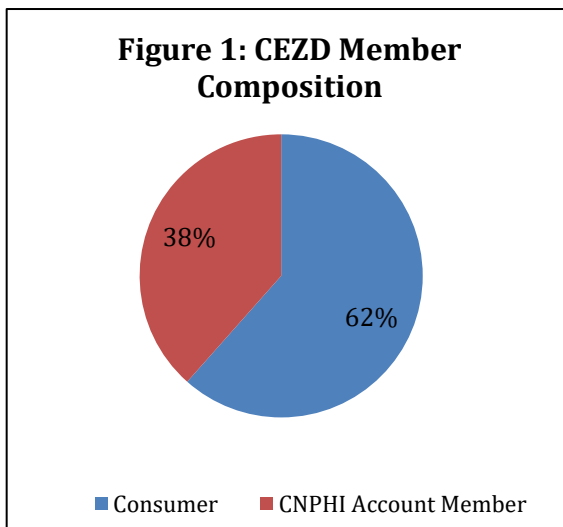
The Community for Emerging and Zoonotic Diseases (CEZD) is a virtual network that integrates automated information-mining tools with professional multidisciplinary perspectives. CEZD's disease intelligence process is designed to provide early identification and warning of threats. Timely and effective intelligence reports are provided back to the communities at risk to help enable them to prevent, avoid or reduce their risk and prepare for an effective response.

CEZD utilizes the Public Health Agency of Canada's (PHAC) Canadian Network for Public Health Intelligence (CNPHI) platform for its day-to-day operations. Within CNPHI, the community uses the Knowledge Integration Using Web-based Intelligence (KIWI) technology and the CEZD Collaboration Centre. The KIWI Emerging and Zoonotic program collects and filters disease signals from open information sources. Then the members analyze the information and the core team disseminates the results in the form of Weekly Intelligence Reports.

This annual report covers the period from April 1 2021 – March 31 2022, and provides information on current CEZD efforts as well as: demographics, stakeholder engagement efforts, KIWI technology, Anticipatory Intelligence Signal trends, and the CEZD Collaboration Centre. It concludes with CEZD's key priorities and action items going forward.

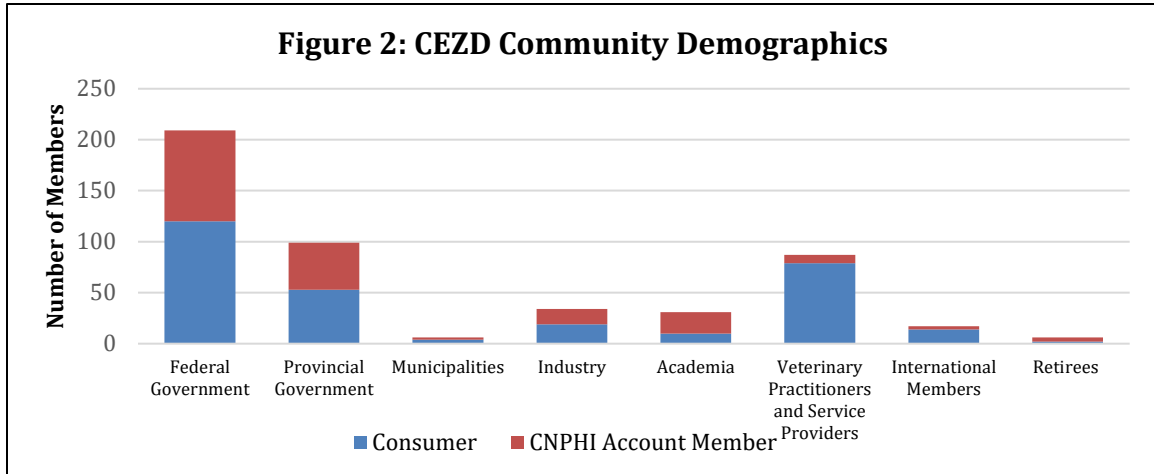
CEZD Demographics

As of May 30, 2022, the CEZD consists of 489 members, 4 of which are in the core team. Over the last year, 129 new members joined the community, a growth of ~34%. However, the community also lost 17 (~4%) of its members due to retirement or occupational change. The overall growth was 30% for the fiscal year. **Figure 1: CEZD Member Composition** displays the percentage of CEZD members who hold CNPHI accounts and consumers who only receive the intelligence reports. The membership growth this year occurred mostly in the consumers group, which makes up 62% of CEZD membership, with CNPHI account members occupying 38%.



CEZD members belong to a variety of fields, including: federal, provincial, and municipal government, industry, academia, veterinary practice and other service provision, as well as a retirees who wish to remain involved. **Figure 2: CEZD Community Demographics** displays the percentage of individuals belonging to each of these demographic groups. The majority of the community members belong to government organizations, however

participation from industry and academia has been increasing. Over the last year, all demographic groups experienced increases in membership.



Figures 3 and 4 provide a more detailed make-up of the federal and provincial government categories. **Figure 3: Federal Government Representation** displays the number of members belonging to each of the federal government organizations involved in CEZD. The majority of federal government members are from the CFIA, followed by the Public Health Agency of Canada (PHAC) and Agriculture and Agri-Food Canada (AAFC). Parks Canada (PC), Global Affairs Canada (GAC), Canadian Nuclear Safety Commission (CNSC), and Fisheries and Oceans Canada (DFO) each have one-two members. Two additional government organizations joined CEZD this past year, one member from Health Canada (HC) and the other Environment Canada (EC).

