Opera & ARIAS Survey and Lessons Learned Summary Report

Oregon Health Authority (OHA) - Public Health Division (PHD) - COVID-19 Response and Recovery Unit (CRRU)

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Special thanks to all those that contributed to these efforts, from the survey respondents to the Lessons Learned session attendees, including anonymous parties and those directly referenced within this report, along with those providing planning and feedback input throughout the pandemic response and recovery effort. Thank you again for your dedication and diligence through these taxing times.

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Executive Summary

The purpose of this report is to summarize findings from a retrospective of the userbases' perceived capabilities provisioned by the Opera case investigation and ARIAS contact tracing systems from the onset of the COVID-19 pandemic to the middle of 2022. This report helps describe how well the information technology systems operated and identifies opportunities for improvement.

The objectives of the brief evaluation were to:

- Use a survey to gather feedback from Opera and ARIAS active user community.
- Collect verbal feedback from Opera and ARIAS active user community within lessons learned meeting sessions reviewing the survey response data to determine what was done well and not so well to help determine key improvement areas.

Key findings from the evaluation include:

- Based on user satisfaction feedback collected using likert scale, the systems performed as follows:
  - Of the Opera user respondents:
    - 1% Highly Satisfied,
    - 46% Satisfied,
    - 23% Undecided,
    - 22% Dissatisfied,
    - 6% Highly Dissatisfied, and
    - 2% Not Applicable.
  - Of the ARIAS user respondents:
    - 8% Highly Satisfied,
    - 49% Satisfied,
    - 26% Undecided,
    - 11% Dissatisfied,
    - 0% Highly Dissatisfied, and
    - 6% Not Applicable.
- During surges in cases, Opera latency delays significantly affected usability and user satisfaction.
- The ARIAS contact tracing functionality could be improved with bi-directional interfacing with the Opera case investigation system.

Introduction

Opera (Oregon Pandemic Emergency Response Application) is an electronic disease surveillance system intended for local and state public health epidemiologists and disease investigators to efficiently manage COVID-19 disease reports. Opera was created as a clone of the Oregon Public Health Epidemiologists' User System (Orpheus) for communicable disease surveillance and reporting, which predated the pandemic. ARIAS (At Risk Identification Alerting System) was newly adopted by OHA in 2020 and is used to facilitate contact tracing among people exposed to COVID-19. Opera and ARIAS are essential elements of tracking, tracing, isolating, and quarantining new cases and contacts to mitigate the spread of COVID-19.

In May 2022, an online survey was sent out to all users of the systems to collect their input. Subsequently, follow-up Lessons Learned sessions were held, converging information collected from the survey and in the sessions to further clarify potential improvement opportunities.

Data Collection Methods

Opera and ARIAS system users were invited to participate in a survey-based brief evaluation. The survey was distributed to active system users as of May 2022. OHA conducts quarterly audits of Opera and ARIAS system access, and with the end of universal contract tracing in early 2022, many contact tracers (i.e., ARIAS users) were no longer active system users. This resulted in a limitation of the survey and findings because people who used the systems earlier in the pandemic were not included.

The Smartsheet online survey, only in English, gathered respondent perceived feedback identifying in summary the respondents' role, system expertise, customer satisfaction, service quality of system service delivery, and further details of why they reported the ratings submitted. Here is a summarized listing of the direct survey questions to further clarify context for this report recommendations:

- What role was served in the past.
- What systems were used, i.e., ARIAS and/or Opera.
- Please rate your satisfaction in using Opera:
    - 0) Not Applicable
    - 2) Dissatisfied
    - 3) Undecided
    - 4) Satisfied
    - 5) Highly Satisfied
- Please describe what led to Opera satisfaction or dissatisfaction.

- Please rate your Opera customer service satisfaction:
  - 0) Not Applicable
  - 1) Case investigation systems and processes are not meeting COVID response needs
  - 2) Case investigation systems and processes function to inadequately meet COVID response needs
  - 3) Case investigation systems and processes function to adequately meet COVID response needs
  - 4) Case investigation systems and processes function in a manner that fully satisfy COVID response needs
- Please rate your Opera level of understanding:
  - L1 – I'm a novice (Limited)
  - L2 – I'm an apprentice (Adequate)
  - L3 – I'm a practitioner (Proficient)
  - L4 – I'm an expert (Excellent)
- Please rate your satisfaction in using ARIAS (same as Opera.)
- Please describe what led to ARIAS satisfaction or dissatisfaction.
- Please rate your ARIAS customer service satisfaction:
  - 0) Not Applicable
  - 1) Contact tracing systems and processes are not meeting COVID response needs
  - 2) Contact tracing systems and processes function to inadequately meet COVID response needs
  - 3) Contact tracing systems and processes function to adequately meet COVID response needs
  - 4) Contact tracing systems and processes function in a manner that fully satisfy COVID response needs
- Please rate your ARIAS level of understanding (same as Opera.)
- Please provide additional feedback.
- Please provide feedback to additional support services desired.
- If interested in follow-up attending lessons learned session(s), provide name and email address for follow-up.

The respondents were comprised of CRRU (i.e., internal) and external (e.g., LPHA, Community-based organization, or OHA staff outside of CRRU) Opera and ARIAS users belonging to the following distribution lists managed by the ARIAS Support Team. The population data (N) for with the "OHA-PHD-OperaUsers" distribution list contained 945 active Opera user members and "DHSOHA-ARIASusers" distribution list contained 482 active ARIAS user members. A total of 50 survey respondents (Appendix A: Respondents) showed interest in follow-up Lessons Learned discussion sessions. Of the total population (N) comprised of 945 users, 104 surveys were submitted, which considering the majority of Opera users also having ARIAS access, the

final survey response rate was approximately 11%. Based on the active respondents (Appendix A: Respondents) encompassing 104 users, 53 respondents used ARIAS, 102 respondents used Opera, and 51 respondents used both systems. In response to the emails sent, there were eight delivery failure notifications. A single reminder follow-up email was sent after a two-week response period.

The survey response data acted as initial foundation basis for this report. Lessons Learned discussion sessions were then held, with groups of OHA and external system users, to review the survey data, note themes, and elicit more detailed feedback around the key focus areas (Appendix C: Lessons Learned Sessions Feedback) improvement opportunities. OHA and external users were grouped separately to help promote objectivity within this report (Diagram 1: Respondent Role Bar Chart).

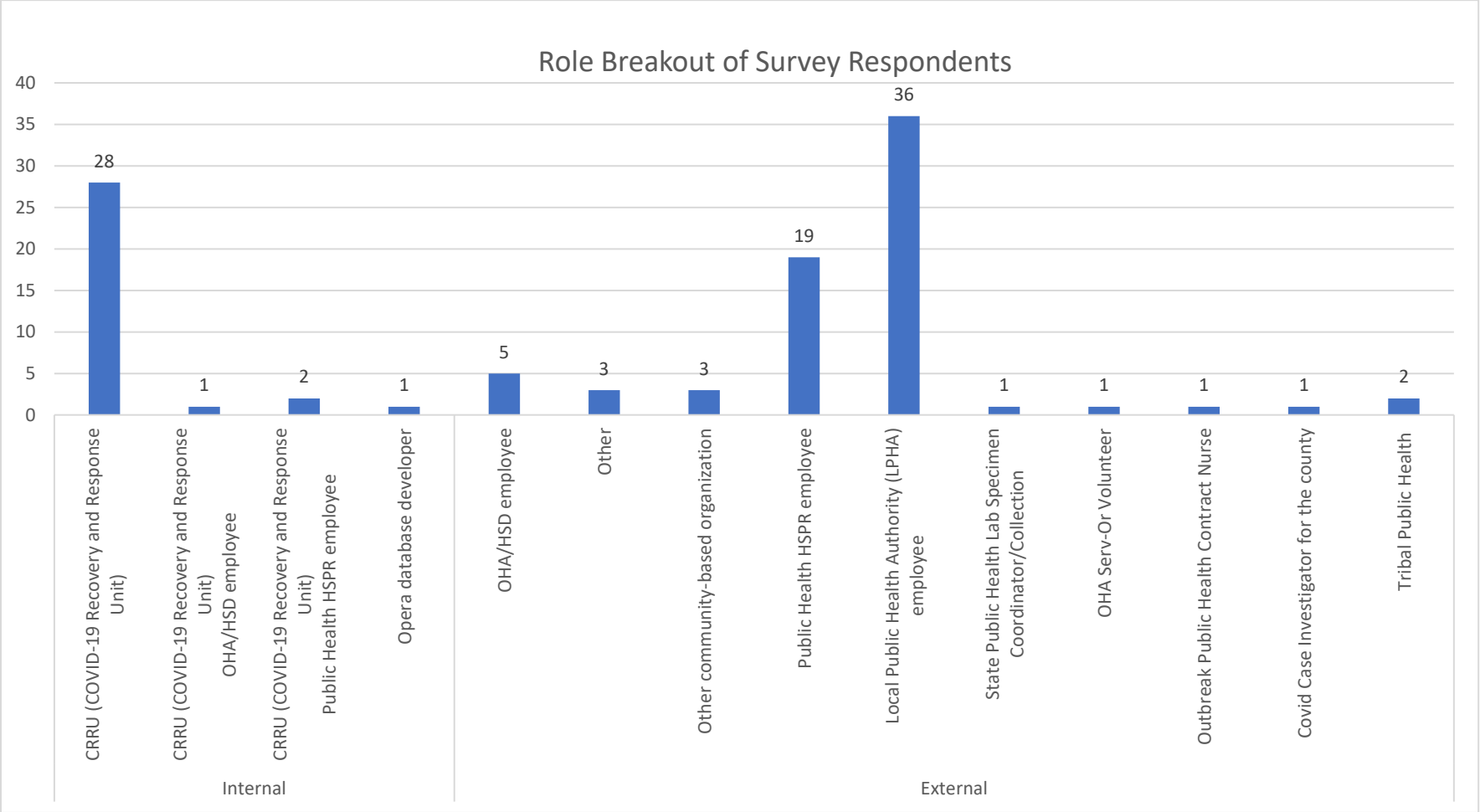


Diagram 1: Respondent Role Bar Chart

Timelines for Context

The Opera and ARIAS timelines (Diagram 2: Opera Timeline and Diagram 3: ARIAS Timeline) were provided to the survey respondents to remind people of key milestones. These timelines illustrate accomplishments or incidents that occurred, including software releases, which note significant changes, helping respondents reflect on their experience using the Opera and ARIAS systems. Additionally, the timelines cover formal online/in-person training services being rolled out or refined instruction guide publications provided to promote exchange.

