Public Health Informatics Institute

Steps for Public Health to Plan for the Use of the Apple|Google Exposure Notification Framework

White Paper

June 2020

Acknowledgements

This report was created by the Public Health Informatics Institute with funding from the CDC Foundation. It was created out of the need to develop and provide guidance to public health about the use of Apple and Google's smartphone-based exposure notification framework in support of contact tracing. This work is the result of input from professionals across public health who generously contributed their time and expertise to meetings and conference calls to produce the following guidance for their colleagues.

The Public Health Informatics Institute welcomes comments on this document and related content for additional information on this effort.

We encourage further non-commercial distribution of this report, but all uses in any form, in any quantity, or by any means—electronic, mechanical, photocopying, recording or otherwise—must include the following attribution on all copies:

"Steps for Public Health to Plan for the Use of the Apple|Google Exposure Notification Framework" Copyright 2020 by Public Health Informatics Institute. All rights reserved."

No other copyright, byline, or appearance of mutual ownership may appear on the copyrighted materials. PHII's copyrighted material cannot be altered. Under no circumstances should material be distributed for commercial use without specific written permission.

Suggested citation

Public Health Informatics Institute. 2020. "Steps for Public Health to Plan for the Use of the Apple|Google ExposureNotification Framework" Decatur, GA: Public Health Informatics Institute.

Published by:

Public Health Informatics Institute
325 Swanton Way
Decatur, GA 30030

Copyright © 2020 by the Public Health Informatics Institute. All rights reserved.

Design Team

CDC Foundation

Judy Monroe - President, CEO

Centers of Disease Control and Prevention

Jason Bonander- Deputy Chief Information Officer
Adi Gundlapalli- Chief Public Health Informatics Officer, Center for Surveillance, Epidemiology, and Laboratory Services
Anita Patel- Lead Advisor, Influenza Coordination Unit, National Center for Immunization and Respiratory Diseases
Michael Judd - Deputy Lead, Innovative Technologies Team, Workforce Development and Innovation Taskforce
Megan Light - Lead, Innovative Technologies Team, Workforce Development and Innovation Taskforce
Mark Stenger - Epidemiologist, Innovative Technologies Team, Workforce Development and Innovation Taskforce
Asad Islam – Computer Scientist, Innovative Technologies Team, Workforce Development and Innovation Taskforce

Council of State and Territorial Epidemiologists

Jeff Engel - Senior Advisor, COVID-19 Response
Janet Hamilton - Executive Director

Council of State and Territorial Epidemiologists

Becky Lampkins - Manager, Surveillance and Informatics Program

State Health Departments

Kathryn Turner - Chief, Bureau of Communicable Disease Prevention Control, Idaho Division of Public Health
Jim Collins - Director, Communicable Disease Division, Michigan Department of Health and Human Services
Michelle Dethloff - Program Director, Epidemiology and Lab Capacity, North Dakota Department of Health Division of Disease Control
Bryant Karras - Chief Informatics Officer, Washington State Department of Health

Local Health Departments

Puneet Sharma - Chief Information Officer, Boston Public Health Commission

The Task Force for Global Health

Patrick O'Carroll- Head, Health Systems Strengthening Sector
Dave Ross - President, CEO, Task Force for Global Health
Vivian Singletary - Executive Director, Public Health Informatics Institute
Jimica Tchamako - Requirements Lab Director, Public Health Informatics Institute
Jelisa Lowe - Communications Manager, Public Health Informatics Institute
Juneka Rembert Senior Business Analyst, Public Health Informatics Institute
Sheereen Brown - Senior Business Analyst, Public Health Informatics institute
Chelsey Kamson- Project Manager, Public Health Informatics Institute

Public Health Experts

Association of Public Health Laboratories

Scott Becker - Executive Director
Patina Zarcone - Director, Informatics Program

Association of State and Territorial Health Officers

Mike Fraser - Chief Executive Officer
Priyanka Surio - Director, Data Analytics and Public Health Informatics
Mylynn Tufte - Former State Health Officer, North Dakota