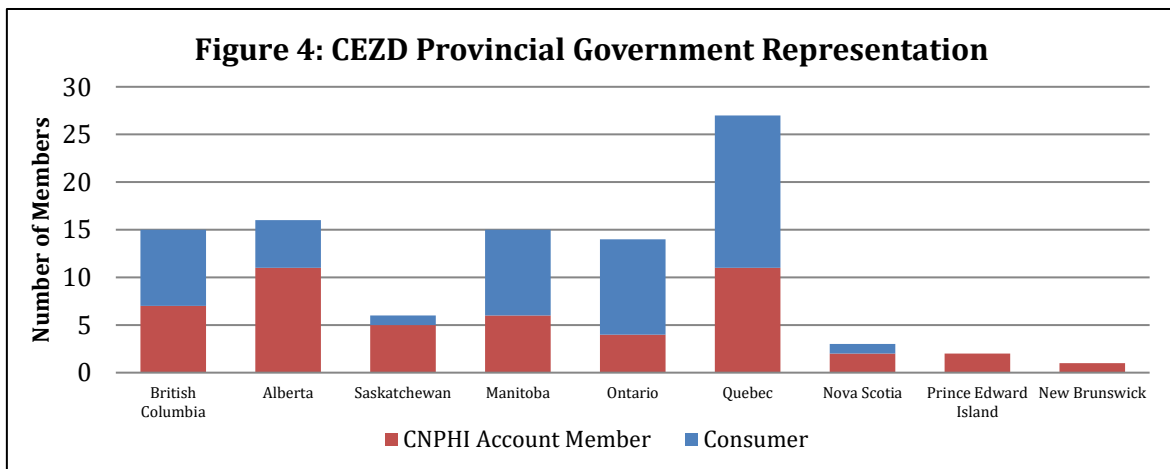
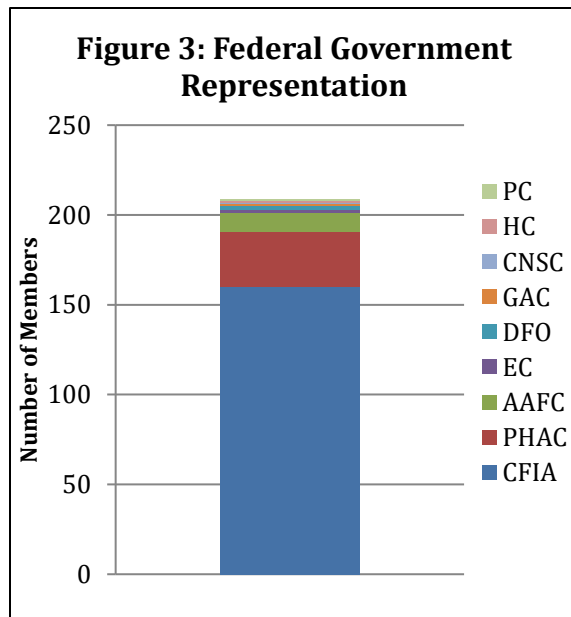


Figure 4: Provincial Government Representation depicts the number of members from provincial government organizations. Provincial representation has remained steady over the last few years, but there is a need for greater involvement from the territories.

To conclude the member demographics section, **Figure 5: CEZD Member Map** provides an updated display of CEZD’s organizational membership.



Figure 5: CEZD Member Map

CEZD Activity Update

In an effort to engage members within the CEZD and apply the community's collective intelligence to emerging disease issues, a variety of activities were conducted throughout the year, including: pings, community teleconferences, scoping meetings, and introductory demonstration sessions.

Reporting:

CEZD's weekly intelligence report is the most utilized product CEZD generates. 51 weekly intelligence reports were produced and distributed in the past fiscal year. An environmental scanning African Swine Fever (ASF) report was also in production for a few weeks after the initial discovery of ASF in the Caribbean. 29 ASF continuous scanning reports were completed. A Porcine Deltacoronavirus (PDCoV) intelligence brief was completed and distributed this year, and an update was made to the Severe Acute Diarrhea Syndrome Coronavirus (SADS-CoV) risk profile to include new scientific findings.

Ping Questions:

Ping questions are sent to the community on a weekly/bi-weekly basis to obtain rapid feedback on signals of particular interest. Ping questions remain very successful, with anywhere from 20 to 30 members rating and/or commenting on their relevance within 48 hours. Hence they are a great way to collect timely feedback on specific issues of concern/interest. Over the last year, 24 ping questions were sent out to community members. Members are also encouraged to submit any questions they may have to the community in the form of ping.

Monthly Community Teleconferences:

The monthly community teleconferences assist with community management and bring together partners across federal and provincial governments, industry, and academia. Ten monthly teleconferences were held during the last year. Monthly teleconferences are also used to discuss relevant ping questions and gather feedback on future direction/priorities.

Working Groups:

No working group meetings [Reporting & Analysis Workgroup (RAW), Outreach Engagement Workgroup (OEW)] were held this year. However, members did participate in editing/reviewing the health conditions dictionary in order to develop species categories within the system.

