![CEZD - Community for Emerging and Zoonotic Diseases logo]

CEZD Annual Performance Report

April 2020 - March 2021

Executive Summary

This annual performance report covers the period from 1 April 2020 – 31 March 2021 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 April 1, 2021, the CEZD consists of 377 members, a total growth of 7% from the previous year (12% increase in new members, 5% member loss to retirement/job change).
- CEZD members are located in 9/10 provinces.
- 100% of respondents to the annual survey indicated that CEZD provided them value in their work.
- From 1 April 2020 to 31 March 2021, the KIWI technology filtered through 37,828 Individual Information Pieces and produced a total of 252 Early Warning Signals in 51 weekly intelligence reports
- ProMed, Community Reported Events, EMPRES-i and Pig Progress produced the largest amount of relevant signals this year.
- From April 2020 to March 2021 KIWI received Anticipatory Intelligence Signals from 150 different countries; the majority of which occurred within the USA, followed by China and Canada.
- COVID-19 was the most frequently reported health condition, followed by African Swine Fever and highly pathogenic avian influenza.
- The most notable events from 2020-21 include: the first cases of African Swine Fever in India and Papua New Guinea, African Swine Fever outbreaks in China linked to unlicensed vaccines, African Swine Fever in wild boar in Germany, SARS-CoV-2 in felines, H1N2v in Alberta, and SARS-CoV-2 in British Columbia mink
- Three different joint rapid qualitative risk assessments' were completed throughout 2020-2021 examining the implications of SARS-CoV-2 in companion animals, livestock, and farmed mink.
- Throughout 2020-21, 27 ping questions were sent out to community members
- CEZD's online presence was established via a [website](), along with [Twitter]() and [YouTube]() accounts
- In the coming fiscal year, CEZD will continue with ongoing activities, focus on engagement with OneHealth networks, explore student onboarding, and the development of disciplines within the KIWI technology in order to streamline the signal rating process.

TABLE OF CONTENTS

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.
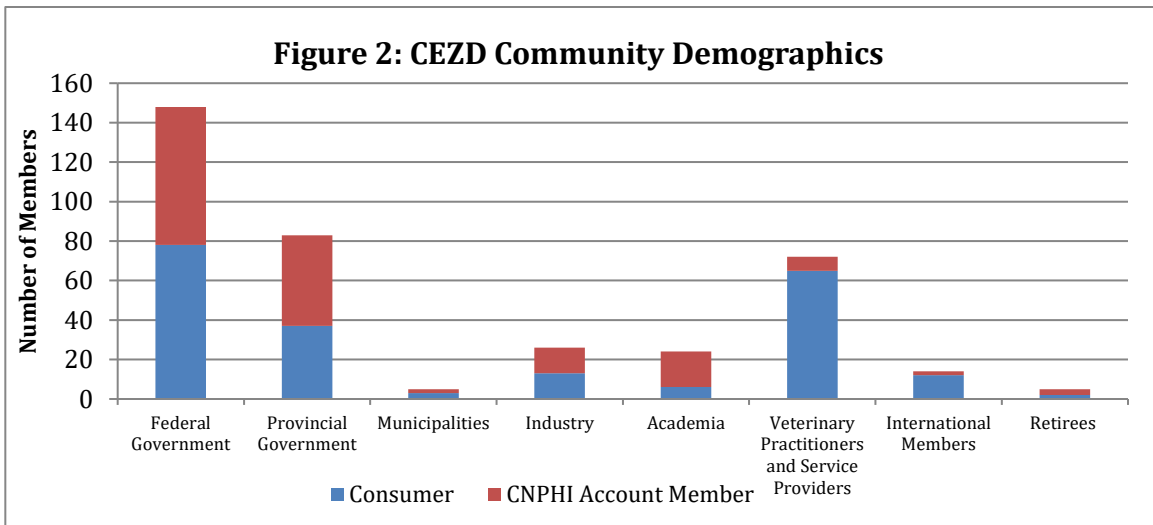
This annual report covers the period from April 1 2020 – March 31 2021, and provides information on current CEZD efforts as well as: demographics, stakeholder engagement efforts, KIWI technology, Anticipatory Intelligence Signal trends, and the CEZD Collaboration Centre. It concludes with CEZD's key priorities and action items going forward.

CEZD Demographics

As of April 1, 2021, the CEZD consists of 377 members, 3 of which are in the core team. Over the last year, 42 new members joined the community, a growth of ~12%. However, the community also lost 20(~5%) of its members due to retirement or occupational change. **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 57% of CEZD membership, with CNPHI account members occupying 43%.

Figure 1: CEZD Member Composition

- Consumer
- CNPHI Account Member

57%

43%
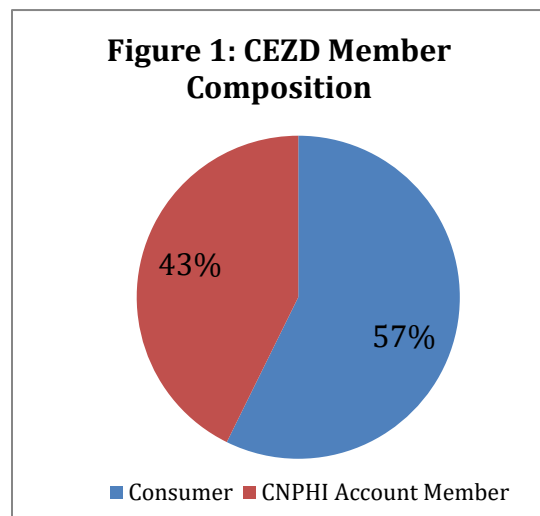
CEZD members belong to a variety of fields, including: federal, provincial, and municipal government, industry, academia, veterinary practice and other service provision, as well as a retirees who wish to remain involved. **Figure 2: CEZD Community Demographics** displays the percentage of individuals belonging to each of these demographic groups. Over the last year, all demographic groups, with the exception of municipalities, experienced increases in membership; with the majority of new members coming from federal government organizations as well as veterinary practice and other service providers.