Opera Timeline

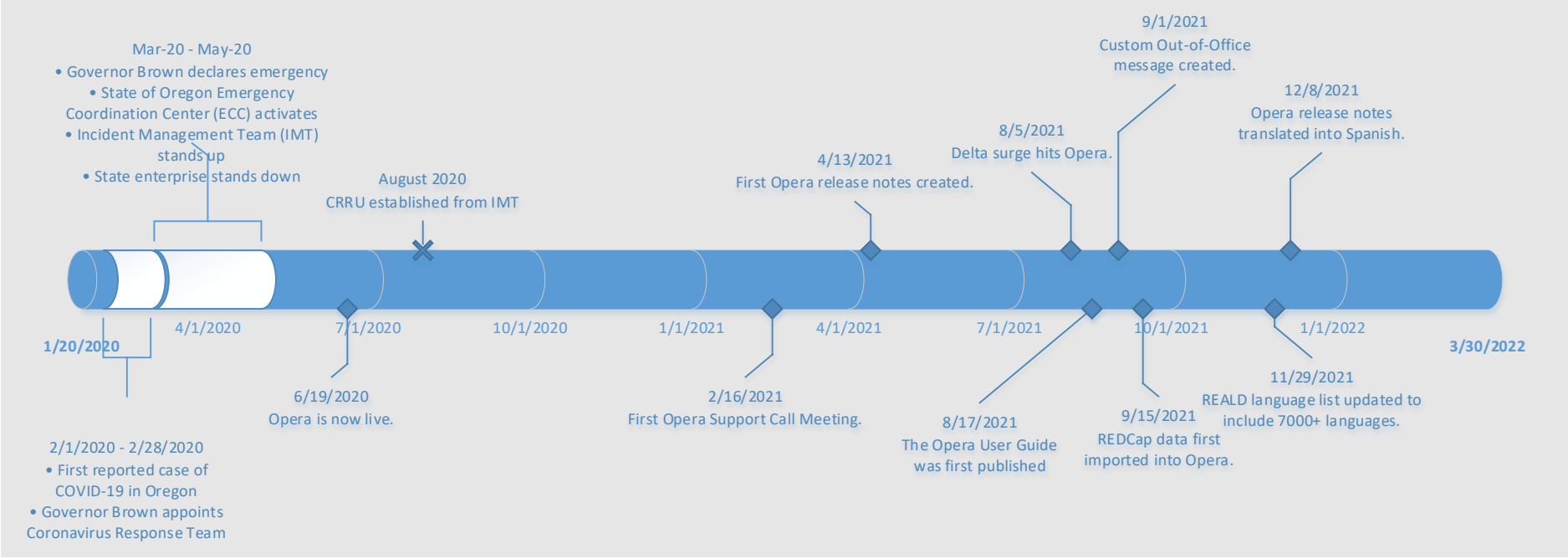


Diagram 2: Opera Timeline

ARIAS Timeline

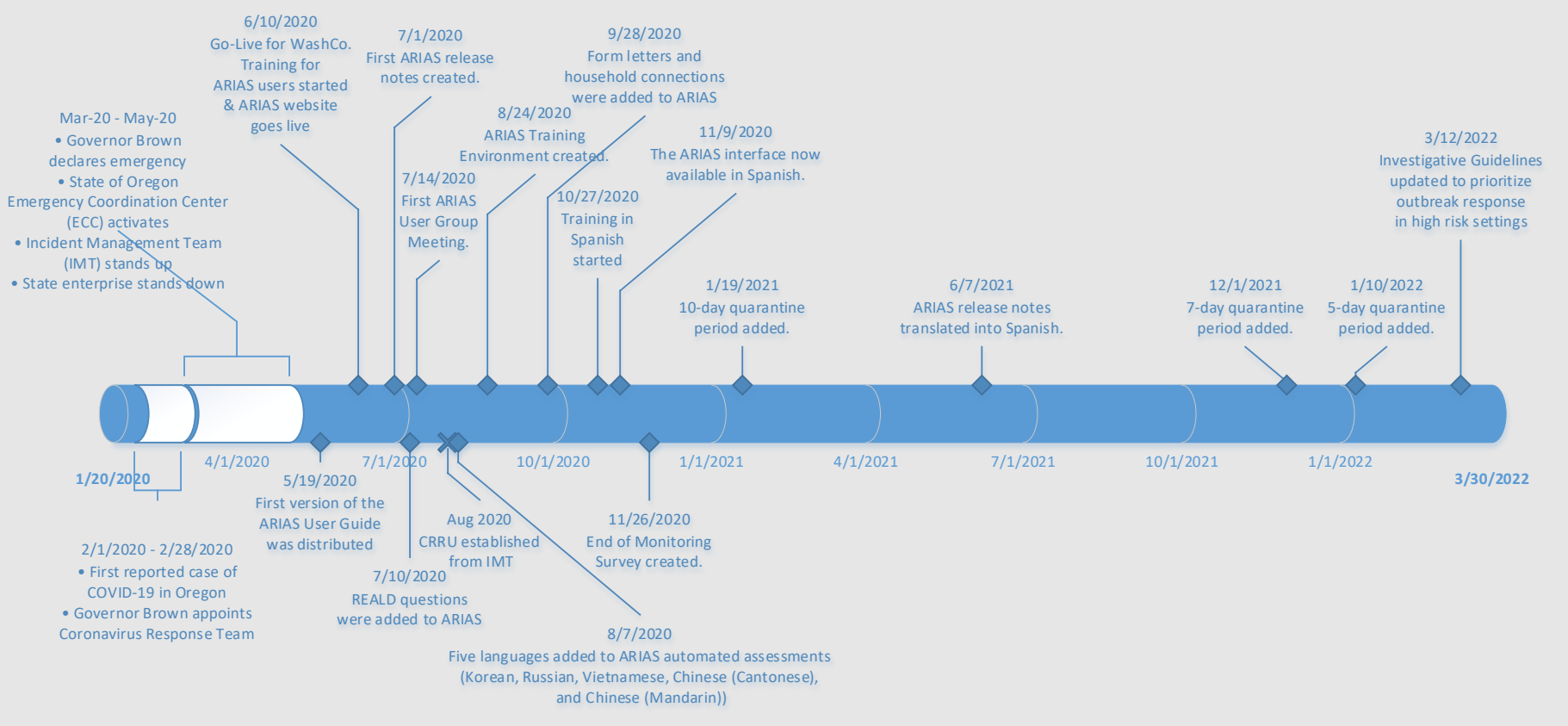


Diagram 3: ARIAS Timeline

Additional Timeline Notable Events	
7/24/2020: Go-Live for Curry county. Last LPHA to be onboarded. 34 total LPHAs onboarded unto ARIAS. 7/27/2020: ARIAS runs out of licenses, new users can't get access. Temporary emergency licenses established. 8/31/2020: Additional license ordered; however, unexpected behavior began with these licenses. 9/7/2020: Access Teams created in ARIAS for secured access users. 10/2/2020: Go-Live for Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians (CTCLUSI) and Yellowhawk Tribal Health Center (CTUIR). First Tribal users.	10/29/2020: Go-Live for Eastern Oregon Center For Independent Living (EOCIL), Euvalcree, and Urban League of Portland. First CBO users. 12/15/2020: All license issues finally resolved. 12/31/2020: Go-live for Confederated Tribes of the Grand Ronde Community of Oregon. Last Tribe to be onboarded. 8 total Tribes onboarded unto ARIAS. 11/2/2021: Go-live for Clatsop Community Action. Last CBO to be onboarded. 28 total CBOs onboarded unto ARIAS.

For the following information, further data analysis and review can be found within the attached spreadsheet. Please note that those requesting anonymity will have "anonymous" or will be blank in email / name cells.

CRRU Survey Data Collected.xlsx

ARIAS Feedback

Of the total population (N) comprised of 945 users, 104 surveys were submitted, which considering the majority of Opera users also having ARIAS access, the final survey response rate was approximately 11%. Based on the active respondents (Appendix A: Respondents) encompassing 104 users, 53 respondents used ARIAS, 102 respondents used Opera, and 51 respondents used both systems. Considering half nonresponses as (blank), greater than 30% of the ARIAS users reported a satisfied user experience (Diagram 4: ARIAS User Satisfaction).