Domestic Pilot:

No additional work was carried out regarding the CEZD domestic pilot and associated scenarios. While scenario templates are ready, there is a need for volunteer members/organizations to participate in leading scenarios.

Scoping Meetings:

Scoping meetings are held as a result of high ratings from ping questions, or by request from CEZD members. The meetings bring together a small group of subject matter experts to determine CEZD's next steps in relation to a specific disease event. Two scoping meetings were completed in this fiscal year, one on Yezo virus and one on Porcine Delta Coronavirus (PDCoV). An intelligence brief was created on the zoonotic potential of PDCoV.

Joint Rapid Qualitative Risk Assessment (RQRA):

No additional work was carried out regarding the RQRA.

Face-to-face Engagement Meeting:

Unfortunately, due to COVID-19, a face-to-face meeting of the larger community did not occur this year. Instead, a monthly community teleconference was used to gather feedback on CEZD activities and identify priorities for the coming year.

CEZD's Online Presence:

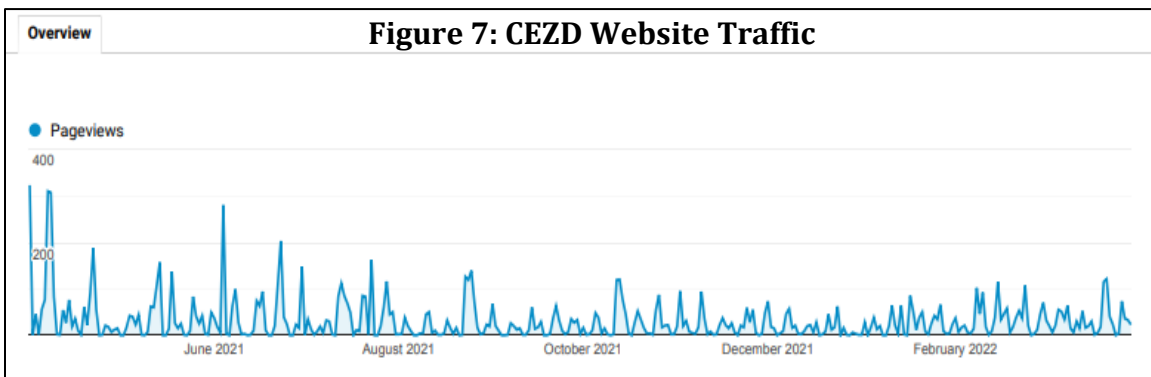
The CEZD website, launched in 2021, had 2204 unique users accessing the site over the course of the past year. As displayed in

Figure 6: CEZD Website Interactions, the website interactions during that time identified 86.7% of visitors as new users, and 13.3% as returning visitors. This is expected as the site is fairly new, however we would like to retain more returning visitors going forward. **Figure 7: CEZD Website Traffic**,



illustrates that traffic remains steady with small peaks noticed during weekly report postings. The most popular/viewed pages on the website are the SARS-CoV-2 Rapid Qualitative Risk Assessments(RQRQ) in deer, mink, companion animal, and livestock; with the SARS-CoV-2 RQRA in deer gathering 330 page views.

CEZD's twitter traffic is also increasing slowly, with the weekly report tweets bringing ~20 views and other tweets regarding high profile issues garnering more. Engagement via the YouTube account remains low.



Annual Member Survey

Respondent Demographics:

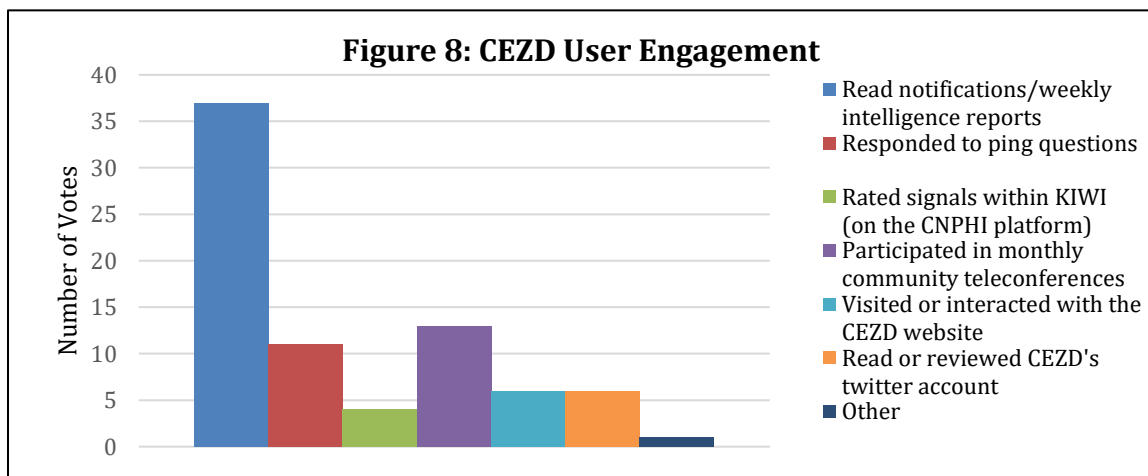
This year’s annual member survey was completed in March 2022. The survey was made available to all members in both English and French and received a response rate of 7.5% (37 respondents). Eighteen of the respondents identified themselves as being CNPHI account members, while nineteen identified as consumers.