Figure 2: CEZD Community Demographics

Number of Members

(bar chart with categories: Federal Government, Provincial Government, Municipalities, Industry, Academia, Veterinary Practitioners and Service Providers, International Members, Retirees)

■ Consumer   ■ CNPHI Account Member

Figures 3 and 4 provide a more detailed depiction of the 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), with one-two members each representing Parks Canada (PC), Global Affairs Canada (GAC), Canadian Nuclear Safety Commission (CNSC), and Fisheries and Oceans Canada (DFO).
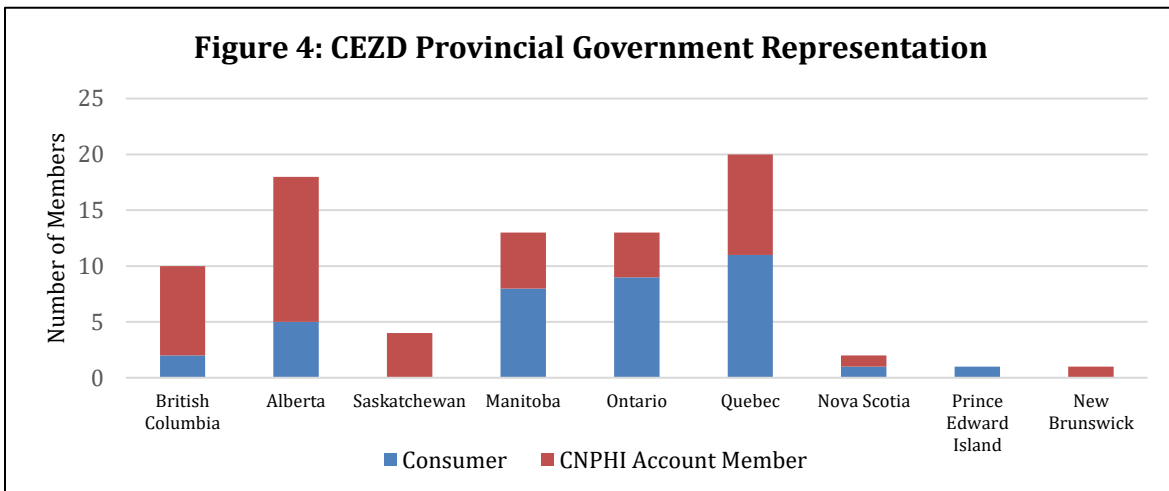
Figure 3: Federal Government Representation

Number of Members

■ CNSC
■ DFO
■ GAC
■ PC
■ AAFC
■ PHAC
■ CFIA

Figure 4: CEZD Provincial Government Representation

Number of Members

(bar chart with categories: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, Nova Scotia, Prince Edward Island, New Brunswick)
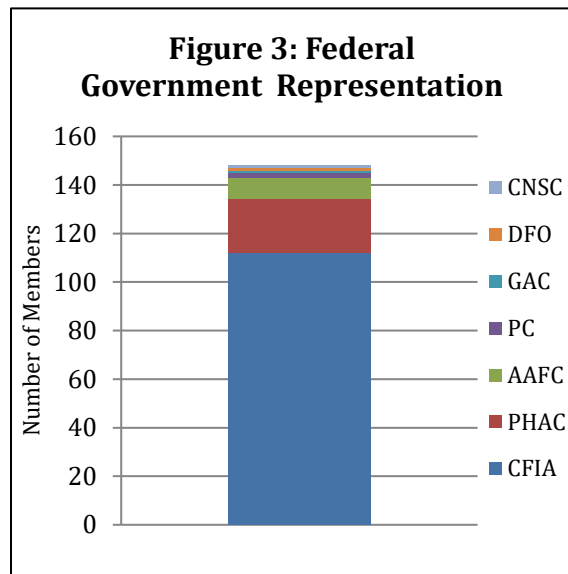
■ Consumer   ■ CNPHI Account Member

Figure 4: Provincial Government Representation depicts the number of members from each province and demonstrates CEZD's geographical reach within Canada. 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 categorized into the following groups: public sector/government, networks, industry, and academia.

