UNIVERSITY of ALASKA ANCHORAGE

Alaska COVID ENX

Final Report
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Kenrick Mock, kjmock@alaska.edu
Jennifer Meyer, jameyer2@alaska.edu

Alaska COVID ENX (also known as Alaska COVID Exposure Notifications) is a free tool that works on smartphones to alert users of possible exposure to COVID-19 without sharing any personal information. It is completely private and doesn't track a user's location.

With the end of the national public health emergency on May 11, 2023, the national servers operated by the Association of Public Health Laboratories (APHL) will discontinue. As a result, all states that utilize the national servers for ENX will also be shut down. Starting May 11, 2023, Alaska COVID ENX and exposure notifications will be discontinued. Beginning May 11, your phone will no longer notify you if you were near someone who tested positive for COVID-19. Your privacy is protected, and no GPS location or personally identifiable information was collected or stored.

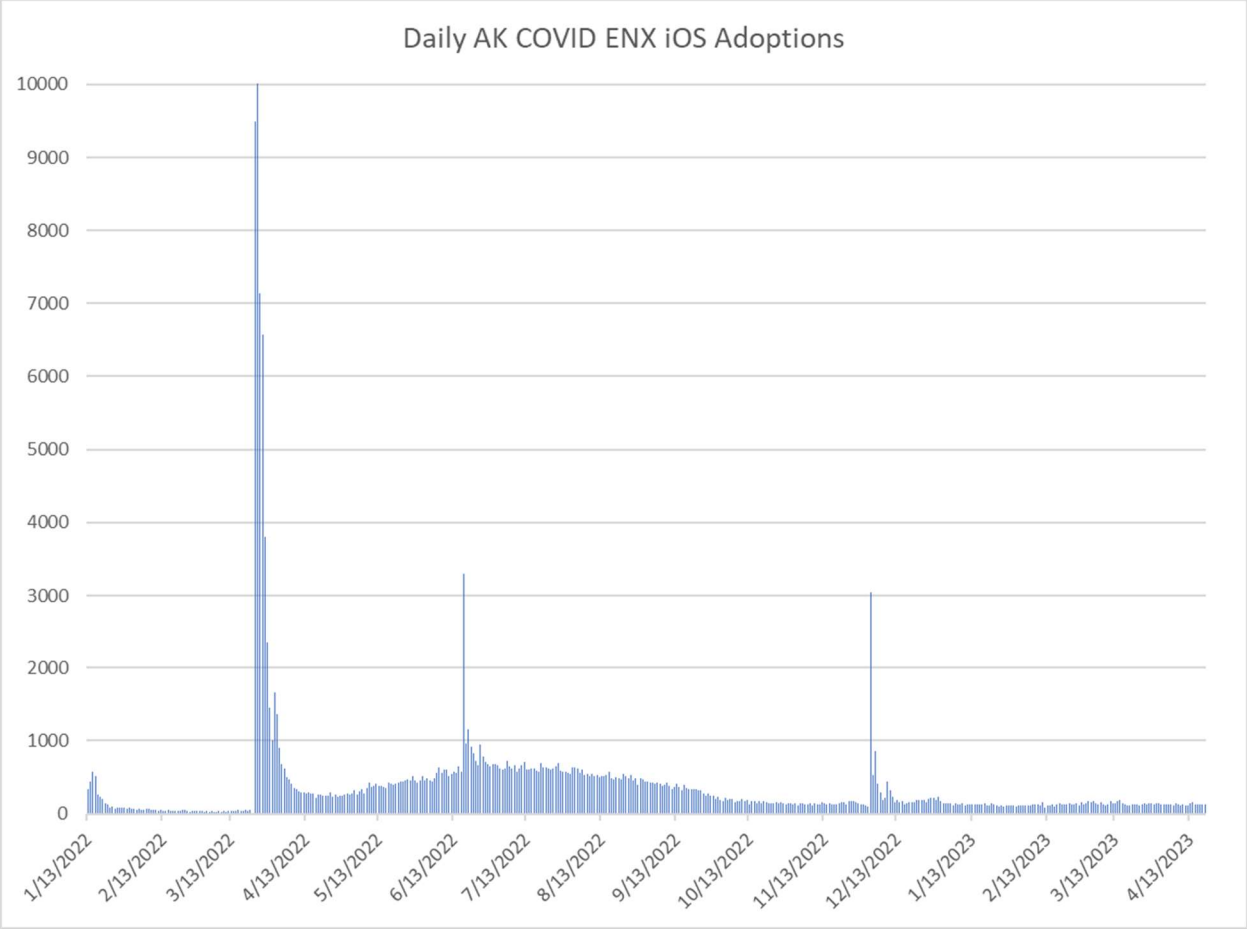
Launched by the University of Alaska Anchorage under the Exposure Notification Express framework developed by Google and Apple, general information is available at https://enx.alaska.edu. The Conquer COVID Coalition has produced videos and media assets that are available at https://www.conquercovidak.com/covid-enx/.