CDC Foundation

Brandon Talley - Vice President for Noninfectious Disease Programs

Davis Wright Tremaine, LLP

Adam Greene - Partner

Global Health Crisis Coordination Center

Robert Aaron - Healthcare IT and Strategic Alliance Lead

Kahuina Consulting

Charlie Ishikawa - Principal Consultant

State Health Departments

Art Davidson - Consultant & Senior Physician Advisor, Denver Department of Public Health
Gerd Clabaugh - Iowa State Health Officer, Iowa Department of Public Health
Richard Vogt- Clinical Professor and Consultant, Colorado School of Public Health

U.S. Department of Health and Human Services

James Daniel - Director, Public Health Innovation
Sharon Sartin - Chief Technology Officer, Center for Medicare and Medicaid Innovation

National Association of County and City Health Officials

Oscar Alleyne - Chief of Programs and Services
Lilly Kan - Senior Director, Infectious Disease & Informatics

National Governors Association

Hemi Tewarson - Director, Health Division
Lauren Block - Program Director, Health Division
Margaux Haviland - Analyst, Data Analytics and Public Health Informatics

Glossary

Framework: A set of protocols focused on a certain problem domain (e.g., digital contact tracing) and the reusable software components providing a standard way for software developers to create and deploy applications that implement the framework's intended functionality.

Bluetooth Exposure Notification: Exposure Notification is a Bluetooth Low Energy (BLE) service designed to enable exchange of anonymous key codes between smartphones in close proximity for the purpose of enabling contact tracing apps to alert users who may be at risk of infection due to exposure to one or more persons with COVID-19[1,2].

Contact Tracing: A technique used by public health agencies to identify, interview and monitor people who may have come into contact with an infectious person[3].

COVID-19: COVID-19 stands for novel coronavirus disease 2019 (which refers to the year of its initial detection) and is the disease caused by SARS-CoV-2.

Coronavirus: A family of viruses that include severe acute respiratory syndrome (SARS)and Middle East respiratory syndrome (MERS) as well as other respiratory illnesses[4].

[1] Apple and Google, "Using Technology to Help Public Health Authorities Fight COVID-19," COVID-19 Information and Resources (Google, May 2020), https://www.google.com/covid19/exposurenotifications/.
[2] Apple and Google, "Exposure Notification Bluetooth Specification," (Apple, April 2020), https://covid19-static.cdn-apple.com/applications/covid19/current/static/contact-tracing/pdf/ExposureNotification-BluetoothSpecificationv1.2.pdf
[3] Centers for Disease Control and Prevention, "Contact Tracing," Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, June 21, 2020), https://www.cdc.gov/coronavirus/2019-ncov/php/open-america/contact-tracing-resources.html.
[4] Texas Medical Center and Alexandra Becker, "COVID-19 Crisis Catalog: A Glossary of Terms," TMC News, May 27, 2020, https://www.tmc.edu/news/2020/05/covid-19-crisis-catalog-a-glossary-of-terms/.

Purpose

The purpose of this white paper is to help state and local public health officials learn about the Apple and Google exposure notification framework (A|G ENF) and decide whether to build and deploy a statewide app for users to receive exposure alerts for enhanced COVID-19 contact tracing. Authored to meet an urgent need for basic information, this white paper provides the following:

1. An executive description of the technology
2. Fundamental public health considerations
3. How to optimize early learning

Background

As states begin to reopen their economies and ease quarantine restrictions, rapid identification, notification and quarantining of individuals exposed to patients diagnosed with COVID-19 is critically important to mitigating further spread of the disease. However, public health agencies face an unprecedented challenge in accomplishing this objective due to the high potential for person-to-person transmission of SARS-CoV-2—especially among contacts unknown to the patient—and the possibility of asymptomatic infection further propagating spread of the disease. To meet these challenges, public health authorities nationwide are rapidly building state and local contact tracing capacities.

Technology cannot and should not, replace the important role that public health workers play in ensuring that persons exposed to COVID-19 are assessed, informed and supported with integrity and compassion. Instead, technology should act as a force multiplier and amplify the efforts of contact tracing teams. As public health authorities focus on expanding the ranks of emergency contact tracers, technology developers are simultaneously creating and marketing digital tools to support various contact tracing procedures. It is paramount that the new exposure notification technology follows best practices and meets the public health agencies' requirements and standards.