Figure 5: CEZD Member Map
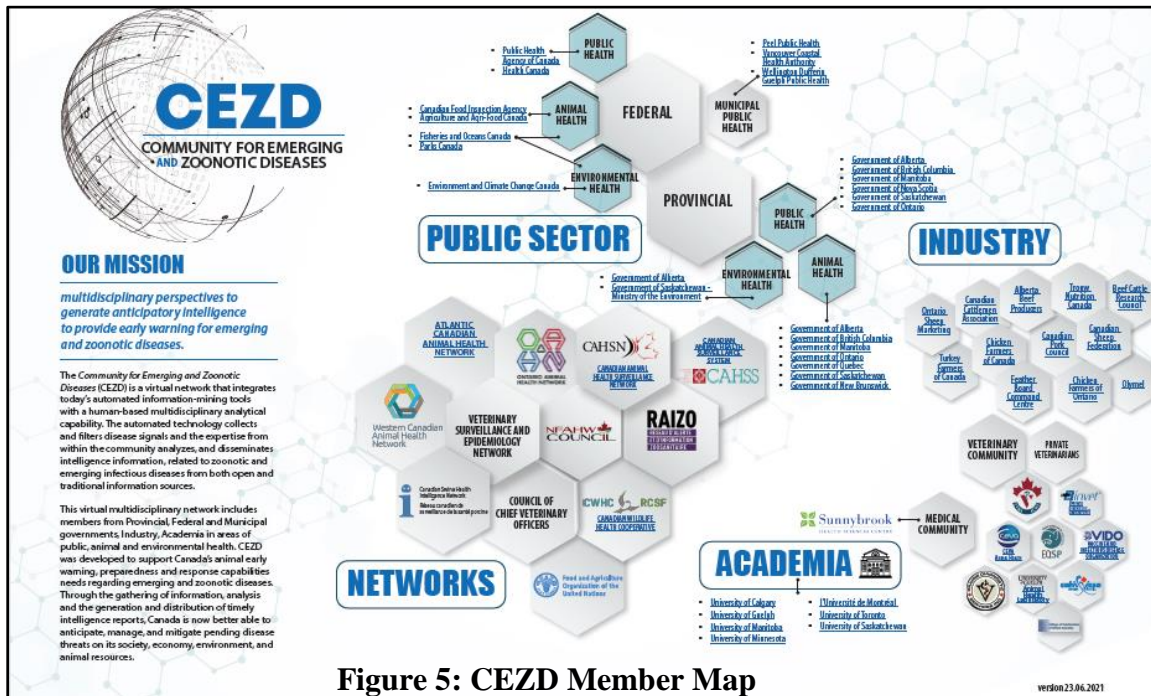
CEZD Activity Update

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, webinars, scoping meetings, rapid qualitative risk assessments, and introductory demonstration sessions.

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 35 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, 27 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 due to an increased focus on the SARS-CoV-2 rapid qualitative risk assessment and CEZD website development.

Domestic Pilot:

The CEZD domestic pilot and associated scenarios, which aim to move domestic signal identification and communication further upstream, were put on hold this year due to COVID-19 and a lack of participant volunteers. However, the specific processes and procedures for the domestic pilot were composed and a terms of reference was created this year.

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.

In the second half of 2020, a scoping meeting was held to discuss an outbreak of adenovirus in Coastal Black Tailed deer in British Columbia. A group of wildlife health experts from across North America were invited to share their expertise. The scoping meeting resulted in a recorded webinar which described the current outbreak and reviewed previous case reports across North America.

Joint Rapid Qualitative Risk Assessment (RQRA):

The COVID-19 pandemic resulted in the development of a rapid qualitative risk assessment (RQRA) process which utilized expert consensus in order to assess the risk of SARS-CoV-2 in different animal groups. An emergency collective expert appraisal group (SARS-CoV-2 in animals) was established in March of 2020. The joint RQRA process was led by CFIA and facilitated by the CEZD core team. The RQRA process relies on multidisciplinary expert consultation in order to address specific risk questions to support disease response and preparedness activities. It was developed as a result of the COVID-19 pandemic and the uncertainties/unknowns around the ability of SARS-CoV-2 to infect animals.

A total of three different RQRA's were completed throughout 2020-2021, the initial one focused on the public health implications of SARS-CoV2 in companion animals. Subsequently, two more RQRA's were completed which looked at livestock and then farmed mink. A total of 7 iterations of the various assessments were conducted; 3 companion animal; 2 livestock and 2 farmed mink. RQRA summary reports are available for review in the reports section of the CEZD website. The CEZD core team provided support to facilitators of subsequent assessments as required.

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 development of a stand-alone [CEZD website](#) was a significant achievement this fiscal year. The website established CEZD's independent online presence and allowed for greater open access to CEZD's intelligence reports and other risk products. Potential members now also have more transparent information on CEZD, our history, membership, activities, and how to engage.

During this time, CEZD also established its social media presence by creating both [Twitter](#) and [YouTube](#) accounts. The YouTube account is used to host recordings of any webinars that occur, whereas Twitter is used to engage with potential new and existing members as well as raise awareness on CEZD and related activities. Engagement across both of these platforms is currently low, however twitter traffic seems to be increasing slowly.

Annual Member Survey

Respondent Demographics:

This year's annual member survey was completed in March 2021. The survey was made available to all 377 members in both English and French and received a response rate of 9.3% (35 respondents). Twenty of the respondents identified themselves as being CNPHI account members, while fifteen identified as consumers. **Figure 6: Survey Respondents by Sector** displays the sectors as listed by respondents and closely resembles CEZD's membership structure. Federal and provincial governments along with industry were most represented, followed by the private sector, academia, and non-government organizations; meanwhile international members and retirees were absent from the survey responses.