Alaska COVID ENX began operation on January 12, 2022. Between 60,000 and 100,000 devices were actively running the software. Most of the devices were added in March after availability alerts were pushed to all Alaskan devices. As of 4/20/23, 1247 users shared their positive diagnosis (publish requests), resulting in thousands of notifications.

Adoptions / Installations

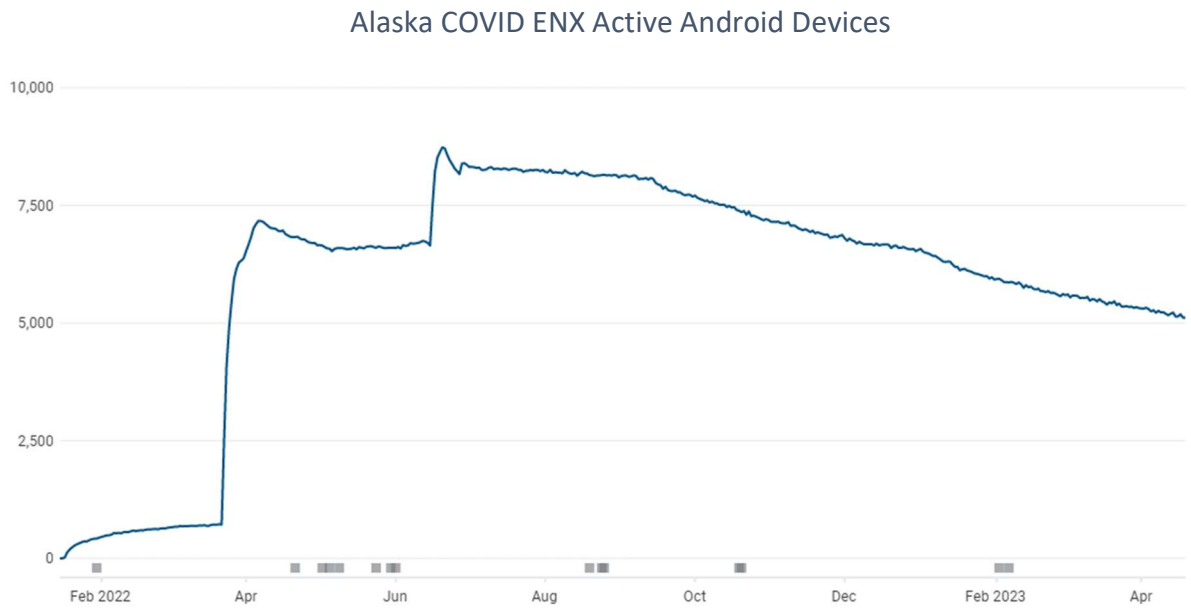
Estimated active devices, 4/20/23: 60,000 – 100,000 smartphones

A graph of iOS adoptions since 1/13/2022 is shown below. The number of iOS adoptions as of 4/19/23 is 182,442. This is measured through a web hit counter. An iOS user that begins the on-boarding process is shown a logo image that is retrieved from a web page, and we can count hits on that image. Note that this only counts adoptions, or installations, but does not subtract from the total when a user uninstalls Alaska COVID ENX or if a user aborts the installation procedure after the logo image is retrieved. As a result, the number of active, installed iOS devices is less than the total adoptions.



The spikes in the graph represent the initial soft-launch on 1/13/22, a push notification in mid-March of 2022 which resulted in a majority of installs, a second push notification in mid-June of 2022, and another push notification in early December, 2022. We averaged 129 adoptions per day from 3/18/23 to 4/18/23.