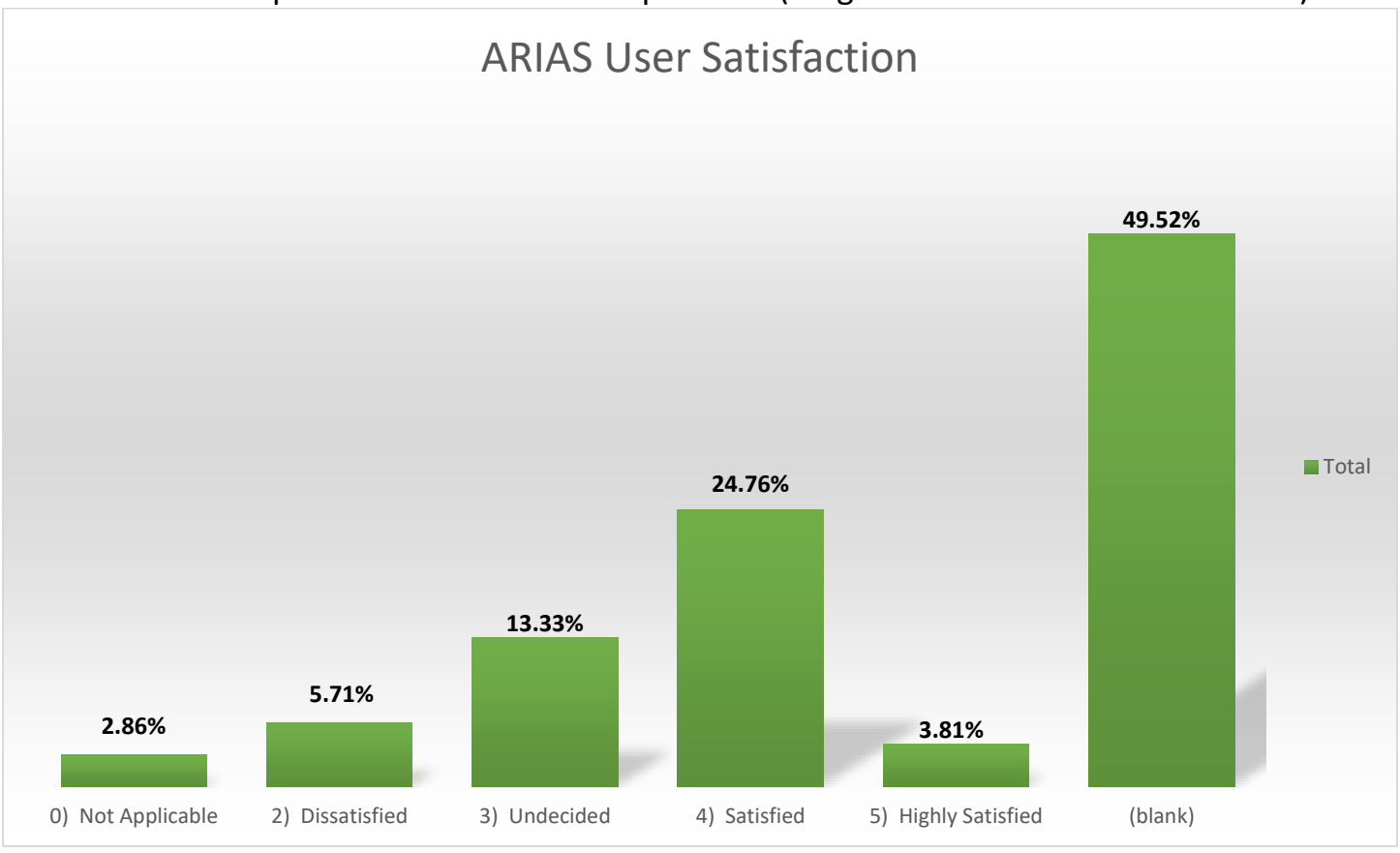


Diagram 4: ARIAS User Satisfaction

Of the total population (N) comprised of 945 users, 104 surveys were submitted, which considering the majority of Opera users also having ARIAS access, the final survey response rate was approximately 11%. Based on the active respondents (Appendix A: Respondents) encompassing 104 users, 53 respondents used ARIAS, 102 respondents used Opera, and 51 respondents used both systems. Considering more than half nonresponses as (blank), approximately 34% of the internal and external user base considered the ARIAS contact tracing system as adequate to meet public COVID response needs (Diagram 5: ARIAS Service Delivery Rating).

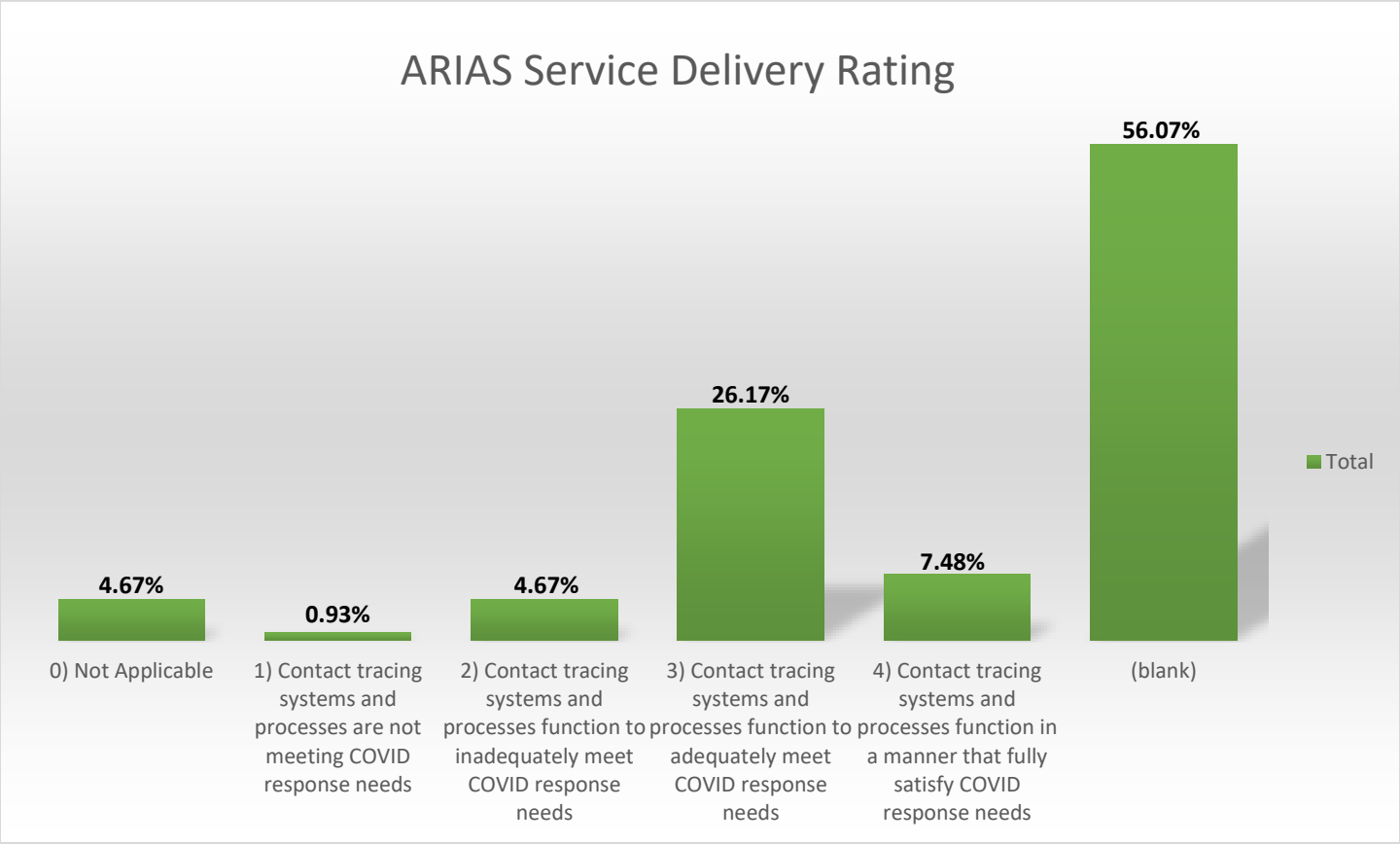
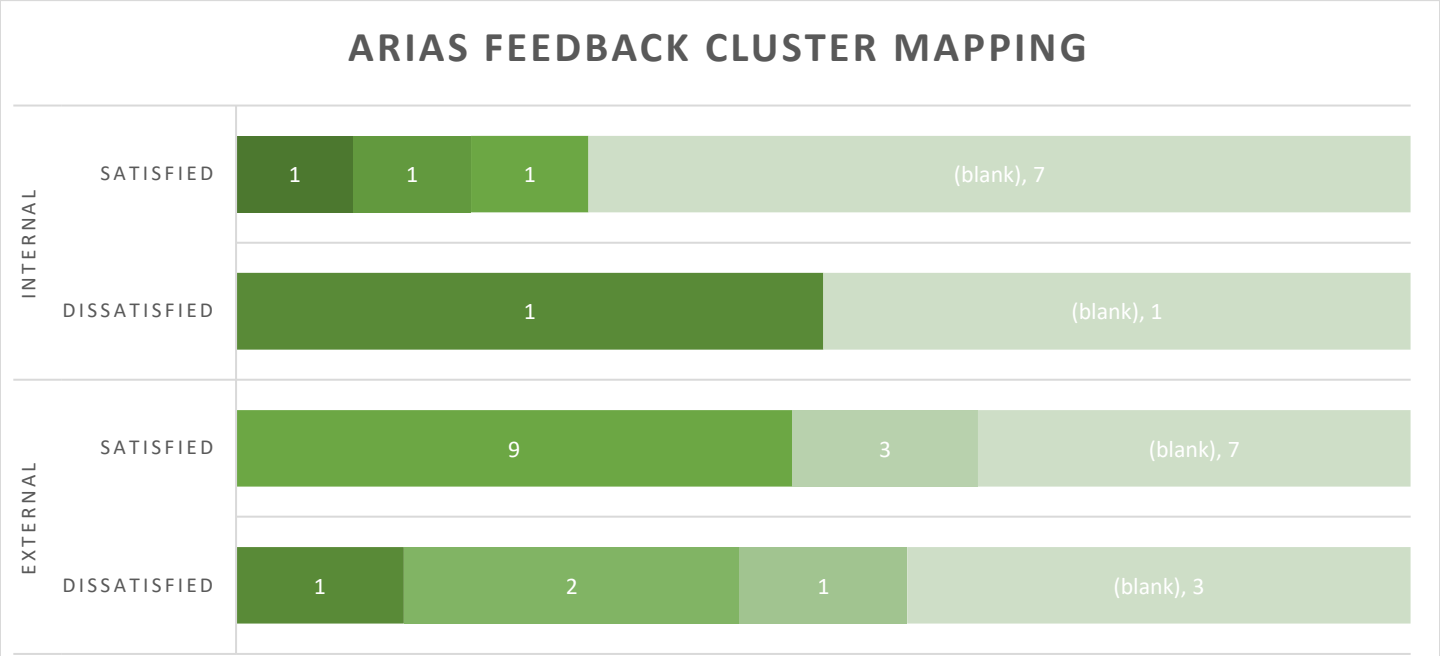