Survey respondents belong to a variety of organizations, 20 of which were identified, including:

- Canadian Food Inspection Agency
- Canadian Poultry Consultants
- Canadian Western Swine Health Intelligence Network
- Centre D'Expertise En Production Ovine Du Québec
- Alberta Beef Producers
- Ontario Ministry of Agriculture, Food and Rural Affairs
- British Columbia Ministry of Agriculture
- University of Montreal
- Dufferin County
- One Health Scientific Solutions Inc.
- Moggy Livestock Research & Extension
- Southwest Ontario Veterinary Services
- British Columbia Society for the Prevention of Cruelty to Animals
- Saskatchewan Ministry of Agriculture
- Saskatchewan Health Authority
- Ceva Animal Health
- Farm Mutual
- Molesworth Farm Supply Ltd.
- Alinea International
- Results Driven Agriculture Research

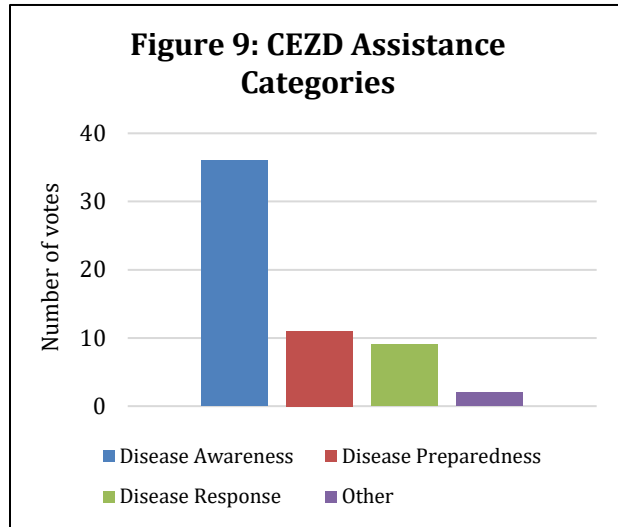
CEZD Value & Support:

When evaluating CEZD’s value, all but one respondent (36) indicated that CEZD provided them with valuable information relevant to their current position. The ways by which respondents engaged with CEZD throughout the year is depicted in **Figure 8: CEZD User Engagement**. All respondents indicated that they read the weekly intelligence report. Engagement in other methods varied with a smaller proportion responding to ping questions, participating in monthly teleconferences, ratings signals, and engaging the CEZD website or twitter.



Only 30% (11/37) of respondents indicated a willingness to participate in signal relevance reviews on the CNPHI platform. Some of the reasons respondents declined to participate in signal rating include: learning to use a new system, time restraints, and uncertainty of expertise/competency in rating different signals. Contrariwise, 84% (31/37) of respondents were willing to bring forth issues they are working on for discussion with the CEZD community.

Figure 9: CEZD Assistance Categories displays three disease categories in which CEZD assisted its members, with all respondents (37) indicating that CEZD assists in raising disease awareness. This is similar to the survey results from the previous few years. However, we are now seeing more respondents select disease preparedness (11) and disease response (9). With increase in these two categories being a result of our focus on additional analytical activities and reports over the last few years. In accordance with the CEZD assistance

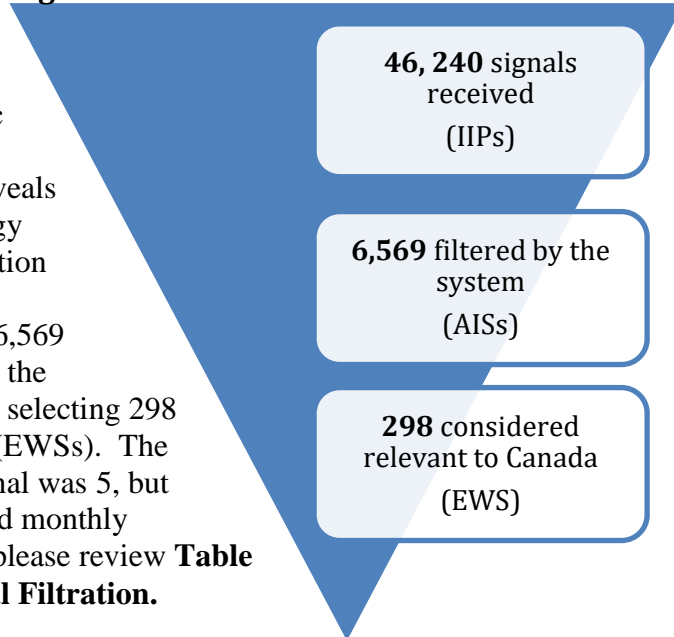


categories, all of the respondents (37) indicated that they use the CEZD reports to increase their own awareness of emerging and zoonotic disease events. The CEZD reports were also shared with colleagues (17), used to brief up to management (10), and as a part of a decision record to support decision making (5). Others mentioned the application of reports in project planning and understanding different intelligence processes. Finally, overall satisfaction in CEZD remains high, with members indicating that they are either satisfied (20), very satisfied (16), or neutral (1).