Figure 6: Survey Respondents by Sector
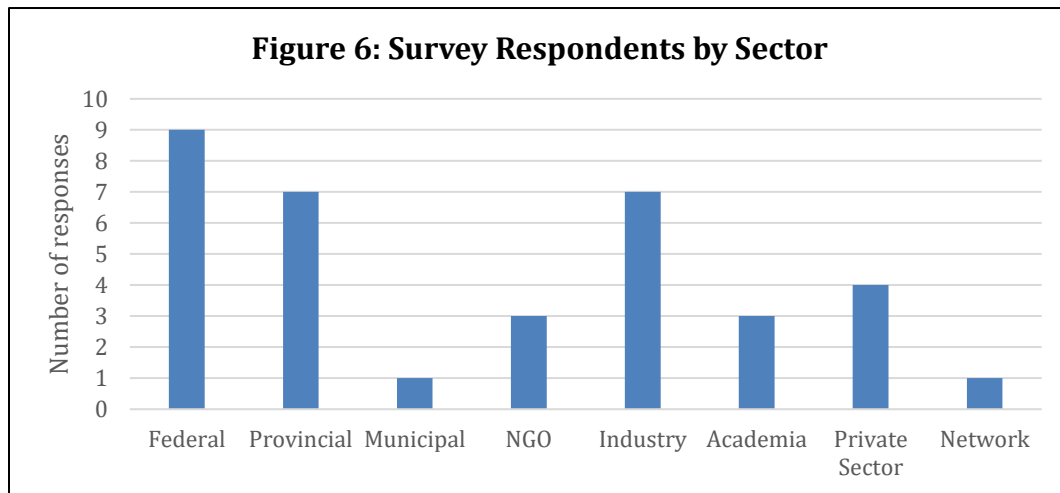
Survey respondents belong to a variety of organizations, including:

- Canadian Food Inspection Agency
- Canadian Sheep Federation
- Canadian Western Swine Health Intelligence Network
- University of Guelph
- Parks Canada
- Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec
- L'Équipe québécoise de santé porcine
- Centre D'Expertise En Production Ovine Du Québec
- Alberta Agriculture and Forestry
- Ontario Ministry of Agriculture, Food and Rural Affairs
- Manitoba Agriculture and Resource Development
- British Columbia Ministry of Agriculture
- Prince Edward Island's Department of Agriculture and Land
- Dufferin County
- One Health Scientific Solutions Inc.
- Farm Mutual
- Molesworth Farm Supply Ltd.

Additional organizations may also be represented as only 23/35 respondents identified their organization.

CEZD Value & Satisfaction:

When evaluating CEZD's value, all respondents (35) indicated that CEZD provided them with valuable information relevant to their current position. The majority of respondents

acknowledged that CEZD's value came from the weekly intelligence reports providing regular updates on disease outbreaks and the RQRAs examining the risk of SARS-CoV-2 in animals. Ping questions were mentioned as they allow members to have a timely discussion on disease events via poll comments and bring forth interesting issues. Other CEZD activities members found to be of value include: fostering new relationships, website development, evidence based webinars and transdisciplinary discussions. Overall satisfaction in CEZD remains high, with all members indicating that they are either satisfied (19) or very satisfied (16).

CEZD Assistance:

Figure 7: CEZD Assistance Categories displays three disease categories in which CEZD assisted its members, with almost all respondents (35) indicating that CEZD assists in raising disease awareness. This is similar to survey results from 2018. However, in the current survey about a third of respondents (13) also selected disease preparedness, and a quarter (9) selected disease response. The latter two categories are new for CEZD, and a result of our focus on additional analytical activities and reports, such as the: risk profile, RQRA, multidisciplinary meetings…etc.

Figure 7: CEZD Assistance Categories
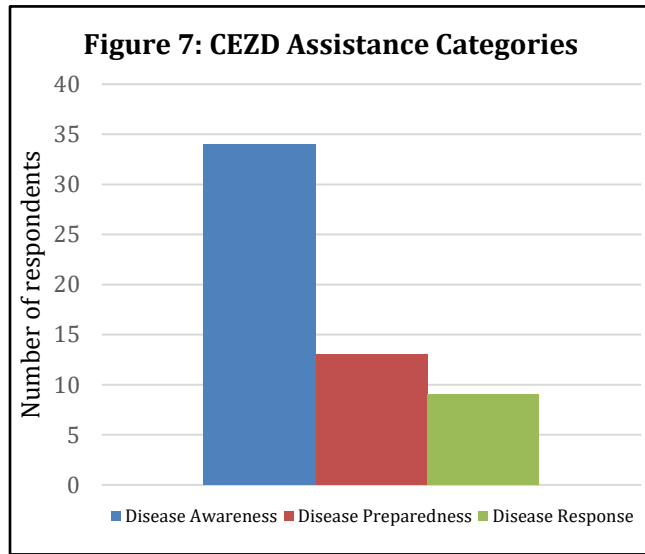
Additionally, respondents were asked how inclined they may be to reach out to CEZD to request assistance on emerging and zoonotic disease events (in the form of ping polls, interdisciplinary discussions or webinars, development of risk products). **Figure 8: Requesting CEZD Assistance** shows that while some members are unlikely to request assistance (5), the majority are neutral or unsure (19), and 11 are either likely or very likely to ask CEZD for support.