Diagram 5: ARIAS Service Delivery Rating

As shown in ARIAS Feedback Cluster Mapping (Diagram 6: ARIAS Feedback Cluster Mapping), based on groupings of ARIAS feedback, 77% of the users were satisfied and reported that the tool was easy to use (Appendix B: User Experience). With 18 nonresponses (blank) showing respondents that didn't provide detailed responses expressing their perceived reasoning for the rating (Diagram 6: ARIAS Feedback Cluster Mapping), several external users recommended that bi-directional interface between the Opera case investigation and ARIAS contact tracing system be considered, or the two separate systems be combined.



	External		Internal	
	Dissatisfied	Satisfied	Dissatisfied	Satisfied
Acceptable performance				1
Difficult to use specific function	1		1	
Dynamic exportablity				1
Easy to use		9		1
Lack of upstream interface with OPERA limited collaboration/reporting capabilities	2			
Similar capabilities without upstream interfacing	1			
Worked well		3		
(blank)	3	7	1	7

Diagram 6: ARIAS Feedback Cluster Mapping (numbers show the count of respondents per cluster mapping category)

Opera Feedback

Of the total population (N) comprised of 945 users, 104 surveys were submitted, which considering the majority of Opera users also having ARIAS access, the final survey response rate was approximately 11%. Based on the active respondents (Appendix A: Respondents) encompassing 104 users, 53 respondents used ARIAS, 102 respondents used Opera, and 51 respondents used both systems. With 5% nonresponses as (blank), approximately 46% were satisfied with the system (Diagram 7: Opera User Satisfaction).

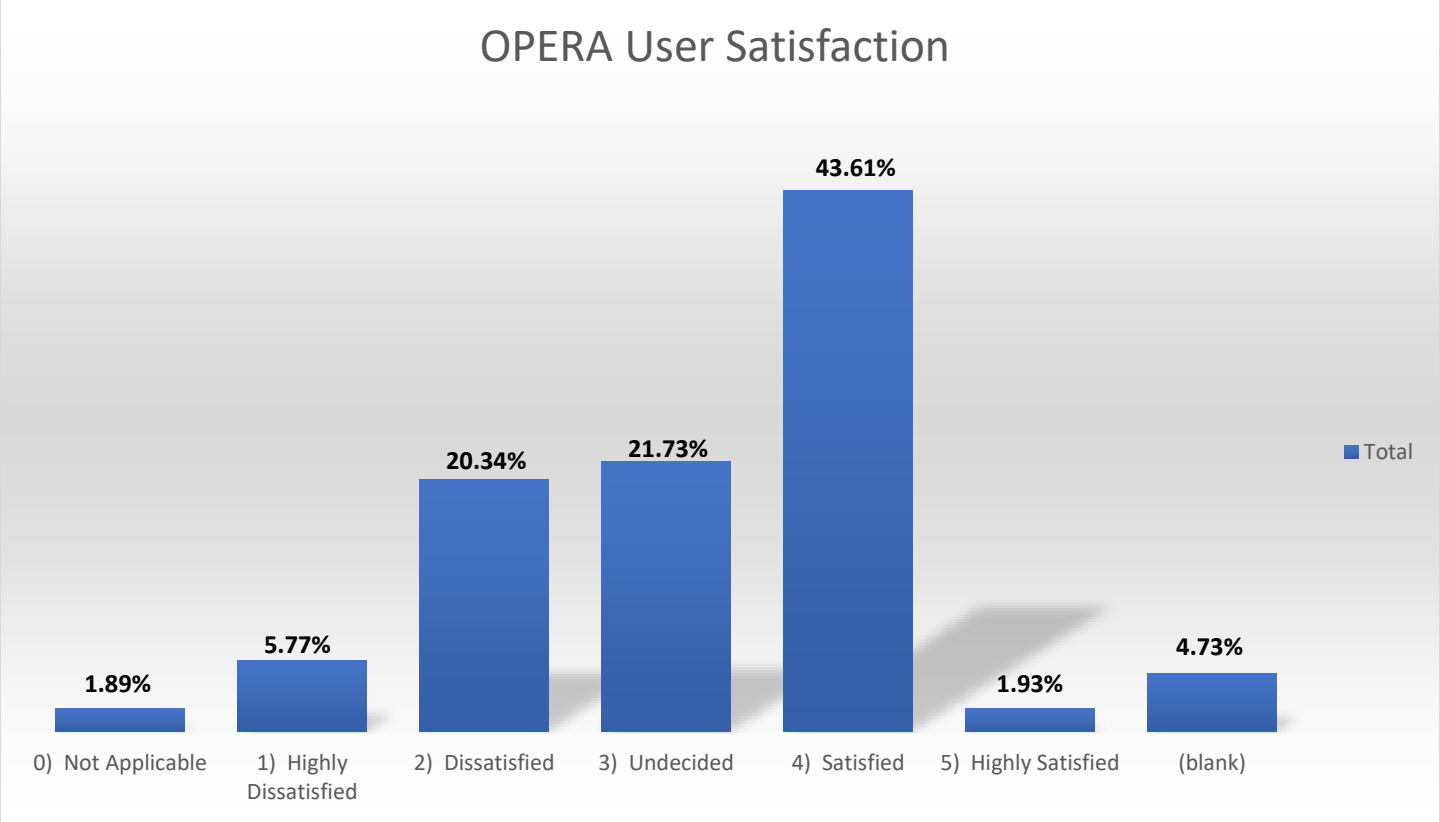


Diagram 7: Opera User Satisfaction

Of the total population (N) comprised of 945 users, 104 surveys were submitted, which considering the majority of Opera users also having ARIAS access, the final survey response rate was approximately 11%. Based on the active respondents (Appendix A: Respondents) encompassing 104 users, 53 respondents used ARIAS, 102 respondents used Opera, and 51 respondents used both systems. With 8% nonresponses as (blank), 64% felt satisfied with the Opera system's case investigation capabilities adequately meeting public COVID response needs (Diagram 8: Opera Service Delivery Rating).