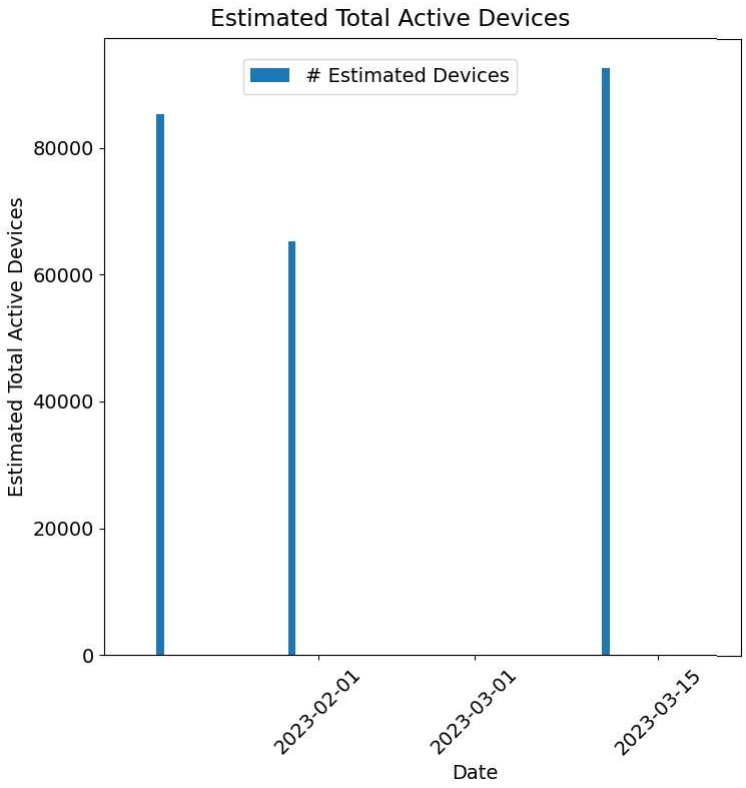
The Android version does track installs and uninstalls through services provided by the Google Play store. A graph of active, installed devices is shown below, with a total of 5,117 on 4/18/23 and a peak of 8,731 on 6/20/22.



Due to user privacy, the exact number of devices that actively use Alaska COVID ENX is not known. Activity is local and private on each device and information shared with the national key servers is limited to anonymous keys for those users that voluntarily report a positive case of COVID-19.

However, we can estimate the number of active total devices using the Exposure Notification Private Analytics (ENPA) service hosted by MITRE. Upon installation of Alaska COVID ENX a user can opt-in to share more detailed metrics that are aggregated into the ENPA service. In a typical day approximately 34,000 devices share this usage data. The national key server tells us how many users verified a code when reporting a positive case, and the ENPA service tells us how many of the opt-in ENPA users reported a positive case. The ratio of ENPA opt-in cases compared to total cases from the key server is approximately 40%, telling us that about 40% of the total number of users opted in to report their data to ENPA. This suggests that all the ENPA usage metrics likely represent 40% of the total activity.

For users, this implies approximately 85,000 active devices (34000 active devices recorded by ENPA divided by 0.4). The number varies daily. A graph showing the number of estimated active devices for recent 10-day time periods is shown below.



Self-Report

In Alaska, ENX is entirely self-report. That is, the end user requests a code based on a home test kit or a lab result, and the individual initiates sharing of a positive diagnosis. No action is needed by a Public Health Authority.

For the period from 2/2/22 to 4/18/22:

- 2334 users requested a code. This is the number of individuals that took the step to click the button to report a positive diagnosis through the app. In response, the server hosted by APHL sends a link to the phone via text message to confirm.
- 1819 of these users clicked the link to continue. The user is then asked for confirmation to upload their keys to share their diagnosis and notify others that may have been exposed.
- 1258 of these users confirmed and shared their keys to complete the process of notifying others.

Notifications Received

The exact number of notifications received is not known because the exposure notification computation is performed on the user's device, not on the server. This is by design for user privacy.

However, notifications received are collected for those users that opted-in to share analytic data via ENPA. With the 40% estimate for ENPA users compared to the total number of users, based on the analysis described in the installation/adoption section, the actual numbers are likely a little more than twice that collected by ENPA. From the ENPA opt-in devices only we have the following notification totals per day over the previous 90 days.

Notifications received among AK ENPA users for the 90 days, 1/13/23 to 4/13/23 (~35K devices)

The average number of notifications per day is approximately 22 during this time range. Using the 40% ENPA adoption estimate compared to all users, this suggests over 50 notifications per day.

The historical graph of ENPA notifications sent from 3/1/22 to 4/13/23 is shown below. The activity has remained relatively constant since October, 2022.