Figure 8: Requesting CEZD Assistance
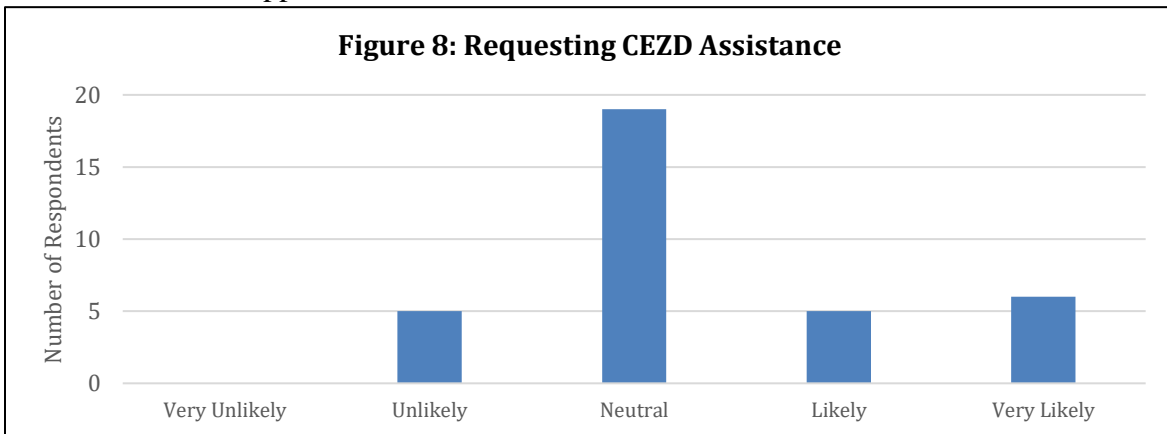
KIWI Technology

From April 2020 to March 2021, a total of 18 different individuals representing 12 different organizations logged in to KIWI and rated signals within the zoonotic and emerging disease program. **Figure 9: KIWI Information Filtration Process** reveals that during this period, the KIWI technology filtered through 37,828 Individual Information Pieces (IIPs) from CEZD's 21 automatic information sources. It provided a total of 6,859 Anticipatory Intelligence Signals (AISs) to the community for rating; with the community selecting 252 signals as relevant Early Warning Signals (EWSs).

The average number of individuals rating a signal was 5, but ranged anywhere from 1 to 12. For a detailed monthly breakdown of the signal filtration process please review **Table 1: April 2020 – March 2021 KIWI Signal Filtration.**
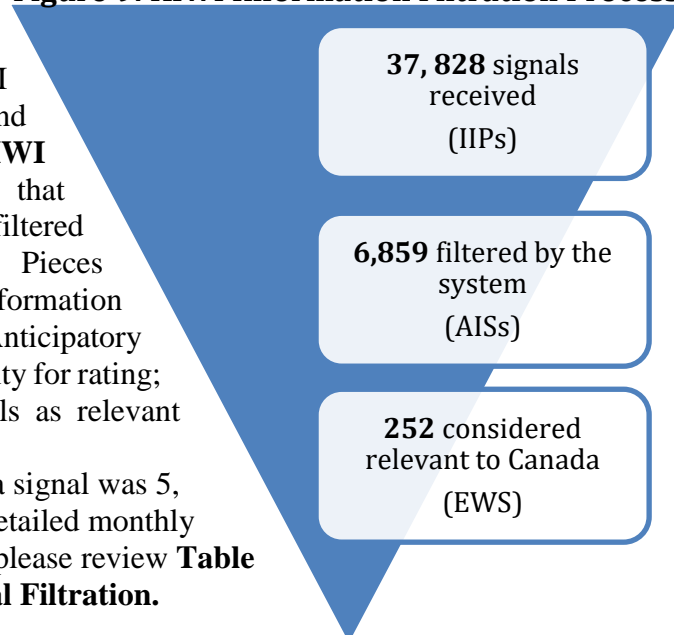
Figure 9: KIWI Information Filtration Process

37, 828 signals received (IIPs)

6,859 filtered by the system (AISs)

252 considered relevant to Canada (EWS)

Table 1: April 2020 – March 2021 KIWI Signal Filtration					
Month	Number of AISs	Automatic AISs	Manual AISs	Community Reported Events	Number of EWSs
April 2020	724	578	118	28	35
May 2020	624	500	99	25	22
June 2020	584	465	94	25	24
July 2020	636	498	117	21	9
August 2020	560	422	123	15	10
September 2020	459	356	81	22	19
October 2020	428	294	96	38	32
November 2020	556	407	123	26	35
December 2020	634	504	116	14	16
January 2021	625	442	137	46	17
February 2021	541	375	119	47	14
March 2021	488	336	102	50	19
Total	**6,859**	**5,177**	**1,325**	**357**	**252**

## 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 10: 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, ProMED accounted for the largest amount of relevant signals, followed by: CREs, EMPRES-i, Pig Progress, Avian Flu Diary, Outbreak News Today, and Worms and Germs Blog. Each of the other sources mentioned had less than 10 relevant signals.