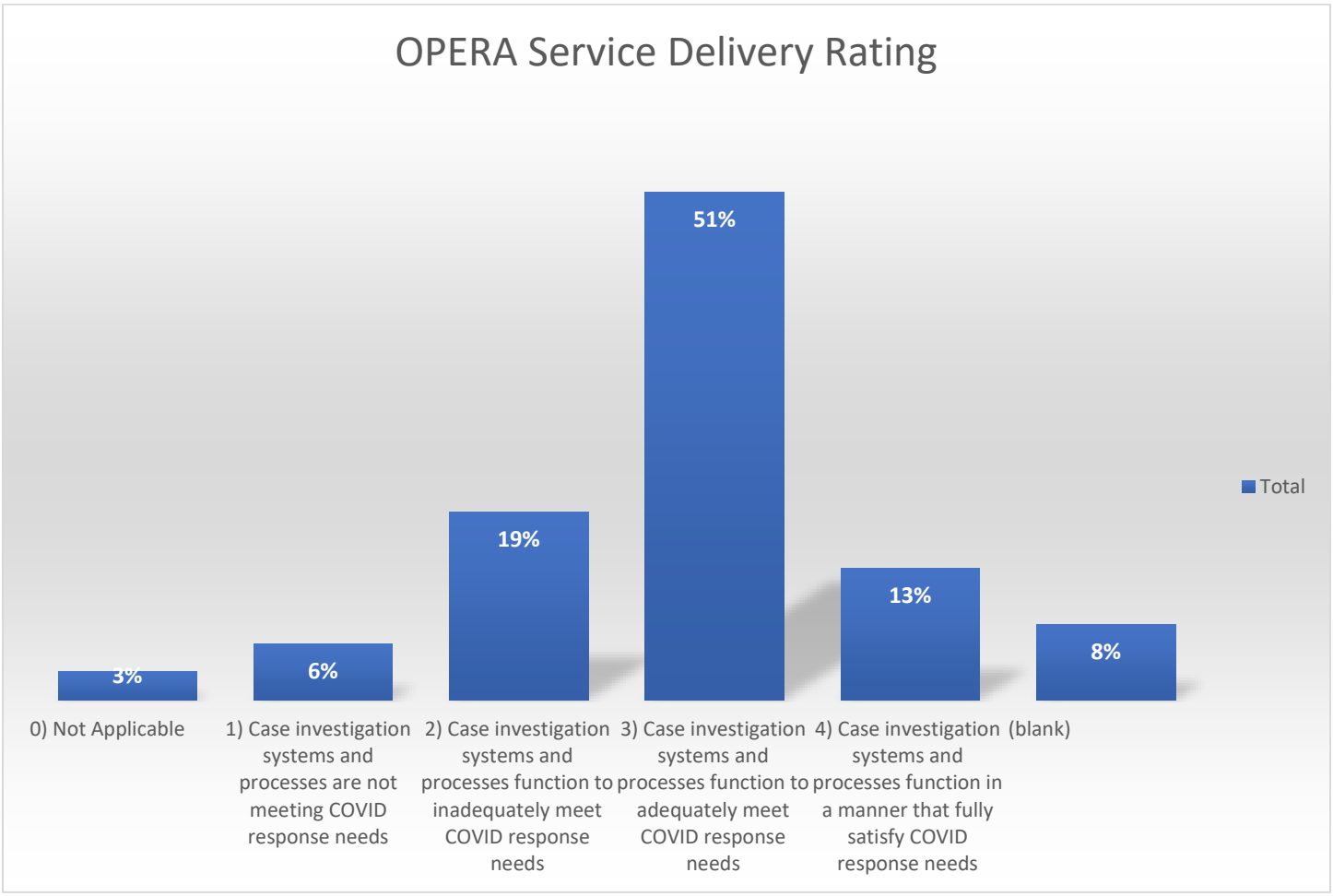
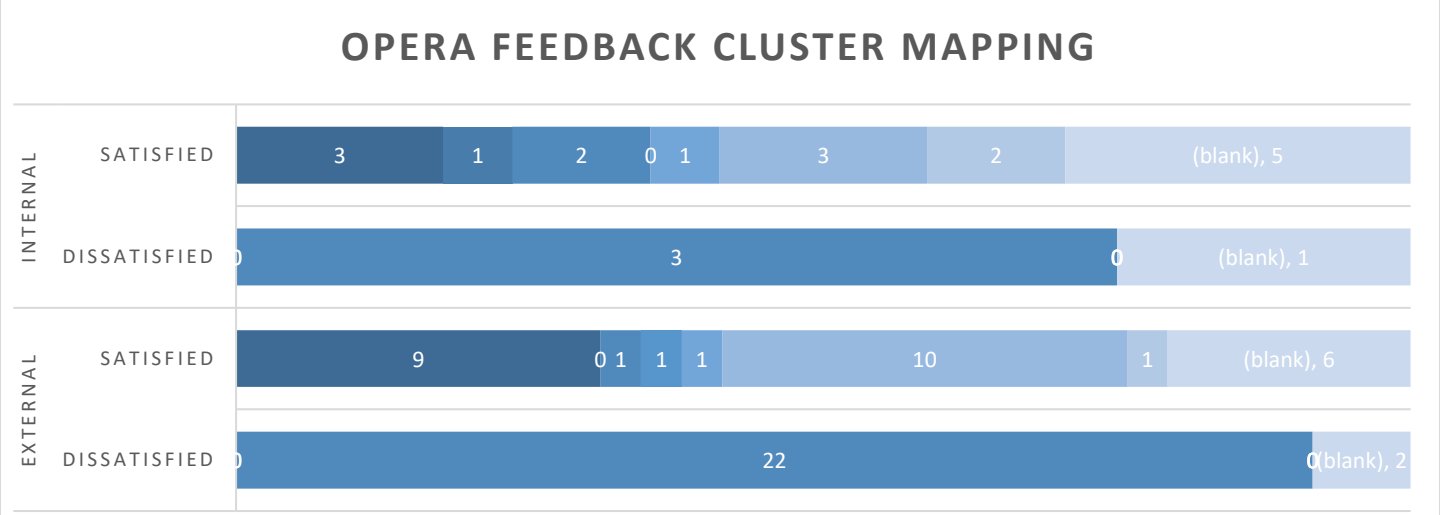


Diagram 8: Opera Service Delivery Rating

Based on cluster grouping of the Opera feedback (Appendix B: User Experience), considering nonresponses as (blank), most users were dissatisfied and found the tool faced latency issues, bottleneck/overburdened system, leading to a backlog of cases, but also described the tool as working well and easy to use, which lead to a few contradictions. For example, several Internal Satisfied responses alternately conveyed feedback classified within the "Latency, bottlenecked/overburden system…" cluster. With 14 nonresponses (blank) showing respondents that didn't provide detailed responses expressing their perceived reasoning for the rating (Diagram 9: Opera Feedback Cluster Mapping), a few external users recommended replacing Opera, or combining Opera and ARIAS. One contradiction within this mapping analysis found two satisfied responses while feedback noting Opera usage barriers, i.e., "found opera easy to use just frustrated with delays with high users" and "everything other than Login issues are more common and slow in loading."



	External		Internal	
	Dissatisfied	Satisfied	Dissatisfied	Satisfied
Easy to use		9		3
Helpful, prompt support				1
Latency, bottlenecked/overburdened system, leading to backlog of cases	22	1	3	2
Room for data entry improvement		1		
Valued case EPI linking capability		1		1
Worked well		10		3
Worked well, but performance issues		1		2
(blank)	2	6	1	5

Diagram 9: Opera Feedback Cluster Mapping

Lessons Learned Findings

With the Lessons Learned meetings held during July and early August, the attendees' key takeaways among the external to CRRU staffing userbase and the internal CRRU development/support staff held the following common themes (Appendix C: Lessons Learned Sessions Feedback):

- The systems lacking bi-directional interfacing led to data quality and service delivery efficiency impacts in multiple ways:
    - contact tracing identified infection data gaps within Opera case records, e.g., when an ARIAS contact tests positive and becomes a case, a new case record must be created in Opera,
    - parent and children have separate records rather than hierarchical relationships; unnecessary, incomplete, and duplicate records,
    - an individual can be a contact for multiple case investigations, resulting in duplicated effort for case investigations and contact tracing resulting in resident frustration,
    - excessive lack of data quality control requiring manual laborious processes, e.g., contacts with differing name spellings, and
    - limited reporting capabilities requiring manual data extraction, in turn, compounding the Opera latency issues.
- Considering the COVID-19 environmental conditions, disconnect of feedback between business userbase and technical support may have limited internal software development lifecycle productivity and maturation.
- The dedicated support and general leader to business liaison communications was appreciated, however systematic improvements could help with maturation during the response and recovery period. Consider collecting feedback following stabilization for each release.

When considering an end product solution and defining business requirements, many found that ARIAS and Opera were designed in such different manners that it was difficult to work between both systems. Depending on the next steps, consider incorporating intuitive, common design to help unify the case investigation and contact tracing capabilities could promote easier ramping and integration in operations. One improvement recommended is an automated notifications system to cases and contacts, e.g., email, SMS/text, etc., rather than depending on solely on direct communications. Direct case investigation and contact

tracing contact messaging systems could help improve efficiency in achieving the targeted outcomes, i.e., mitigating risk of spread, promoting proper care and vaccination.

Recommendations

After reviewing the thoughtful feedback provided by ARIAS and Opera system users and the Lessons Learned follow-up sessions confirmed these key recommendations:

1. Exploring feasibility of bi-directional interfacing or consolidating the two systems. Because Opera receives input from multiple sources, a bi-directional relationship with ARIAS would require more exploration.
2. Feedback supports consolidation, unifying the wisdom within case management design with the existing contact tracing ARIAS cloud solution. Being that Opera is a legacy system that many greatly appreciate, it could be used to model the augmentation or redesign of ARIAS.

A centralized case investigation and contact tracing system could provide the essential elements required – facilitating tracking, tracing, isolating, and quarantining cases and contacts. With cloud hosting services allowing capacity management, the system(s) would be better able to meet the data entry, reporting and analysis requirements allowing efficient and effective delivery of the essential response and recovery operations.

Considering this report's recommendations and Appendix D: Contribution from Washington County Public Health, the project sponsor recommended identifying resources who have bandwidth to present the key findings and takeaways to Oregon Coalition of Local Health Officials (CLHO)-CD via a PowerPoint presentation. Those presenters are recommended to be prepared to present, lead a bit of a discussion, have prompts and questions ready, to answer any questions surrounding Oregon Health Authority (OHA) Public Health Division (PHD), specifically. It is also recommended this response partner with the Acute and Communicable Disease Prevention (ACDP) Informatics Team in determining the future for Opera and ARIAS, along with how PHD is planning to use subsequent requirements information.