KIWI Technology

From April 2021 to March 2022, a total of 19 different individuals representing 11 different organizations logged in to KIWI and rated signals within the zoonotic and emerging disease program. **Figure 10: KIWI Information Filtration Process** reveals that during this period, the KIWI technology filtered through 46,240 Individual Information Pieces (IIPs) from CEZD’s 21 automatic information sources. It provided a total of 6,569 Anticipatory Intelligence Signals (AISs) to the community for rating; with the community selecting 298 signals as relevant Early Warning Signals (EWSs). The average number of individuals rating a signal was 5, but ranged anywhere from 1 to 7. For a detailed monthly breakdown of the signal filtration process please review **Table 1: April 2021 – March 2022 KIWI Signal Filtration.**

Figure 10: KIWI Information Filtration Process

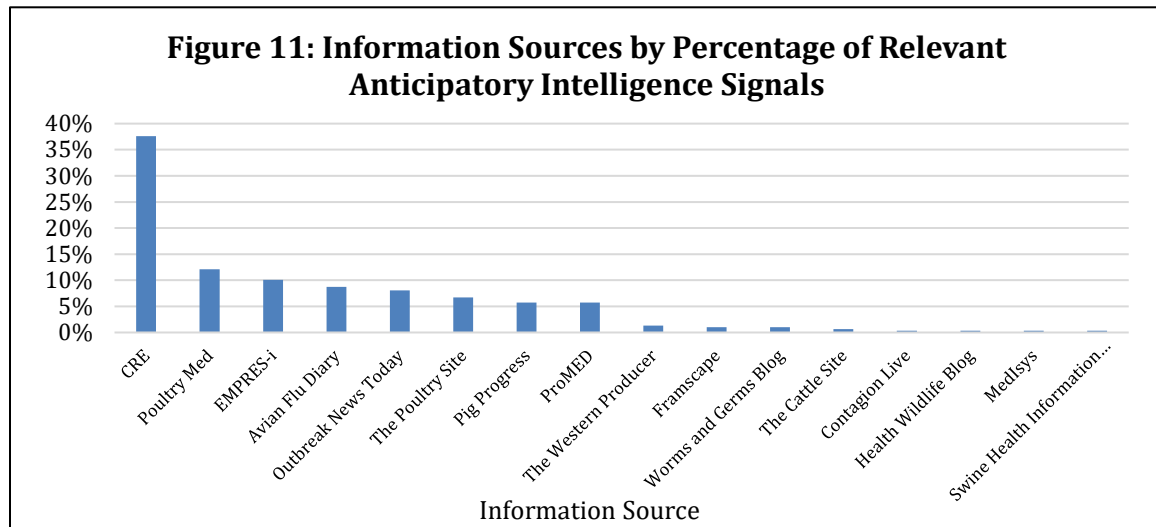


Month	Number of AISs	Automatic AISs	Manual AISs	Community Reported Events	Number of EWSs
April 2021	578	379	139	60	18
May 2021	554	421	95	38	5
June 2021	581	449	91	41	10
July 2021	701	551	112	38	16
August 2021	759	507	182	70	23
September 2021	606	411	145	50	13
October 2021	556	282	143	131	5
November 2021	445	185	129	131	19
December 2021	349	158	113	78	14
January 2022	465	163	140	162	40
February 2022	450	141	134	175	58
March 2022	525	163	169	193	77
Total	6,569	3,810	1,592	1167	298

Information Source Anticipatory Intelligence Signal Production

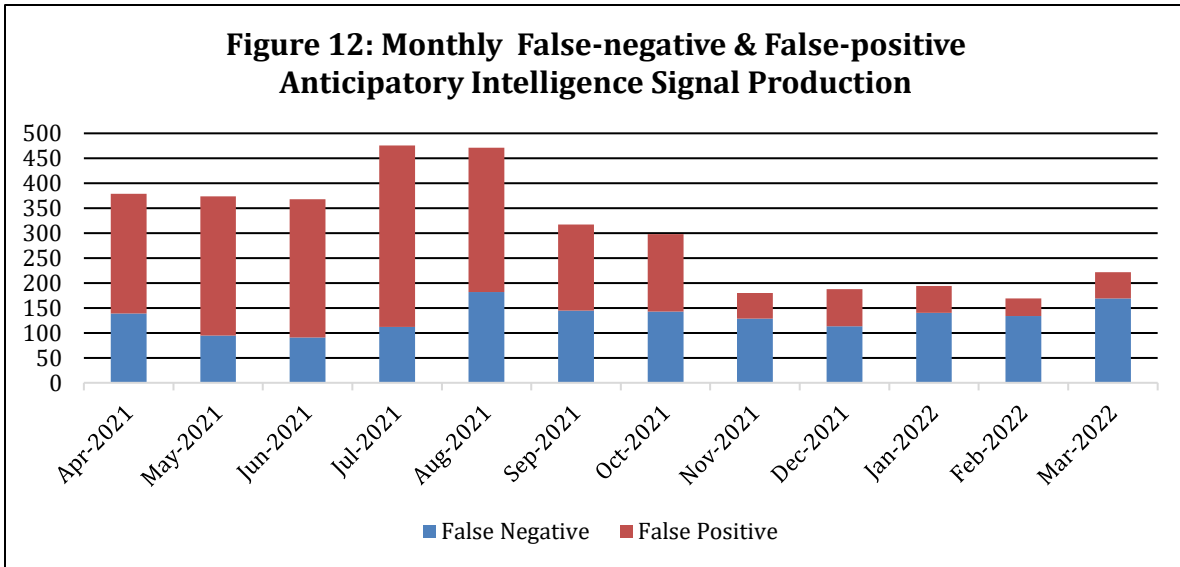
The CEZD emerging and zoonotic program within the KIWI technology currently subscribes to 21 open disease information sources. A list of these sources is available in Appendix I – CEZD Information Sources. Additionally, the KIWI technology also gathers disease incident information from outside sources in the form of Community Reported Events (CREs). Examples of outside sources include: the United States Animal Health Association, Ontario Farmer, Feedstuff, Flutrackers, Google News, and the Food