Figure 10: Information Sources by Percentage of Relevant Anticipatory Intelligence Signals
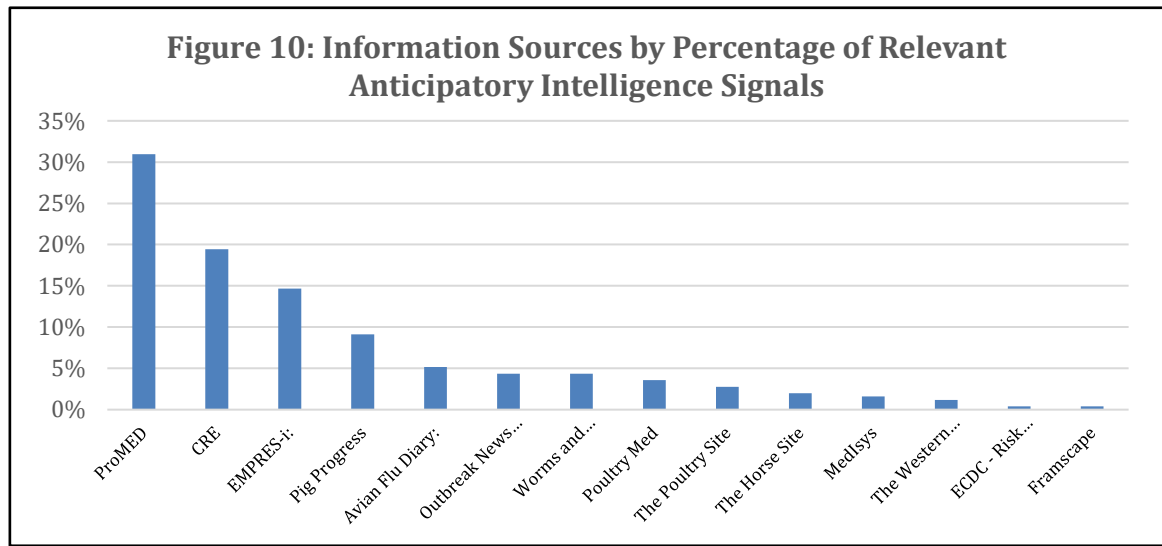
Anticipatory Intelligence Signal Specificity & Sensitivity

Figure 11: 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 and average rating greater than 1. From April 2020 to March 2021, 39.2% of signals coming in for community rating were classified as false-positives, while 19.3% were false-negatives. When compared to previous years, the number of false-negative signals has remained relatively consistent. However the number of false-positives has increased significantly (an increase of ~24%) over the last 2 years. This increase is attributed to the COVID-19 pandemic and signals related to COVID-19 research, vaccinations, updates on case counts, and response efforts that are typically rated as not relevant.

Figure 11: Monthly False-negative & False-positive Anticipatory Intelligence Signal Production
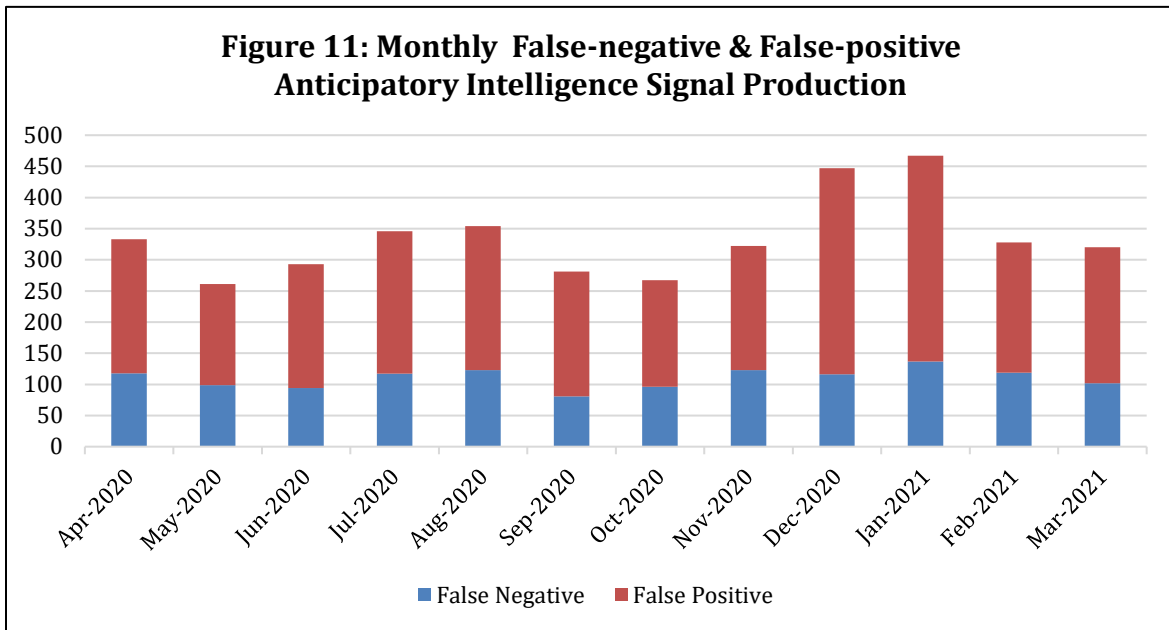
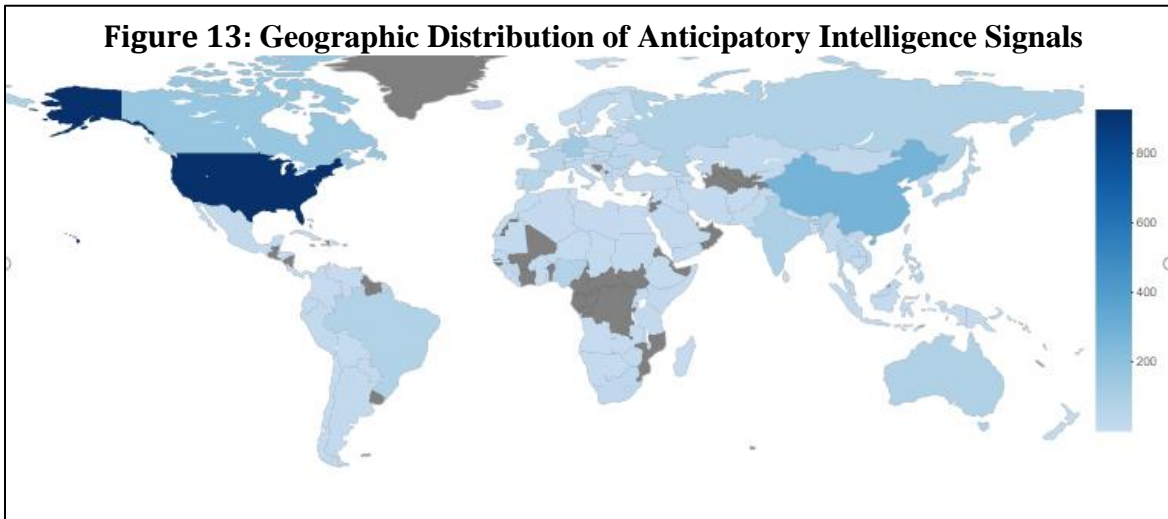## Anticipatory Intelligence Signal Relevancy