PHII is convening public health and technology experts to help inform and coordinate the use and further development of digital tools in support of contact tracing. Deliberations on this topic are ongoing. You can find the most up to date information at www.phii.org/contact-tracing. If you would like to engage in the ongoing deliberations, please contact us at info@phii.org.

An Executive Description of the Technology[5]

Apple and Google co-developed and embedded a new feature within the iOS and Android operating systems, used by nearly all smartphones in the United States, that aims to support the contact identification and notification process. Called the Apple|Google exposure notification framework (A|G ENF), it is intended to supplement traditional contact tracing by allowing smartphone apps built in collaboration with (or otherwise endorsed by) state public health authorities to anonymously notify

[5] For detailed A|G ENF requirements and specifications, see on-line documentation by Apple: Apple, "Privacy-Preserving Contact Tracing - Apple and Google," Apple, 2020, https://www.apple.com/covid19/contacttracing.

consenting users of their exposure to confirmed COVID-19 cases via a smartphone alert. These alerts are sent as rapidly and securely as possible and encourage potentially exposed individuals to immediately contact trained public health staff for testing and follow up.

This anonymous method for assessing exposure is made possible by the Bluetooth Low Energy (BLE) protocol that smartphones routinely use to connect with other Bluetooth devices (e.g., wireless headphones, or other smartphones). In this method, smartphones that come into close proximity of one another exchange randomly-generated BLE key codes and store them encrypted on the users' phones for 14 days. These 'keys' can later be linked to a confirmed COVID-19 patient if the patient chooses to share their keys; however, the keys do not contain personal identifiers, but rather a code associated with a particular cell phone for a short period of time. See Figures 1 and 2 for a storyboard developed by Apple and Google illustrating how the technology is intended to work.[6]

The A|G ENF is not an app: if no app is built and endorsed by a state health authority, the feature remains inactive.

There are three key points to keep in mind about this new technology:

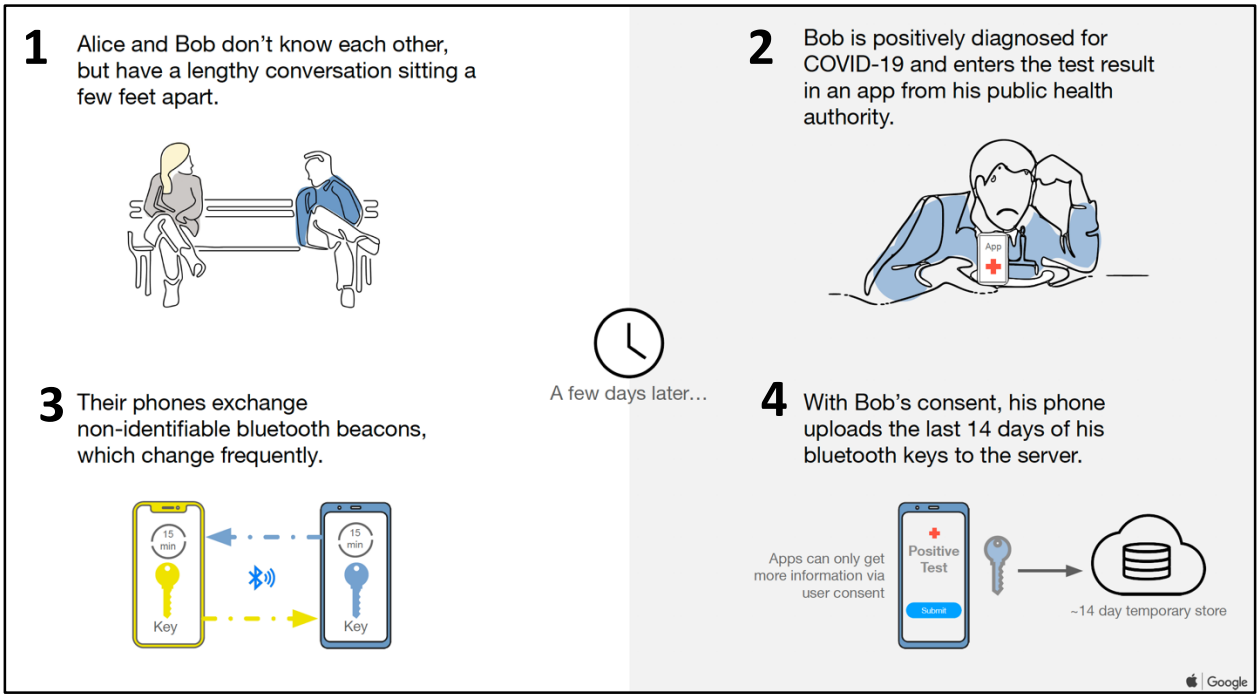
1. **The Apple|Google ENF is <u>not</u> a software application (app).**
   The A|G ENF enables state and local health officials to have developers build apps. If no app is built and endorsed by a state health authority, the feature remains inactive. Importantly, the exposure notifications and connections to public health contact tracers, such as those illustrated in Figures 1 and 2, must be done by apps developed by public health officials, not the A|G ENF. Only one app per state is allowed by Apple and Google.