Inspection Environmental Scanning Canada (FIESCA) tool. **Figure 11: Information Sources by Percentage of Relevant Anticipatory Intelligence Signals** displays the percentage of relevant AISs coming from CEZDs information sources. Information sources that did not provide relevant signals, as rated by the community, are not listed in this figure. This year, CREs accounted for the largest amount of relevant signals, followed by: Poultry Med, EMPRES-i, Avian Flu Diary, Outbreak News Today, the Poultry Site, Pig Progress, and ProMed. Each of the other sources identified had less than 10 relevant signals. A significant reduction in the number of relevant signals coming from ProMed is observed due to the deactivation of their RSS feed in October 2021. Subsequent inclusion of ProMed signals into the system was in the form of CREs.



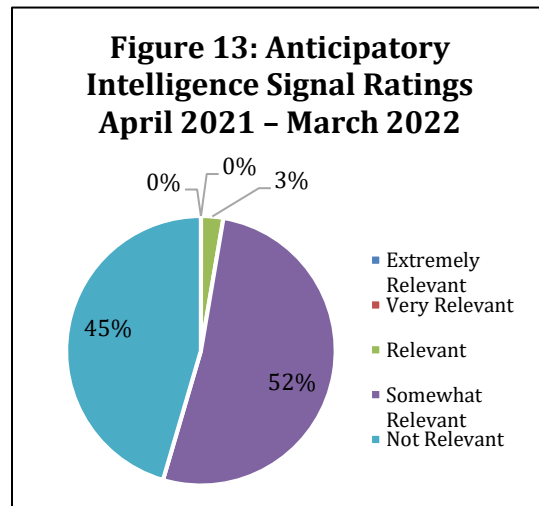
Anticipatory Intelligence Signal Specificity & Sensitivity

Figure 12: Monthly False-negative & False-positive Anticipatory Intelligence Signals displays the percentage of false-negative and -positive signals coming into KIWI each month. False-positives are automatic signals that achieve an average rating of 1 (not relevant), while false-negatives are IIPs that were not identified by the algorithm but by analysts and achieve an average rating greater than 1. From April 2021 to March 2022, 31.1% of signals coming in for community rating were classified as false-positives, while 24.2% were false-negatives. The percent of false-positives had increased significantly due to COVID-19 (signals related to COVID-19 research, vaccinations, updates on case counts, and response efforts are usually rated as not relevant), however the rate is starting to revert back (decline) to pre-pandemic levels.



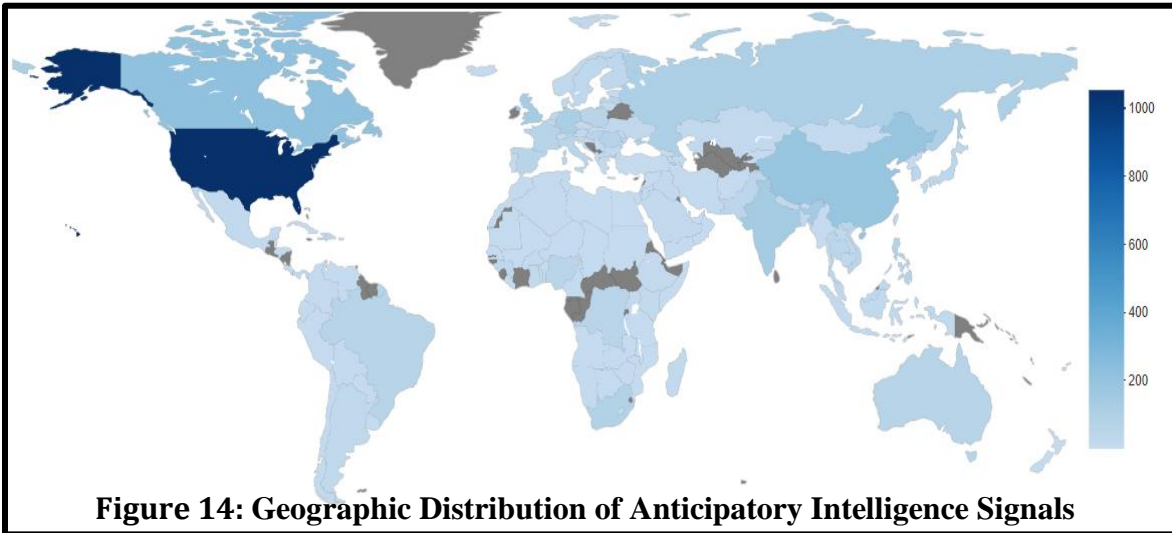
Anticipatory Intelligence Signal Relevancy

Figure 13: Anticipatory Intelligence Signal Ratings April 2021 – March 2022 outlines the percentage of signals falling into KIWI's relevance categories. Within KIWI, the CEZD rates AISs on a scale of 1 to 5, 1 being not relevant and 5 being extremely relevant. A relevancy assessment tool is provided to assist with the rating process. This year again, no signals achieved a rating of extremely relevant (5) or very relevant (4). 52% of signals were rated as somewhat relevant, 45% as not relevant, and only 3% of signals rated as relevant.