Figure 12: Anticipatory Intelligence Signal Ratings April 2020 – March 2021 outlines the percentage of signals falling into KIWIs 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, no signals achieved a rating of extremely relevant (5) or very relevant (4). The majority of signals have an average rating of not relevant (60%) or somewhat relevant (38%), with only 2% of signals rated as relevant.

Figure 12: Anticipatory Intelligence Signal Ratings April 2020 – March 2021
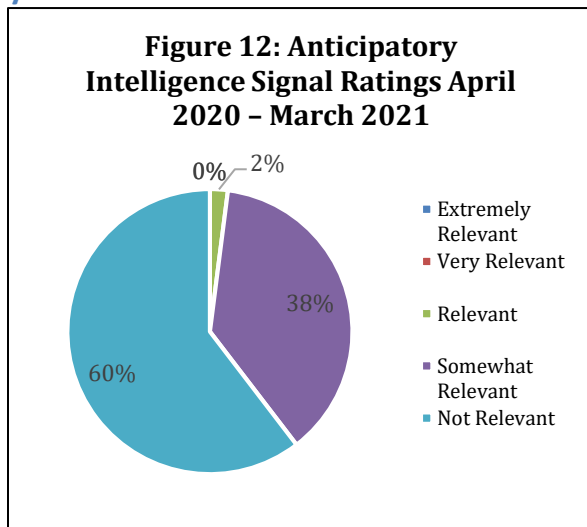
Geographic Distribution of Anticipatory Intelligence Signals

From April 2020 to March 2021, KIWI has received AISs from 150 different countries. **Figure 13: 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 (929), followed by China (282), Canada (166), Germany (137), and the Democratic Republic of Congo (107). Other noteworthy countries with 50+ signals include: India, UK, Russia, Australia, Brazil, Japan, South Korea, Nigeria, Netherlands, Philippines, and Spain. 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.

Figure 13: Geographic Distribution of Anticipatory Intelligence Signals

Anticipatory Intelligence Signal Trends

The top 5 most frequent health conditions from April 2020 – March 2021 were: Novel coronavirus, influenza (including: low pathogenic avian influenza, swine influenza, equine influenza, human influenza...etc.), African Swine Fever (ASF), highly pathogenic avian influenza (HPAI), and Salmonellosis. **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	3226
2	Influenza	525
3	African Swine Fever	440
4	Highly Pathogenic Avian Influenza	401
5	Salmonellosis	155
6	Dengue	139
7	Ebola	139
8	Eastern Equine Encephalitis	110
9	West Nile virus	90
10	Plague	87

Similarly, **Figure 14: Top Ten Health Condition Frequencies by Month** plots these most frequent health conditions by month to show specific time periods where these conditions occurred.

Figure 14: Top Ten Health Condition Frequencies by Month
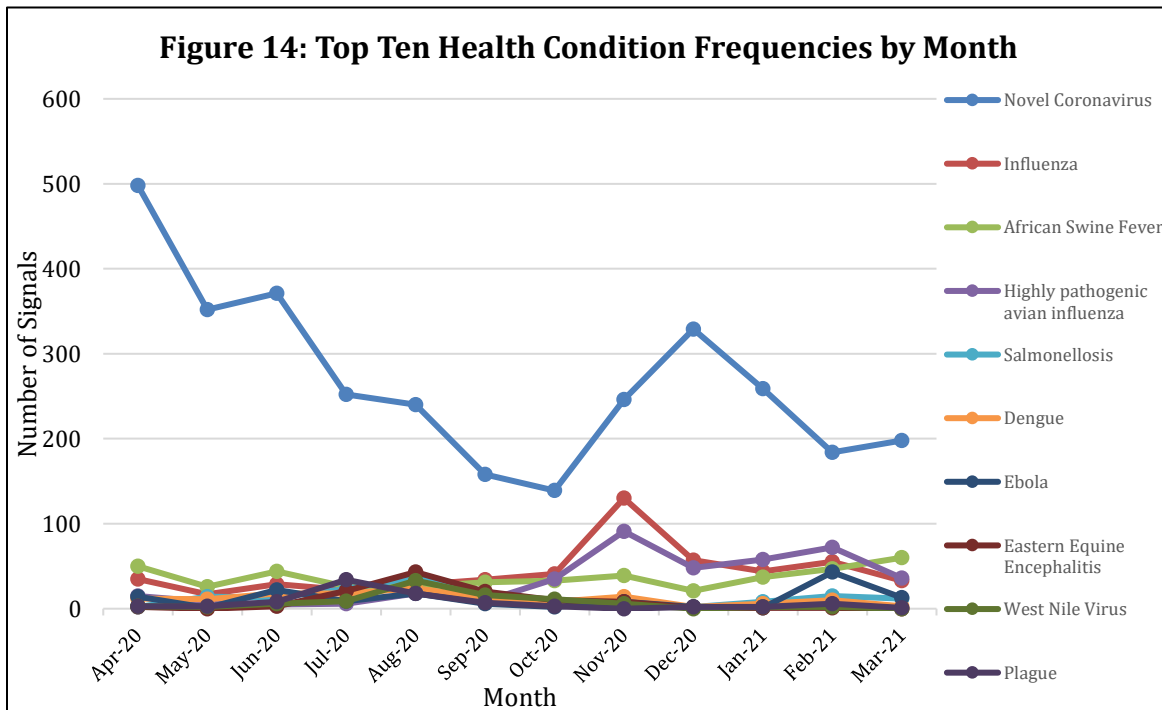
Disease Frequency Trends