Notifications received among AK ENPA users 3/1/22 to 4/13/23

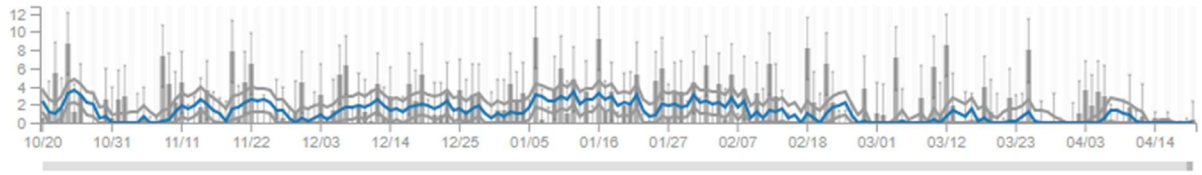
Over the entire time span from March 1, 2022 to April 13, 2023 there were a total of approximately 26,600 notifications received recorded by ENPA users, suggesting a total of approximately 67,000 notifications among all users.

Codes Verified

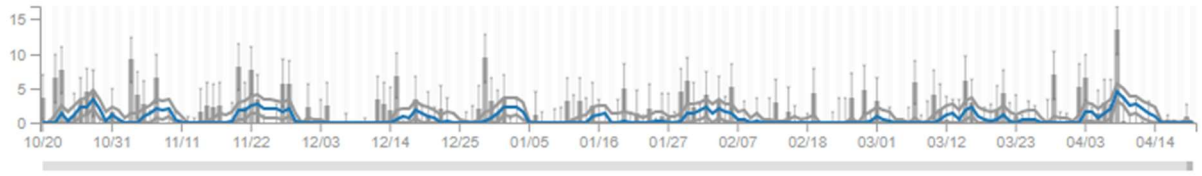
When a user initiates a self-report for a positive case and clicks the link received via SMS to continue (or enters a code), this is considered a verified code. For states that do not use self-report, the PHA generates the code based on a positive lab test, communicates the code to the user, and when a user correctly enters the code on the app it is considered a verified code. The graphs below show the number of verified codes.

The two graphs are further broken down into those users that did not receive an Exposure Notification in the prior 14 days, and those users that did receive an Exposure Notification in the prior 14 days. Users with prior notifications may act as a proxy indicator for estimating secondary attack rates.

Codes Verified without Notification



Total Codes Verified With Notification



Codes verified (confirmed self-reports) received among AK ENPA users 10/20/22 to 4/20/23

Email Support

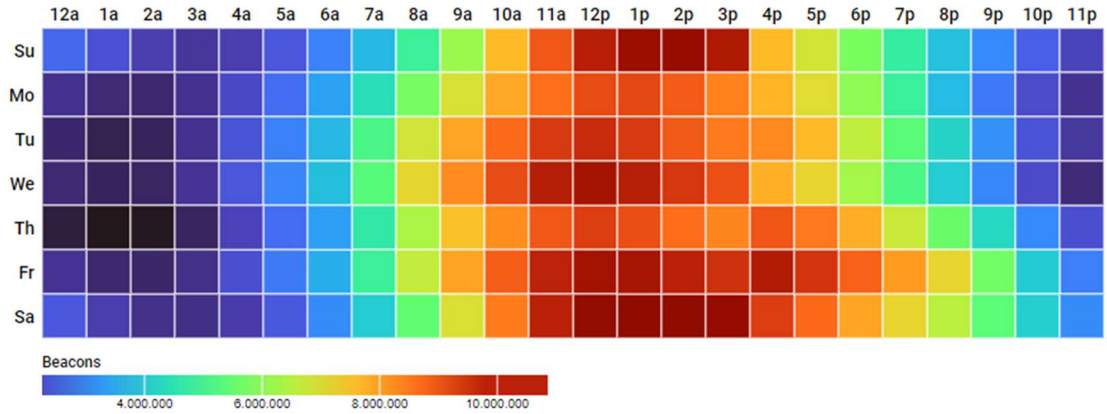
We set up covidenx@alaska.edu to respond to questions from the public. Most inquiries were received in the first few months. The breakdown of the types of questions received are noted below.

- 32% (13) Problems submitting/completing self-report
- 19% (8) Complaints
- 15% (6) Installation problems
- 17% (7) Question about notification received
- 17% (7) Other (e.g. where can I get a test, or other COVID-related question)

Most of the complaints were around concerns of user privacy or individual tracking in response to receiving an availability alert and offered prompt clarification.