Geographic Distribution of Anticipatory Intelligence Signals

From April 2021 to March 2022, KIWI has received AISs from 155 different countries. **Figure 14: Geographic Distribution of Anticipatory Intelligence Signals** presents the density of KIWI signals across the world. The highest frequency of signals (rated >1) occurred within the USA (1055), followed by Canada (224), China (194), India (141), the UK (135), Germany (117), and Russia (106). Again, the high prevalence of USA based signals is mainly due to the information sources used, as the majority of them are based in the USA and therefore relay disease events from their location more frequently.

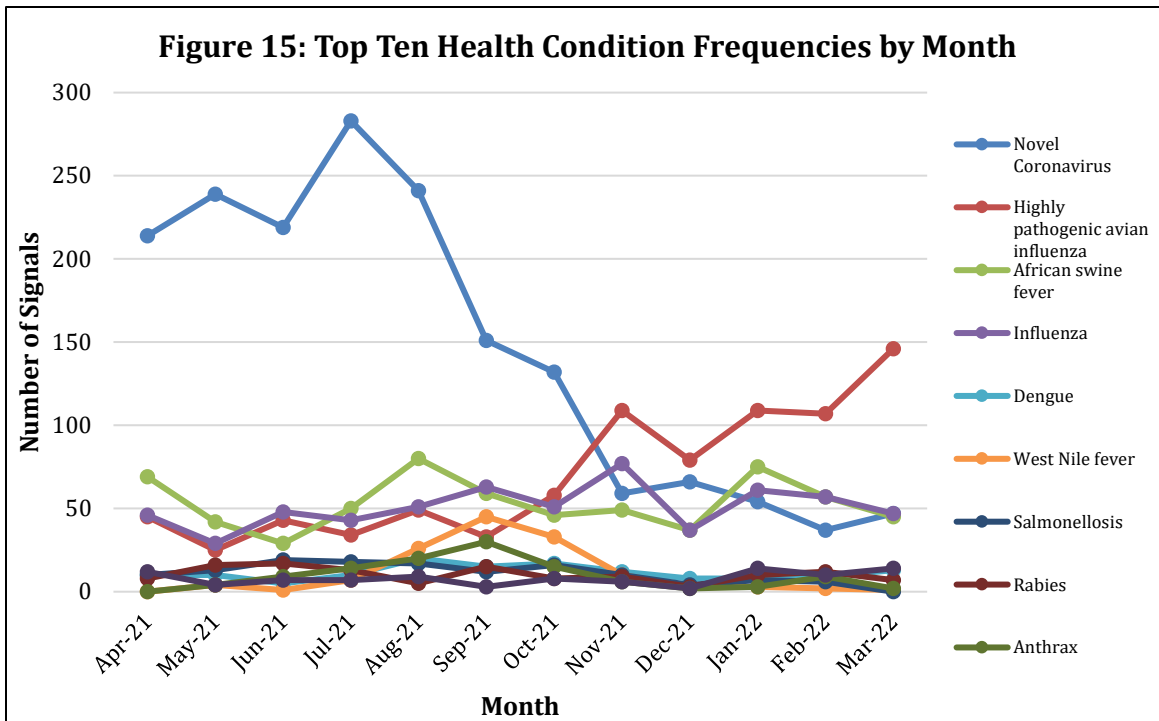


Anticipatory Intelligence Signal Trends

The top 5 most frequent health conditions from April 2021 – March 2022 were: Novel coronavirus, highly pathogenic avian influenza (HPAI), African Swine Fever (ASF), influenza (including: low pathogenic avian influenza, swine influenza, equine influenza, human influenza...etc.), and Dengue. **Table 2: KIWI Most Frequent Health Conditions** lists the AIS frequency counts of the top ten most frequent KIWI Health Conditions of the year.