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 15: HPAI KIWI Hazard Trends,** the weekly frequency counts for highly pathogenic avian influenza are provided from January 4, 2016 (when the KIWI system was initiated) to March 29, 2021. A total of 1075 HPAI signals entered the system during this time period, however 401 of those signals occurred in the 2020-2021 fiscal year.

Figure 15: HPAI KIWI Hazard Trends
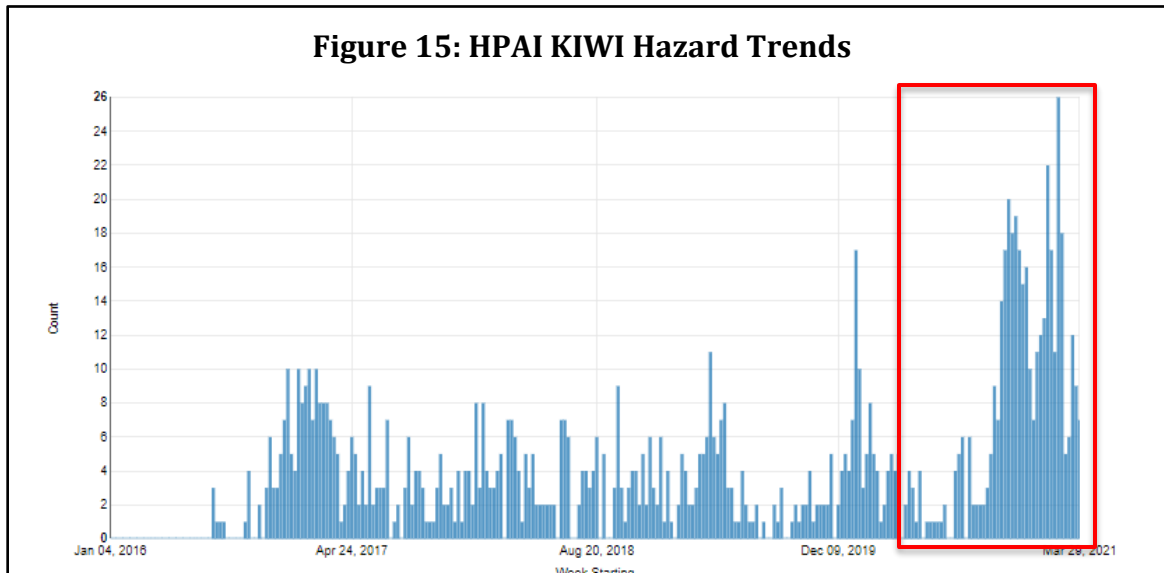
New Notable Disease Events of the Year

Over the course of the year, the following new events received the highest relevance ratings from the community: ASF in India, ASF in China, SARS-CoV-2 in felines, ASF in Papua New Guinea, ASF in Germany, H1N2v in Alberta, and SARS-CoV-2 in British Columbia mink. **Table 3: New Notable Events of the Year** lists these events, the month they occurred, and their average rating.

Table 3: New Notable Events of the Year		
Event	**Month Reported**	**Average Rating**
African Swine Fever in India – first case	April 2020	3.7
African Swine Fever in China – cases linked to unlicensed vaccines	January 2021	3.7
SARS-CoV-2 findings in cats, lions, tigers	April 2020	3.4
African Swine Fever in Papua New Guinea - first case	April 2020	3.3
African Swine Fever in Germany – first case in wild boar	September 2020	3.3
H1N2v Influenza A in Alberta	November 2020	3.3
SARS-CoV-2 in British Columbia mink	December 2020	3.2

CEZD Going Forward

Going forward into the coming year the following items have been identified by the community as key priorities for 2021-22:

CEZD Engagement
- Identify and connect with national One Health networks and organizations
- Engage with Veterinary Colleges (with CAHSS + WeCAHN)
- Create student framework/strategy for CEZD involvement/onboarding
- Continue with ongoing activities: webinars, monthly community teleconferences, pings, website & social media maintenance

Weekly intelligence report
- Continue production of the enhanced intelligence report
- Identify additional types of signal that can result in early warning

Risk Products & Processes
- Support training development for joint rapid qualitative risk assessments
- Explore production of additional risk products as situations warrant

CNPHI Developments
- Develop discipline categories to streamline rating in KIWI
- Explore dashboard and automatic report creation
- Complete automatic comments options

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