General Activity

Beacons are the pings shared between smartphones. The following chart shows the average weighted beacon counts for different times of the day for each day of the week for ENPA users for 1/21/23-4/20/23. Most contact appears to happen between 11am-2pm and on weekends.



Picking a single day, we can see that most encounters are less than 5 minutes. Numbers are not exact – there is a small amount of injected noise utilizing the differential privacy algorithm enforced by the analytics system.

Encounters (04/19/2023)

Distribution of Duration of Encounters

Duration of Encounter	Count	Percent of Total
1 - 5 minutes	1,414 ± 22.8	70.8%
5 - 10 minutes	201 ± 22.8	10.1%
10 - 15 minutes	106 ± 22.8	5.3%
15 - 22.5 minutes	88 ± 22.8	4.4%
22.5 - 30 minutes	59 ± 22.8	3.0%
30 - 60 minutes	44 ± 22.8	2.2%
60 - 120 minutes	42 ± 22.8	2.1%
120+ minutes	43 ± 22.8	2.2%

This information does help reinforce that the application is operated as designed.

Simulation Tool

ENPA includes a simulation tool for opt-in users. For 14 days ending December 6, 2022 the simulation suggests four notifications were sent to individuals with positive transmission before symptom onset. When multiplied by our estimated installation base, this would account for approximately 10 notifications sent prior to symptom onset over the 14 day period.

Exposure Notification Config

Preset: Alaska

Notification Types

- **Type 1** — Risk Score Threshold 900 seconds (15.00 minutes)
- **Type 2** — Risk Score Threshold 0 seconds (0.00 minutes)
- **Type 3** — Risk Score Threshold 0 seconds (0.00 minutes)
- **Type 4** — Risk Score Threshold 0 seconds (0.00 minutes)

Simulation Parameters

Systemic Delays

Testing	2	days
Results	1	days
Reporting	0	days

Transmissibility

How easily the COVID-19 variant that the infected person has can be transmitted relative to the original

1 1.5 2 2.5 3

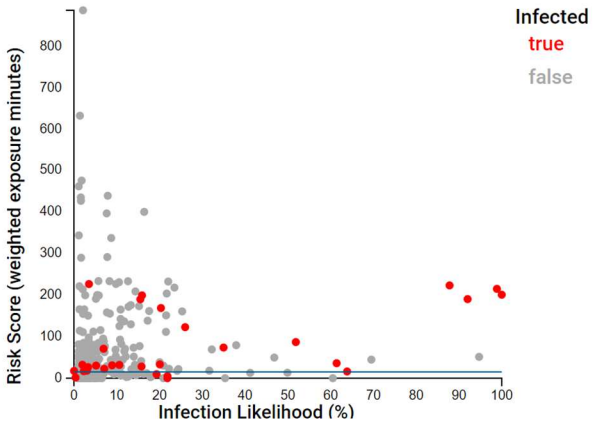
Estimated Real-world Impact

20,539	Total number of exposures recorded between EN app users in the last 14 days
6	Estimated number of such exposures that result in a new infection
5	Estimated number of such new infections for which a notification is sent
4	Estimated number of such notifications sent before symptom onset in the secondary case
868	Estimated number of notifications sent to app users who are not infected

Estimated Efficacy Metrics

Category	Recall	Precision	Percent
Notification Type 1	86.21%	0.59%	4.25%
All Notifications	86.21%	0.59%	4.25%

Risk Score vs Infection Likelihood for Simulated Data



Disclaimer

The simulation model underlying the risk score simulator reflects our current understanding of SARS-CoV-2 and COVID-19 based on the current literature and available evidence; however, much is still unknown. Therefore, the model should not be relied upon to provide accurate estimates of the real number of infected individuals. This work has not been scientifically peer-reviewed.

This model is provided "as is". No warranty of any kind, implied, expressed, or statutory, including but not limited to the warranties of non-infringement and/or fitness for a particular purpose, is given with respect to the model. Do not rely on this tool or its underlying model for medical advice, diagnosis, treatment, or judgment.

The model assumes that inhalation of aerosolized virus is the primary route of SARS-CoV-2 transmission, and that the individuals in each encounter are speaking with one another at a normal volume, with the breathing rate of an average adult, in an indoor setting. The model may under-estimate the likelihood of transmission in very small enclosed spaces and over-estimate the likelihood of transmission in rooms with a significant amount of turbulence in the air.

Despite its limitations, the risk score simulator can serve as a useful tool for comparing the relative efficacies of different EN app configurations and logistical capabilities.