APPENDICES

Appendix A: Respondents

All individuals that responded to this COVID-19 Response and Recovery Unit (CRRU) survey were invited to attend a Lessons Learned follow-up session and are listed (Table 1: Respondents interested in attending collaborative Lessons Learned follow up session(s)). The following grouping of internal CRRU staff and staff external to CRRU was based on the role selection submissions provided by the respondents within the survey. For further details, please view the data extract attached to the end of the Introduction section of this report.

	INTERNAL CRRU RESOURCES	RESOURCES EXTERNAL TO CRRU
Opera	• Andree Shidlovsky • Heather Young • Kristin Gonzalez • Ramila Bhandari • Riley Appelgren • Rose Thompson • Siobhan Burns • Sirisha Botta • Janice Hammonds • Laura Wendel	• Audrey Caro • Cerisa Albrechtsen • Edgar Zarazua • Heather Crawford • Jennifer Scheit • Jill Duncan • Jill Weidenkeller • Kari Wilhite • Laura Ruiz • Lisa Ferguson • Tami Brown • Tessa Friason • Vikas Reddy
ARIAS	• Walt Lierman	• Ronica Reimers

INTERESTED IN BOTH ARIAS & Opera	• Eric Runnels • Eric Vaughn • Gabrielle Sturchio • Kim Fantazia • Kory Aschoff • Ramila Bhandari • Sandy Pullella • Tom Fitch • Vikki Cuellar	• Abby Gray • Amiee Westfall • Beth Ann Beamer • Brian Mahoney • Christina Rubidoux • Joanie Coleman • Kathleen Rees • Kelle Osborn • Lisa McClean • Mystie Haynie • Nicole Acuff • Shelby Thompson • Starr Ahrens • J Clarke • Laura Minkiewitz

Table 1: Respondents interested in attending collaborative Lessons Learned follow up session(s)

Appendix B: User Experience

Opera Dissatisfied Feedback

- Constant lag and inaccessibility... we started calling it inOperable Opera. Data entry took forever after we hit our first surge. Issues that we had were reported
- Daily and hourly OPERA at anytime could become very sluggish in its response time. Often for hours. Too many times OPERA just stopped working and I do remember once all of us in the facility had nothing we could do for several hours. Very frustrating to work with especially when we had so many cases.
- I appreciate the resources (especially the human ones!) that have gone into the surveillance systems for Oregon during COVID, and also appreciate the extraordinary volume of data to manage. However, I did choose dissatisfied because of the number of times we have been unable to function because of Opera. As a manager, it is hard to have a problem that stops your team from being able to work, but being powerless to solve that problem. Functionality has certainly improved over time, but the lack of responsiveness to problems in the past has felt very frustrating and at times unacceptable for an emergency response. I also think more clarity around meaning of

fields and the options would be beneficial. Again, this has improved, but has additional room for improvement.

- I have been dissatisfied with Opera since I started using it in January 2021. Capacity issues in citrix meant that our whole health department was unable to have access to accurate data. Additionally, we had a limited number of staff to do case investigation work, and they had to waste so much time duplicating data entry into a downtime solution AND Opera. Another frustration was that the targets set by OHA to call cases within 24hrs did not feel fair given the additional barrier that Opera gave. I would also add that the questions in Opera were laid out in a very frustrating way, and feedback from CIs about this to OHA was not taken or implemented for months. Given that once REDCap was implemented the Opera usability increased so dramatically - and REDCap was a tool already in existence before the pandemic - it speaks volumes about the inefficiency at the root of these problems that it took so long for it to be done. I appreciate that there was a great deal of pressure on all aspects of the COVID response at state, federal and local levels, but we were shouting for months about the problems that Opera was causing, with nothing being done to fix it. It is a stain on the reputation of OHA.
- I used Opera from February 2021 through February 2022. It was common for the system to lag, or be shut down completely for maintenance. That interfered with the ability to contact cases, which in turn interfered with the ability to learn about and give guidance and wrap services to cases and close contacts. This was especially concerning at a time when vaccines weren't easily available.
- I was dissatisfied with the speed of Opera. We had to use paper interview sheets because OPERA was to slow to use during an interview. I could not make as many phone calls as I needed because putting in interviews into Opera was such a slow process.
- It is very slow to respond, very challenging to find results, and easy to make mistakes.
- It was frequently slow, frozen, and/or crashed. It had a lot of quirks about how windows opened and how data could be entered. It feels like I spent more time using workarounds for it than actually using it for my work tasks.
- It's unusable during surges, which is when you need it most. Lagging or constantly searching for 10-20 minutes for just 1 case. If you go to check emails or work on

something else, Opera pops up and interrupts you just to let you know it's still searching.

- Lagging. This system should have only been used as a stopgap while a better system that could handle the user traffic, case loads, and lab loads was purchased or developed.
- Lots of issues when there were a high number of users, this significantly impacted our ability to serve the public.
- Multiple dates, Opera is slow when it is most needed. There were multiple issues with reporting delays that impacted our ability to respond.
- Multiple times a month Opera was really slow, and crashed constantly, making it hard to get work done. Hard to read font as it was sometimes too small and quality was bad.
- Opera could not handle the amount of users in the system during peak covid times forcing us to work split shifts. We'd make calls in the morning to positive cases and then have to return after 7pm to enter the date because the system was frozen or to slow to Operate between noon and 5pm.
- Opera crashed, was inOperable, or so painfully slow that it was not useful. We were doing case investigations on paper and then staying up late into the night or waking up super early to enter data when the system would function at a normal speed. It helped when we could do the list view to select answers a little more quickly.
- Opera was being tasked with too many functions which rendered it useless for about 4 months starting in October 2020 through and at every ""spike"" in COVID cases. It was a great repository for data and tracking case trends, but it was impossible to input data into Opera. Opera was completely unusable during business hours for about 6 months starting in October 2020. Lane County had to create the following systems just to work around Opera: October 2020 - LCPH creates paper downtime forms of the Opera survey and enters in Case Information from Opera to the paper form between the hours of 8:00 pm - 6:00 am so staff can work from 8:00 am - 5:00 pm. Staff then add data to Opera from 7:00 pm - 10:00 pm as OHA was still requesting LHDs contact cases within 24 hours and using Opera to report out COVID data. LCPH is having to manually add cases to Opera to track case counts. November 2020 - Opera is still not usable during the day time, LCPH creates an online ""Cognito"" form that is based on the Opera Survey & sunsets the paper version. However, we still have to make cases in Opera & make duplicate cases in Cognito so staff can work during the day time. Data entry is still

happening in the evening, but LCPH has identified ""data of importance"" to streamline data entry - only the data that is reported on LCPH & OHA data forms are being entered into Opera. December 2020 - LCPH has had to updated the Cognito form to continue to match the questions in Opera. LCPH has finally created its own offline Line List called ""Case Manager."" Case Manager allows LCPH to eliminate the double case creation by having Case Manager update its daily list from a late night/early morning Opera report. Data is 24 hours late, but at this point, we are literally not calling cases that are not considered ""priority groups"" because the volume is too high and we will never meet the 24 hour call request. Staff are still working 8:00 pm - 6:00 am to make cases in Opera, but we are no longer doing double case creation and data entry. LCPH continues to only enter in minimal data. January to March 2021 (or whenever LCPH requested auto-case creation) - LCPH is able to have OHA auto-create cases and they no longer have to have staff work 8:00 pm - 6:00 am to create cases in Opera. LCPH still has to do all data collection in our Cognito system & send cases out through Case Manager to filter for our ""priority cases"" because our line list has more than 30K and Opera does not allow for easy filtering during day time. At some point this Summer, Opera was transitioned from a data collection & data reporting system to really just a data reporting system with the onset of REDCap - that change was monumental in our improvement in workflows as it allowed our team to work directly in the database for the first time in nearly 12 months.

- Opera was broken out of ORPHEUS early on in the pandemic to help support high volume of data and user load on the system. The system continued to have major slowdowns, significant periods of inOperability, and poor performance. Our LPHA had to significantly adjust staff schedules to off hours to accommodate use of the system at times, which increased staff frustration and burnout during an already high-stress pandemic response. We struggled to balance staff time with case investigation and the amount of time that the data entry took into Opera. Case data entry into Opera became a large administrative burden for our county. Our LPHA had to develop and maintain many external processes and documents (example: a PDF case interview script) to work around the unreliability of the Opera system. We attempted to utilize automated offerings (lab processing/case creation) but would often find that the system would not function appropriately; examples including linking labs to incorrect persons or creating duplicate cases on a single person.

- Opera was difficult to use during peak times in the pandemic. The system was very hard to use for data entry from case investigations. There were a lot of querying when doing very basic things like making a note.
- Opera was down multiple times and was oftentimes extremely slow and unusable. I understand that it was unprecedented times and it was not necessarily intended to support such a high amount of users pre-COVID. We often had to work late hours or early mornings just to be able to use it. It also impacted trainings.
- our team lost hundreds of work hours during Opera slow downs, for months that was a daily problem, super inefficient until it was finally fixed, caused a high level of workplace anxiety we had so much work to do and couldn't get Opera to work, continually stayed late to finish data entry,
- Server capacity was regularly inadequate to meet demand/usage volume. This caused Opera to be down or sluggish a large percentage of the time. These outtages happened most frequently during surges in Covid-19 cases, due to higher demand/numbers of users at one time, which further crippled our response efforts at the time.
- Slowness of system.
- System crash when uptake of cases due to surge. Updated in data removed old data.
- The more Covid cases we had to enter, the slower Opera got. There were days the entire unit could not enter any data for 3 or 4 hours in a row. We started working more weekend hours just to avoid the logjam. The expense of having 100s of people throughout the state not able to work was immense.
- The program is consistently slow with constant disruptions which highly impacted my ability to perform my job functions. I have been using Opera (previously ORPHEUS) since the beginning of the pandemic (3/2020). There were frequent times that I would have to work late into the evening and early morning hours just to be able to process ELR/ECRs because the system was so slow and bogged down during regular business hours. There were times that it would take 20 minutes just to create one case from an ELR. This was not a good use of overtime or funds. When the system would go down our hands were tied. We had hundreds of cases that needed interviewed but were unable. We were fully staffed but our team was left sitting with nothing to do for hours at a time. This interfered with the accuracy of our case counts and ability to report COVID numbers to the public and slowed our response time in reaching the cases.