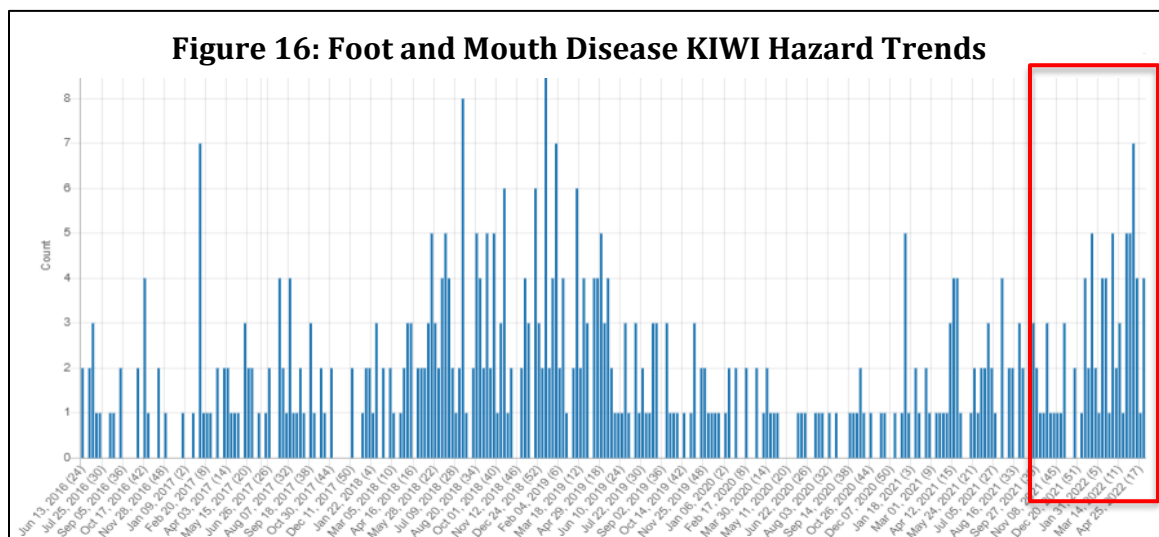
Table 2: KIWI Most Frequent Health Conditions		
Rank	Health Condition	Number of Signals
1	Novel Coronavirus	1742
2	Highly Pathogenic Avian Influenza	837
3	African Swine Fever	638
4	Influenza	610
5	Dengue	137
6	West Nile Virus	135
7	Salmonellosis	132
8	Rabies	123
9	Anthrax	114
10	Foot and Mouth Disease	96

Similarly, **Figure 15: Top Ten Health Condition Frequencies by Month** plots these most frequent health conditions by month to show specific time periods where these conditions occurred.



Disease Frequency Trends

KIWI disease trends provide valuable information in the form of disease signal frequency counts over time. While the trends do not represent case counts, one may infer seasonal patterns or an increase in a particular disease based on the frequency counts and constant number of information sources. In **Figure 16: Foot and Mouth Disease KIWI Hazard Trends**, the weekly frequency counts for FMD are provided from January 4, 2016 (when the KIWI system was initiated) to April 2022. A total of 486 FMD signals entered the system during this time period. An increase in FMD signals was noted beginning in December 2021 and continuing into present day (mostly attributed to the rapid spread of FMD in Indonesia).



New Notable Disease Events of the Year

Over the course of the year, the following new events received the highest relevance ratings from the community: HPAI in Canada and the USA, ASF in domestic swine in Germany, the Dominican and Haiti, imported canine rabies in Ontario, virulent Porcine Reproductive and Respiratory Syndrome (PRRS) in the USA, and ASF in wild boar in Italy. **Table 3: New Notable Events of the Year** lists these events, the month they occurred, and their average rating. Other notable events that didn't make the list include an increase in Influenza A (H5N6) reports from China, chronic wasting disease detections in North America, and Japanese encephalitis emerging in new areas of Australia.

Table 3: New Notable Events of the Year		
Event	Month Reported	Average Rating
HPAI in Canada	December 2021	4.0
HPAI in the USA	January 2022	4.0
ASF in Germany – domestic swine	July 2021	3.8
ASF in the Dominican Republic & Haiti	July 2021 / September 2021	3.2 - 3.8
Imported Canine Rabies in Ontario	July 2021 / February 2022	3.0 - 3.5
Virulent PRRS in the USA	June 2021	3.2
ASF in Italy – wild boar in Piedmont	January 2022	3.2
White-nose syndrome in Manitoba	July 2022	3.0
Atypical BSE in Alberta	December 2021	3.0
SARS-CoV-2 in Deer (US & Canada)	August 2021	3.0

CEZD Going Forward

Going forward into the coming year the following items have been identified by the community as key priorities for 2022-23:

CEZD Engagement

- Continuing integration with OneHealth networks and organizations
- Student onboarding & successor planning/incorporation
- Develop and implement online engagement strategy

Risk Products & Reporting

- Increasing capacity for intelligence product development (training & analysis)
- Exploring how to incorporate information regarding drivers of disease emergence
- Exploring new reporting options based on discipline categories

Domestic Information Sharing

- Conducting additional scenarios*

*Identified as key priority, however need more volunteers to move forward

Appendix I: CEZD Information Sources

CEZD INFORMATION SOURCES

MEDISYS

OUTBREAK NEWS TODAY

PROMED*

THE POULTRY SITE

AVIAN FLU DIARY

CONTAGION LIVE

ECDC

EMPRESS-I

SWINE HEALTH INFORMATION CENTRE

FARMSCAPE

GLOBAL MEAT NEWS

HEALTHY WILDLIFE BLOG

POULTRY MED

PIG PROGRESS

SWINE HEALTH INFORMATION CENTRE

THE WESTERN PRODUCER

THE HORSE SITE

WORMS & GERMS BLOG

CENTRE FOR INFECTIOUS DISEASE RESEARCH AND POLICY

ONTARIO ANIMAL HEALTH NETWORK

THE CATTLE SITE

*No longer supports RSS feed