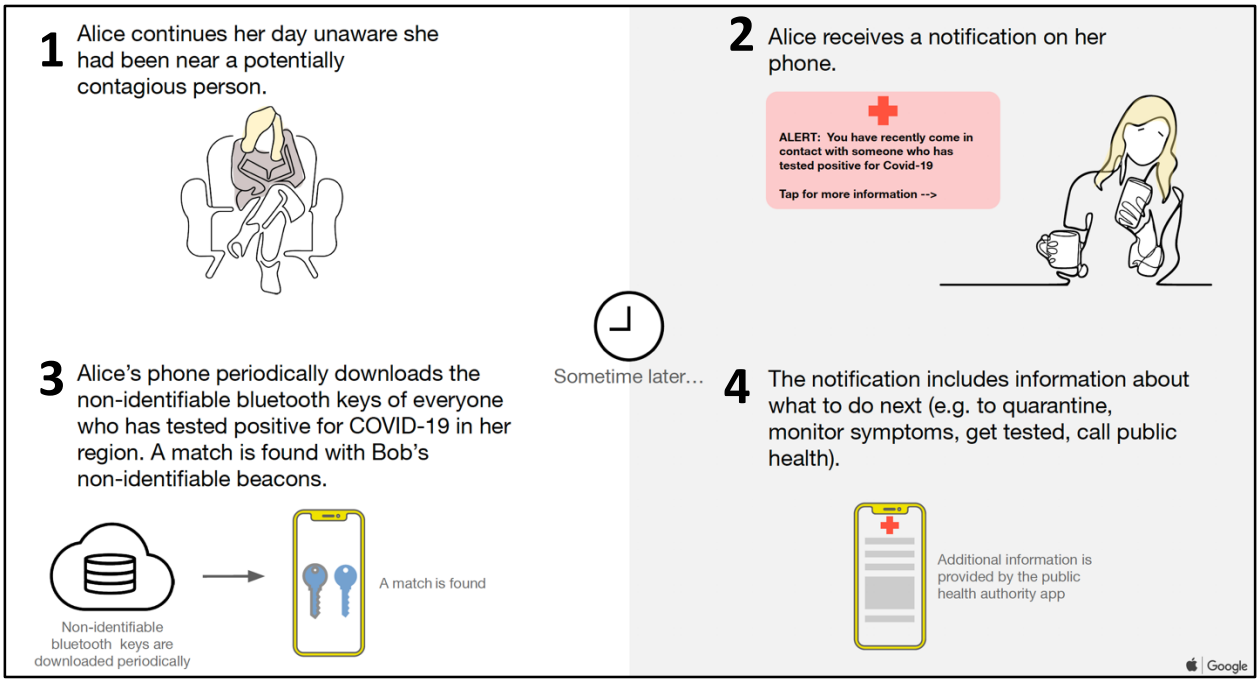
2. **Meaningful exposure thresholds must be defined by each public health authority.**
   Within the A|G ENF, COVID-19 exposure is measured by a risk score calculated using proximity, duration, transmission risk and "days since exposure" parameters[7]. Public health officials are responsible for configuring these parameters and the weighted calculation that results in an exceeded threshold to trigger an exposure notification. Officials in different states can set different thresholds, but only one configuration is allowed per state app. There are currently no public health practice-based standards for extrapolating exposure risk or the likelihood of COVID-19 infection and illness within the A|G ENF.