- There were too many malfunctions to list by date. It was slow. There were weird errors. Changes would just appear without warning. Changes wouldn't make sense or wouldn't be explained. When things became so slow as to be unworkable then there would be a major overhaul, but it always seemed that we had to wait for a problem to become a crisis before it was fixed. On top of all that the support services were wildly lacking. Frequently, it would turn out that the OHA support staff were not knowledgeable enough about Opera to fix problems. As someone who has been using Orpheus for years, I often found that when I reported a problem the ""support"" person didn't understand the system as well as I did.

Opera Satisfied Feedback

- Although in the last year it has functioned. My rating is on the amount of times it would crash and also the amount of times there was some error that would lead to labs not being uploaded into Opera. This would lead to backlog of cases.
- Clear, easy to use and input information
- everything other than Login issues are more common and slow in loading.
- Fairly easy to navigate. Updates have been helpful. The redcap survey has been very helpful in that we do not give the impression of intrusiveness though the survey could be refined on wording and directions given.
- For the most part, given the intent of functionality, I feel like the system worked as expected. I appreciate how different components of the greater system interact with each other (Opera <-> ARIAS*; Opera <-> DUDE (OBs); etc.) *I never used ARIAS* Additionally, the Support Team has always been great. Thank you for all you've done and continue to do!
- For the most part, I have little issues with Opera.
- Found Opera easy to use just frustrated with delays with high users
- From the limited understanding that I had it seemed to function good enough. The greatest challenge was how slow it was.
- Generally felt like it was a good solution to move COVID-19 case surveillance to Opera off from Orpheus but model it like Orpheus so users already had familiarity with how to navigate the system.
- I appreciate the level of detail Opera is able to retain -- we have A LOT of detail for some cases. But there are so many tabs and layouts, I worry we lose data just because we

forget where to put it. Another feature I appreciate is RedCap integration -- being able to fill out a simple form, and seamlessly upload the data into the appropriate fields in Opera. I feel like this mitigates both the issue with system lag, and with navigating through complex screens.

- I feel that Opera is very user friendly once you are used to using it. I appreciate being able to easily pull data when needed and the incorporation of ALERT searches is very helpful.
- I found suggestions I made were implemented very swiftly by the Opera team. I suggested including a home test lab option (2021) which was implemented, updated school field information (2021) was immediately implemented whenever I reached out, certain changes I recommended to the language fields in REALD were also updated, though at that time (Sept 2020) I was not submitting those recommendations directly to Opera support so they took longer. The human, customer-service response was very fast and consistently friendly. Overall the application was relatively easy to use and understand and contained quite a lot of data and potential data had we not been overwhelmed by the sheer number of cases. the application packs a data punch and really has the potential to show trends if used consistently. Unfortunately human hands don't seem to be able to enter info fast enough.
- I had to use Opera every day, several times a day to create new line lists of new cases in order for case investigators to have what they needed to do case investigations. When we had only a few cases a day (less than around 20) it was pretty easy. We got up to 250 case a day (August 2021), and that became almost impossible. The state then set up a way to automatically run a query where I could get all the information that I needed in one spreadsheet (around November 2021).
- I have been working in Opera daily since the summer of 2021. Other than the slow processing time during high traffic, I feel the platform works as needed.
- I only know Opera basics which have been easy to navigate. I would appreciate a training session if information entered creating cases entered is not sufficient and more details are needed.
- I selected "satisfied" because the process of data entry and viewing the information in Opera was relatively easy.

- I think Opera has been helpful as a team to use. We were able to reassign cases for co-workers and send notes to each other for updates. It helped with the collaboration within counties, the state, etc...
- I think Opera is wonderful on so many levels. It has powerful reporting abilities and is very flexible in searching capabilities.
- Majority of the time it worked well
- Now that Opera is functioning it is fine. It works a lot like ORPHEUS so that makes it easy to use. It just seems it can't handle a lot of traffic.
- Opera had frequent slow downs in the past that have greatly improved my rating selection as of 5/10/22. I like that Opera can link cases together in a logical sense.
- Opera has been Operating well these days. At the initial stage, there were many performance issues such as frozen screen, missing questions in each tab, issue connecting to ALERT etc. The number of issues reported have been reduced significantly.
- Opera has provided the ability to link cases to make it easier to track break through cases or to see where an outbreak started from.
- Opera is a wonderful system and is incredible [sic] helpful at finding old cases, contacts, etc.
- Opera is easy to navigate
- Opera lags sometimes, but in my opinion is designed well and easy to use. I had good trainers, good tech support, and rarely run into issues.
- Opera often works well for what it is designed for.
- Opera support has been very helpful on numerous occasions. And, after several months of slow Operation early in the pandemic, it has worked very well.
- Opera used to be slower at the beginning, but seems like it was improved and it is way better now.
- Opera worked efficiently, sometimes it was slow but overall, I was able to finish my duties.
- Overall good system, but it would be slow during surges and slowed workflow. There are many tabs to go through, but it was easy to maneuver.
- Overall I understand the importance of the program and how to pull data out of the system.

- Primarily looking at ELR/lab data
- The ease of the system.
- The majority of the time Opera functioned as it had been designed to.
- There are many spaces within Opera that are not used regularly that could make the information more relevant. Perhaps there are too many places for information to be entered by users and thus they cannot/do not give as much.
- We had doubts for Opera in the beginning because ORPHEUS had it's own quirks. But honestly with the amount of data and users that this system had everyday and the volume of the data it really ran quite well. Yes it did have it's slow days and it was frustrating but so was COVID in general. All in all I think you guys did a wonderful job and we appreciate everything that you guys do and thank you for always answering even the stupidest of questions

Opera Undecided Feedback

- As a software, it is quite user-friendly... the way the tabs are laid out on the side.
- I like being able to find clients with minimal information. I also like being able to create cases without a date of birth.
- I like the way it is structured and organized.
- I like the way Opera works (when it is working) and I like the way it allow us to communicate between counties and between county and state. The process as a whole did make sense to me when we were using it for case investigation and contact tracing.
- I started using OPERA this March. I use it every other day to review covid cases and send out letters.
- I was very pleased when it worked and didn't get locked up somewhere. I was happy to get lab data, demographics, do epi links, etc.
- Interface is fairly clean and easy to use
- It's a pretty amazing system, given the immediacy of our need for it, and the huge number of users.
- My experience with Opera has been from August 2020 - current. No prior public health work experience prior to August 2020. No experience with Orpheus. From July 2021 - current - I felt Opera became a bit more stable. I felt much more comfortable with some of the more advance features such as advanced searches, exporting, etc. I felt Lex and her team were amazing at providing Q/A and bringing on Opera users to provide

feedback and suggestions. Around this time frame Lex showed us some features that saved us many hours of work - such as automating case creations overnight. We learned how to export daily case reports that included contact information - incase Opera crashed we could continue doing our work. So I'm conflicted - I'm highly satisfied with the Opera team - but Opera the software made a big negative impression where it showed the system can get overwhelmed. - Our team would say ""Opera is being Opera"" and we all knew what that meant.

- Not having previous experience with these kinds of systems I don't have a working knowledge prior. I always appreciate the feedback and availability of OPERA staff when a question would come up. They communicated clearly when the system went down or troubleshooting needed to happen.
- Oh wow. When Opera was working and I had the time to look at data, I liked some of the search functions. However, usually these were discovered by accident or by someone randomly mentioning it on one of the thousands of meetings we listened to. For those of us that started in the middle of the pandemic, the amount of actually functional training we received was lacking. The big overview stuff that is easy to figure out was really all that was covered. Things like how to run a date range with the "..." or that you can see all the little shortcuts by clicking on a button, those are things that would be helpful to see.
- Opera is, for the most part, a very intelligent application that does a lot to help ease the process of case investigation. I can't think of any specific scenario where I was extremely happy with it, but it works and is a great resource.
- Opera makes interviewing very easy. It is a statewide system. We appreciated the ability to add new variables in the course of the pandemic. State support and regional epis.
- Opera was pulled from Orpheus due to stability issues, which persisted until the data was moved to its own servers. There are still some stability issues at high-volume times and slow export speeds for data reports.
- Opera works much like ORPHEUS, therefore, it was an easy transition to use Opera
- The system is easy to use
- There is a lot of fields that have duplicate information.

- This is not an easy program to navigate and it would be beneficial if there were training videos that we could watch. The training calls were not much help. You basically had to figure it out on your own, if you were new to the system.
- When Opera was working properly, it was great. The interface was user-friendly and it was easy to navigate, enter cases, complete information, run hospital reports, etc. Having been a prior Orpheus user/CD nurse for a number of years, I found it an easy transition to Opera.