Academic Studies on the Impact of ENX

Several studies have been published that estimate the impact of ENX. A few are referenced below.

- Jeon S, Rainisch G, Harris AM, Shinabery J, Iqbal M, Pallavaram A, Hilton S, Karki S, Moonan PK, Oeltmann JE, Meltzer MI. Estimated Cases Averted by COVID-19 Digital Exposure Notification, Pennsylvania, USA, November 8, 2020-January 2, 2021. Emerg Infect Dis. 2023 Feb;29(2):426-430. doi: 10.3201/eid2902.220959. Epub 2023 Jan 13. PMID: 36639132; PMCID: PMC9881797.

  This study combined field-based data with mathematical modeling to estimate the effectiveness of smartphone-enabled COVID-19 exposure notification in Pennsylvania, USA. The authors estimated that digital notifications potentially averted 7–69 cases/1,000 notifications during November 8, 2020–January 2, 2021. Greater use and increased compliance could increase the effectiveness of digital notifications.

- Kendall, M., Tsallis, D., Wymant, C. et al. Epidemiological impacts of the NHS COVID-19 app in England and Wales throughout its first year. Nat Commun 14, 858 (2023). https://doi.org/10.1038/s41467-023-36495-z

  The NHS COVID-19 app was launched in England and Wales in September 2020, with a Bluetooth-based contact tracing functionality designed to reduce transmission of SARS-CoV-2. The authors show that user engagement and the app's epidemiological impacts varied according to changing social and epidemic characteristics throughout the app's first year. The authors describe the interaction and complementarity of manual and digital contact tracing approaches. Results of our statistical analyses of anonymised, aggregated app data include that app users who were recently notified were more likely to test positive than app users who were not recently notified, by a factor that varied considerably over time. The authors estimate that the app's contact tracing function alone averted about 1 million cases (sensitivity analysis 450,000–1,400,000) during its first year, corresponding to 44,000 hospital cases (SA 20,000–60,000) and 9,600 deaths (SA 4600–13,000).

- Abueg, M., Hinch, R., Wu, N. et al. Modeling the effect of exposure notification and non-pharmaceutical interventions on COVID-19 transmission in Washington state. npj Digit. Med. 4, 49 (2021). https://doi.org/10.1038/s41746-021-00422-7

  This study examined individual-based models of three Washington state counties to explore how digital exposure notifications combined with other non-pharmaceutical interventions influence COVID-19 disease spread under various adoption, compliance, and mobility scenarios. In a model with 15% participation, the authors found that exposure notification could reduce infections and deaths by approximately 8% and 6% and could effectively complement traditional contact tracing.

Summary

Alaska COVID ENX operated as designed. The system protected individual privacy while allowing anonymous notifications for potential exposure to SARS-Cov-2

- Voluntary adoption by thousands of users highlighted the potential for tools that support bottom-up, individual-based monitoring for infectious and respiratory diseases.
- In the absence of a major marketing campaign, alert notifications were most effective in getting user adoptions.
- Detailed metrics from opt-in users provided a valuable window into overall use. Without this data and a way to calibrate against the limited known data, we would have little insight into the number of active users, notifications received, etc.

After our experience using exposure notification express in Alaska, we are confident that should another emergency or need for exposure notification applications occur, we, in collaboration with university, state and national partners could quickly stand up an application for public health protection.

We would like to thank Google, Apple, MITRE, and APHL for their contributions to making ENX possible and available, with special thanks to Sarah Tuneberg and Zach Eddinger from Google and Michael Tanne from Apple. We would also like to thank Anne Zink, Chief Medical Officer for the State of Alaska, and Heidi Hedberg, Commissioner for the Alaska Department of Health. The project would also not have been possible without the support of Pat Pitney, University of Alaska President, Sean Parnell, University of Alaska Anchorage Chancellor, and Denise Runge, University of Alaska Anchorage Provost.

The Digital Notification Alliance team, especially Laura West and Bryant Karras, provided additional support to operate, maintain and coordinate ENX across states. https://dna-enx.org/

Grant Johnston with the Yuit Comms team and the University Advancement and UAA Communications team members of Theodore Kincaid, Marmian Grimes, Marci Suazo, and Austin Osborne were instrumental in the promotion of Alaska COVID ENX.

Finally, the project was initiated thanks to the dedication of UAA/MOA team notification app members Brendan Babb, Jazon Burnell, Joy Chavez Mapaye, Tom Hennessy, Lisa Schwarzburg, Jayna Combs, and RD Parker.