3. **Exposure notifications are most useful with a shared, nationwide public health data resource; i.e., a national key server.**
   Each app leveraging the A|G ENF needs an internet resource to look up BLE keys linked to newly diagnosed COVID-19 cases. To make exposure notifications work across state boundaries, all case-linked BLE keys must be sent to and stored on a server accessible by apps from users nationwide. This server is referred to as the national key server (see Figure 3). On behalf of the public health community, the Association of Public Health Laboratories (APHL) is championing a national effort to design and host a key server for use by apps that state public health officials develop.

[6] 2020. Apple | Google. "Apple/Google Exposure Notification for Public Health Authorities" pdf. Pg. 2
[7] Apple, "ENExposure Notification," Apple Developer Documentation, 2020, https://developer.apple.com/documentation/exposurenotification/enexposureconfiguration.

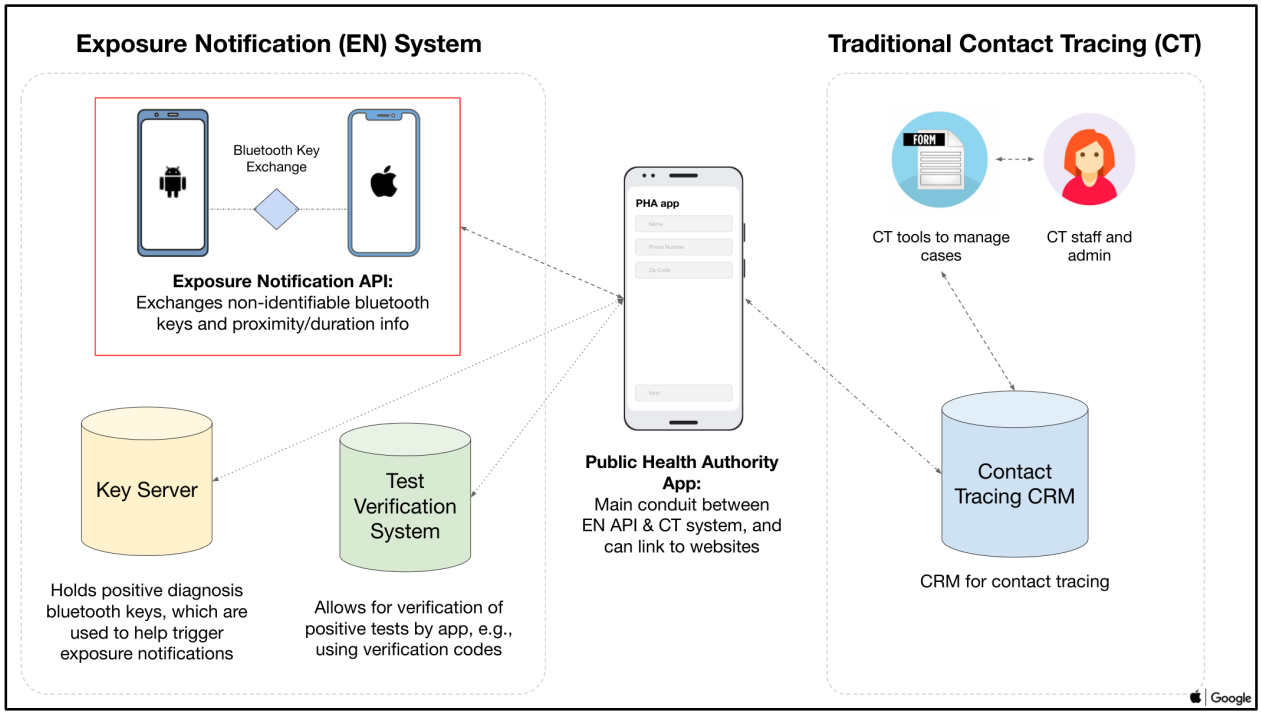
Figures 1 and 2: Storyboard illustrations published by Apple and Google depict how exposure notification framework works.