ARIAS Dissatisfied Feedback

- ARIAS did not speak with Opera, making all data collected impossible to inform our case investigation work. ARIAS data was not available to counties and was not shared with counties. Data collection within ARIAS was very limited. Issue with duplicate contacts being reported and inability to easily link families together for one call. Overall, clunky system that necessitated a lot of work arounds from the county.
- I may not have had the right training but I found it very difficult to look up contacts based on their phone number
- Lack of system wide processes to use ARIAS--much was left up to each LPHA, which hinders the ability to work across jurisdictions (transfers, etc). Lack of ability for info to feed back to Opera--creating duplicate work for user in ARIAS and Opera.
- The inability for the ARIAS system to communicate with Opera became a major hindrance during CI/CT work. Our LPHA had to set up additional systems and processes to communicate information back from one system and team to the other. Because so much work had to happen outside of the system, utilization of ARIAS essentially became a duplication of documentation. The inability to enter contacts directly into ARIAS as an LPHA also presented a challenge. In times of slow Opera functionality, our staff spent huge amounts of time attempting to enter contacts as it was the only way to have them appear in ARIAS for CT work. Allowing direct entry would have saved time and frustration of staff, and limited the amount of technical delays caused by the large exports from Opera to ARIAS.
- Very confusing to set up for patients and follow up with

ARIAS Satisfied Feedback

- ARIAS for the most part was quick to use and update.
- ARIAS functions fine, it doesn't bog down. There are a LOT of fields but it is intuitive. I noticed a lot of staff missed/skipped sections/questions.
- ARIAS was a little harder to get used to. But the more you were in there and got use to it, it was very user friendly. It was great that Opera and ARIAS communicated well.
- Arias was easy to use and having the auto response option was really helpful, both for us and for the clients.
- Arias worked much more smoothly than Opera during the two years that I used it.
- Arias worked well for me when I needed to use it. Opera was more of my day to day program. We had temporary workers doing most of contact tracing.
- Ease of the system
- Easy to navigate, and easy to read.
- easy to use, performed consistently well
- I have constructed a data base from Arias (periodic refreshes) specifically to look at questions regarding the places of employment of each contact that provided that information. The extraction of needed data went smoothly, generally.
- I never had any problems. It was easy to move through the system. I don't recall any lag or shut downs of the program.
- N/a
- Simple design, easy to learn and use.
- The system works great except for few technical difficulties here and there.
- When I was asked to work in ARIAS (not my primary role) it functioned well.
- "With regards to contact tracing, Arias was fairly easy to use, we had a few ""tutorials"" on what to include or where to report certain findings."
- Working system without lag.

ARIAS Undecided Feedback

- ARIAS was good as a repository of information.
- Helpful to see auto-populated information from Opera.
- I liked the look of ARIAS
- I started using ARIAS after our county had reduced contact tracing response, using it more as a monitoring system to get contacts submitted from other counties. I liked

aspects of it, although I used it so infrequently that it's hard to remember the specifics. I liked its connection to Opera and using ARIAS helped me better understand Opera and the relationship between the applications. I liked the functionality which was very consistent during my use.

- I think it was a nice system to keep tract from Opera all contacts.
- N/A.
- The system was adequate at first and has become much better. Still a lot of tasks that should be automated.

Appendix C: Lessons Learned Sessions Feedback

External Opera

A lesson learned session was held on 7/25/2022 from 11:00 to 12:00 pm with the following recorded findings:

What was done right?	Could have been done better?	Changes recommended?
Separate Opera support	REDCap – could have been implemented sooner.	Allow ELRs to have REALD information & populate into the case
Having a paper version of the interview was helpful	Auto processing results – could have been implemented sooner.	Different trainings for different levels. More catered trainings/support.
The training videos & training sessions were AMAZING	More alternatives/options.	
	Better support available. Additional training. (email and phone)	
	More languages could have been integrated earlier. Messages sent out with multiple languages in initial contact in interview/ REDCap.	
	Citrix being used for external vs internal access.	
	User guide given earlier; updates with no warning.	
	ARIAS and Opera not communicating between one another was EXTREMELY difficult to	

	identify contacts who seroconverted.	
	Standardized processes and shared with everyone. (Include in the user guide.)	
	Support available until 7, flexible times were helpful.	

Internal Opera

A lesson learned session was held on 7/26/2022 from 10:00 to 11:00 am with the following recorded findings:

What was done right?	Could have been done better?	Changes recommended?
Create custom buttons/processes	Connection – VPN vs Citrix	Compare other state solutions. Sharing information with other states. (WA DOH uses key fobs to access cloud/server as an additional security measure with VPN/secure LAN)
Opera Data Report	We needed to transition but we didn't.	Connecting customers in design and aligning with business process / AGILE or SCRUM
	User Group Meetings to update on changes to sending out PDF of meeting notes/updates	Cloud migration
	Validate information entered proactively. System can check addresses for example.	Develop Steering Committee/Working Group to continuously review functionality; representatives from State/Local/Tribes for feedback.
		Adding Grade/Classroom for Schools; LTCF Resident location vs. Workplace.

External ARIAS

A lesson learned session was held on 7/26/2022 from 10:00 to 11:00 am with the following recorded findings:

What was done right?	Could have been done better?	Changes recommended?

Web based version, which made it more intuitive	No communication between systems.	Standardized processes and training. Top down, simple and it hits home.
Dependable and less complicated, easier to access (Citrix not required, VPN not required)	Duplicated work; validating information is needed.	Communication between systems (Opera vs ARIAS) and counties.
Arias support was good	Options for large households with different names.	Drills of the future system. Stress tests. (How often?)
System was less complicated	Different processes between counties. (Needs standardized processes between counties and OHA.)	Recognition of the work, appreciation after the trainings.
Training was helpful (power user group meetings)	Targeted trainings, with coloration between the counties leading to train the trainer.	
	Trainings can be ambiguous, simple, and needs to be potentially more standardized allowing easy application at each county level.	
	A lot of tedious process for linking contacts leading to multiple organizations and schools not utilizing capability. (automation)	
	Remote training can be challenging; less peer-to-peer training/support.	

Internal ARIAS

A lesson learned session was held on 08/04/2022 from 10:05 to 10:55 am with the following recorded findings:

What was done right?	Could have been done better?	Changes recommended?
CRRU and OIS have a stronger relationship now.	Duplicate/data management. Additional cleanup/assigning was needed.	Add external users in the SCRUM process as subject matter experts and testers.
There is a way to link families/addresses, but it needs improvement.	Need the ability to link families/addresses together. (Eliminate duplicate calls to the same household.)	Bi-directional will eliminate the presumptive case form being sent via email for Opera new cases to be recognized.
	Error tracking from Opera to ARIAS to reduce duplicate data.	The tool could be looking at usage simplification, especially with linking families/addresses.
	Counties couldn't pull their own data. (OHA could pull reports/data and send to the county)	Sending email/SMS/Alerts communication from the platform, in multiple languages. For monitoring and for notification ("you may have been exposed..." Or "we tried to contact you..." Or "did you check your symptoms today?").

Appendix D: Contribution from Washington County Public Health

Members of the contact tracing and case investigation team at Washington County Public Health through the Oregon Coalition of Local Health Officials (CLHO)-CD chair provided the following feedback following reviewing this report in draft format. Footnotes provide annotation and input from ARIAS business team.

- Users would like bi-directionality between Opera (case investigation database) and ARIAS (contact tracing database). Some of the expected benefits of bi-directionality include:
  - ✓ Capture status of contacts in Opera: users would have been able to see in both systems whether the contacts were contacted, and/or were symptomatic, and/or if they became a presumptive/confirmed case[i],
  - ✓ Maintain the outbreak link and easily identify contacts who became presumptive/confirmed cases,
  - ✓ When contact info is updated or corrected in ARIAS, that contact information would also be updated for contacts in Opera (especially since many contacts were exposed and identified multiple times),
  - ✓ Capture demographic data for contacts in Opera.

- ARIAS wouldn't always end quarantine periods for cases who did electronic check ins after their quarantine time ended. Cases would continue to be called for weeks until the person notified someone at OHA, who then notified us so could turn off the notification process[ii].

- Transfer cases from other counties were problematic because we wouldn't always get notified they were being transferred even when the transfer information was present.

- System was set up for just data collection with no date retrieval capabilities[iii].

- Difficult to find people in the system when looking for contacts, often had to have a phone number and track people that way.

- Difficult to group families without having a contact tracing (CT) call someone who then manually had to transfer all of the family members to one person[iv].

- Would have been great for outbreak (OB) purposes to have a way to group contacts from an OB. The CTs would talk about certain cases in a Teams chat and that's how they would know they had multiple people from an OB. We then worked with the OB Team to let them know about contacts that would be exposed during their investigation.

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[i] Washington County developed a presumptive case form which was in use for some time. They later stopped using the presumptive form and relied on incoming lab reports and electronic records to notify them when contact became a confirmed case. Both the presumptive form and matching contacts in ARIAS to confirmed incoming cases in Opera, took time and resources, and some automation of this process might be more efficient.

[ii] An automatic end to automated monitoring based on quarantine period was never implemented in ARIAS, allowing the contact tracers flexibility. However, an automated stop to assessments being sent could be implemented in the future, either tied to a quarantine length or to some other number (30 days, for example)

[iii] LPHAs would like the ability to export their data.

[iv] Although linking cases in households was not available at the beginning of ARIAS, this functionality was added later. The feedback here indicates perhaps the need for improved training or communication, and possibly an interface that makes connections between family members more immediately visible.