Note: Step 3 is dependent on unique functionality of each app; infrastructure may not have capability to collect *regional* test data.

Figure 3: Basic schematic of the Apple|Google exposure notification framework's core technologies. Additional necessary information services and applications are not depicted.



Steps for Public Health Agency Consideration

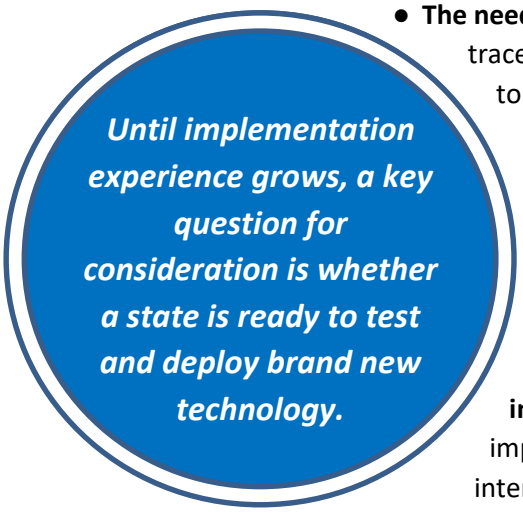
At the most basic level, U.S. public health officials are asking whether the cost of building the A|G ENF will yield sufficient public health value. Apple and Google outlined seven steps to launching the exposure notification technology (Table 1). Significant resource commitments are needed to complete these steps, and there is limited public health science to inform key decisions.

Table 1: Apple and Google's outline for public health officials to launch the exposure notification framework.

#	Action	Purpose
1	Develop iOS and Android user-facing app	Enable Bluetooth key exchange; provide the user interface for exposure notification system
2	Connect to the key server	Store the non-identifiable Bluetooth keys of users with verified positive diagnosis supported by APHL
3	Determine and implement positive test verification method	Enable verification of positive test on app
4	Define meaningful exposure	Determine which exposures warrant a notification

5	Define next steps for contacts	Determine what next steps to provide to exposed users (e.g., quarantine, get tested, contact public health, monitor symptoms)
6	Integrate with existing contact/case management solution	Enable contact tracers to accelerate outreach
7	Launch a public awareness campaign	Maximize public participation

Until implementation experience grows, a key question for consideration is whether a state is ready to test and deploy a brand new technology. Although there is great potential for the technology to aid in controlling the spread of COVID-19, risks are also evident given the unknowns. Health officials who decide to implement the A|G ENF will do so with limited public health science to inform key decisions. Because of that, some additional important needs should be considered for implementation of the A|G ENF:

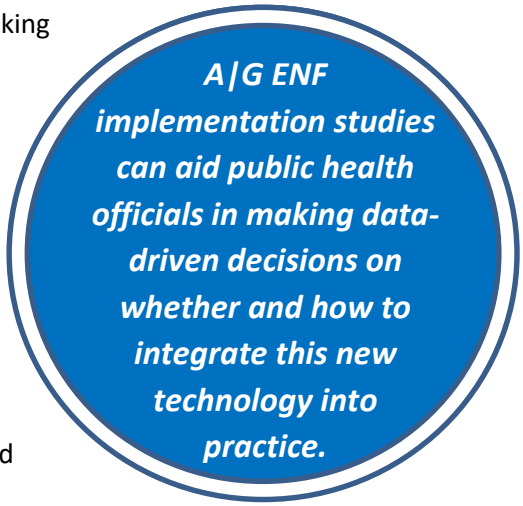


- **The need for an adequate workforce.** Competent and well-equipped contact tracers to support case investigation and contact tracing efforts is essential to ensure proper aid for *those notified by the public health app.*
- **The need for experienced IT staff for development and implementation.** App development is highly specialized and complex. It is critical to appoint personnel who (1) can develop an app that meets public health officials' requirements, (2) are able to iterate through versions of the app (as needed) and its exposure notification configuration settings, and (3) can adopt and follow best practices.
- **The need for partnerships and policies to support interoperability with the national key server.** The technology is important, but partnerships and policies are also needed to support interoperability between the national key server and apps public health authorities endorse or create. Each app leveraging the A|G ENF needs an internet resource to identify BLE keys linked to newly diagnosed COVID-19 cases. For exposure notifications to work across state boundaries, all case-linked BLE keys must be sent to and stored on a server accessible to users nationwide via the app. Thus, in addition to the technical aspects, there are service-level agreements and partnerships that will be required to complete interoperability with the national key server.
- **The need for protection of public health information.** Assurance of protected health information (PHI) security is a central factor in any public health system design. Confidentiality of significant volumes of PHI must be maintained. The obligation to protect the confidentiality of PHI is defined by each state's law and the federal Health Insurance Portability and Accountability Act of 1996 (HIPAA) as amended under the Health Information Technology for Economic and Clinical Health Act (HITECH Act) and expanded under the HIPAA Omnibus Rule (2013).
- **The need for oversight.** An oversight group is essential to appropriately address concerns related to the adoption of this new technology. This group would primarily monitor and inform development and implementation so that all relevant privacy, security, ethics and health equity/cultural sensitivity concerns are properly addressed before wide-scale implementation.

Overall, the readiness and resources required for agencies to implement the A|G ENF may be significant. However, agencies could also benefit significantly from the learnings that the implementations will provide. For additional approaches and considerations, please see the PEST analysis and SBAR notes.

How to optimize early-learning

A|G ENF implementation studies can aid public health officials in making data-driven decisions on whether and how to integrate this new technology into practice. Due to complexity and scope, implementation projects will probably differ among states and use existing local assets to minimize expense. Moreover, there will likely be important differences in how implementations are conducted, and the generalizability of study data may be limited.



Officials who implement the A|G ENF must learn and adapt implementation plans while moving to launch the A|G ENF. In contrast to implementations conducted for basic research, these studies will take pragmatic and agile approaches with a focus on delivering working results and value. The methods and solutions used will likely differ from initial plans.

A means for implementation projects to collaborate, share lessons learned, and present and solve problems among peers will help ensure success and minimize waste. A national community of practice (CoP) should be established and managed for this purpose. The learnings of this CoP should be accessible to every interested state and local public health official.

Expect that knowledge about the A|G ENF from implementations will come in phases (Table 2). Initial implementation findings and data may address feasibility questions (e.g., readiness and development costs) and later yield data on epidemiological issues (e.g., exposure thresholds and risk). As states decide to roll out the A|G ENF, implementation projects will discover challenges and produce practices that other health officials will find informative.

Table 2: Depiction of the relative time in a technology implementation project lifecycle that experience and data may answer feasibility, infrastructure and scientific or operational questions about implementing the Apple|Google exposure notification framework. Note: Implementing new technology is an iterative process, and the time frames listed for each phase are suggestions based on practical transitions between each phase.

	Phase 0: Administrative tasks	Phase 1: Beta-test	Phase 2: Proof-of-concept	Phase 3: Integrate
Approximate timeline from project start	Weeks 0 - 2	Weeks 2 - 4	Weeks 4 - 6	Weeks 6 - 8
Possible activities	● Develop work plan/technical roadmap/timeline ● Develop budgets ● Identify resources ● Develop aids/policies (e.g. system access roles) ● Develop communication plan ● Develop monitoring and evaluation plan	● Develop minimally viable public health app ● Establish service agreements ● Build server connections and protocols ● Design follow-up workflows	● Set baseline exposure threshold ● Test and validate functions and connections ● Recruit users ● Debut app and education materials	● Adjust thresholds ● Test "connection" to CRM or traditional CT solution ● Measure adoption ● Explore user and public health worker experience
Questions that experience and data may help answer	Work plan/technical roadmap questions, e.g. time, scope, budget, work aids, communication needs, monitoring and evaluation activities, project oversight needs, system access role types	Feasibility questions; e.g., legal and policy matters, service agreements, human resource requirements, and material costs	Infrastructure questions; e.g., app requirements, key server exchange and lab validation protocols, and initial approaches to adopt promotion through social marketing or public education	Public health scientific and operational questions; e.g., baseline configurations for exposure notification, follow-up processes, and drivers that may promote adoption by users