

What is Digital Contact-Tracing (DCT) ?

Contact tracing, whether operated manually or digitally, aims to identify and isolate people who have been exposed to the virus through physical proximity with a positive-tested person. Successful contact-tracing requires that : 1) Case numbers are low and 2) There is quick turn-around in testing to utilize a 3-day window for tracing contacts to stop exponential spread. In an uncontrolled epidemic, with widespread asymptomatic and airborne transmission there is little either traditional or digital contact tracing can do.

Digital Contact Tracing (DCT), or Technology-Assisted Contact Tracing (TACT), is used as a mitigation strategy to support public health responses by slowing the rate of transmission (R). In the context of DCT, the term contact relates to any individual with whom a user has exchanged tokens in a contact tracing app. DCT mainly operates through app notifications, e.g. in the form of real-time location-based alerts, updates of confirmed cases, COVID-19 education information, or monitoring of symptoms, home isolation and quarantines. If people do not ignore notifications, one advantage to DCT is that its app interfaces and “instantaneous” notifications of exposure may save time and resources over more time-intensive paper-based systems or manual contact tracing via phone calls or house-visits (which are not possible in areas of high transmission). In order to come to terms with rising infection rates, US state health departments need to scale up their contact tracing efforts which are understaffed. According to estimates, at least 30 contact tracers are needed for every 100,000 U.S. residents, but as of mid-June only 37,110 contact tracers have been employed nationally.

Who is using DCT?

DCT technologies are prototyped, tested, and implemented in dozens of countries, but a recent review in Nature found that across 28 countries only 16 of 50 apps reviewed used anonymized data. Without federal oversight, DCT apps have been adopted in about half of the US without much success although a larger number of states use some form of TACT. Increasingly, U.S. universities (see table) are turning to DCT apps, again without evidence that they work, and sometimes in areas of high transmission where contact tracing itself is rendered ineffective. These apps are relatively simple to design, and college students themselves have designed them. Some schools, such as Indiana University, UMass Amherst and University of New Hampshire are making the tracking apps mandatory for students, without giving them the opportunity to assess their privacy needs, while a recent report for higher education recommends that such apps be opt-in and non-mandatory for campuses. There is some indication that HBCU administrations may be more reluctant to adopt DCTs; Hispanic Serving Institutions (HSIs) report concerns with bias and AI. The University of Washington-Seattle has developed an app in conjunction with state health authorities that is designed to augment traditional contact-tracing, and has encourage use of the app on campus. The University of Alabama (with federal relief funds) and the University of Wisconsin have developed apps with state health authorities and have tested (or are starting to test) with campus populations; the University of Buffalo also tested its Covid -19 app (retooled from an earlier flu-detection app) with its students. Some state universities in Massachusetts (along with local school districts) are considering use of Bluetooth beacons.

How effective is DCT?

In combination with timely testing, effective contact tracing is considered an alternative to more pervasive suppression strategies such as shutdowns and sheltering in place. Most importantly, DCT's efficiency is dependent upon a high degree of user uptake and trust. There is as yet, no proof-of concept for DCT app efficacy, and with little trust of these technologies as a result of lack of security, data breaches, or sharing of personal information with third party vendors, there has been little uptake, rendering them ineffective. Current calculations are that 60 percent of any given population would need to adopt DCT and willingly report their health status to make for successful mitigation. DCT uptake also depends on whether more

[vulnerable communities](#) have access to smartphone applications, and user literacy. However, the only forms of DCT/TACT that had success before new outbreaks—in [Taiwan](#), [South Korea](#), [China](#), and [Singapore](#)—have been coupled with traditional CT (and/or [invasive forms of data collection in India](#) and [facial-recognition technology in China](#)). Singapore’s Bluetooth-based [TraceTogether](#) app was one of the first to be introduced globally, but is only used by 35% of the population. In the US, Apple and Google have developed a shared (GAEN) Application Programming Interface (API) to be used for [Bluetooth-enabled \(BLE\) mobile phones](#). To date, there is [a dearth of evidence that these apps actually do what they claim](#); there are battery drain and design upload issues in non-GAEN apps, as well as a high rate of both false positives and false negatives with unanticipated social costs. There is [wide debate](#) as to whether DCT apps should take a [centralized or decentralized approach](#) whether they should trace physical proximity between users with Bluetooth, Global Positioning System (GPS), cell tower tracking, Wi-fi signals, barcoding strategies, or even other biometric smartphone sensors, including facial recognition and wide-area thermal imaging.

What do policy experts and the law say about data privacy?

At the core of the debate around DCT implementation is a so-called ["trade-off"](#) between personal information and health benefits where citizens are asked to give up some privacy in the interest of [increased health security](#). In the absence of compelling data that these apps work—even in countries with invasive data collection and mandatory app use like China which have suffered new outbreaks—it is unclear that the trade-off is justified, and European countries are issuing [new rulings](#) and considering [new legislation](#). In the US, privacy protections are [patchwork](#), and there is no constitutional right to privacy apart from the [4th amendment](#) which protects against unreasonable search and seizure, often applied in a restrictive sense. In the 1970s, the “Fair Information Practices” (FIP) were developed by HEW and codified as law in the 1974 Privacy Act.¹ Many of these principles are expressed in the [Digital Contact Tracing Bill of Rights](#) and in [ACLU White Papers on TACT](#); The [MIT Computational Law Report](#) has also developed principles of practice, and more than [200 scientists](#) globally have urged the adoption of privacy-preserving protocols.

Data [privacy legislation should include](#), encryption of all personal data, user consent for data storage and use, restrictions on use of the data outside the public health responses to COVID-19, automatic deletion of data, a delete data at any time option, and most importantly, voluntary opt-in. In May, [senators](#) and representatives introduced the [Public Health Emergency Privacy Act \(PHEPA\)](#). It [requires opt-in consent and data minimization](#), and limits data disclosures to [government](#). Calls have been made to have a more [comprehensive privacy law](#) that goes beyond the existing Consumer Online Privacy Rights Act, the COVID-19 Consumer Data Protection Act (CCDPA), or the Federal Health Insurance Portability and Accountability Act (HIPAA). The National Association of Attorneys General has written [to Google](#) requesting it to better protect consumer privacy by removing free, unregulated contact-tracing apps from its app store, and to verify that every DCT app in their app store is affiliated with a public health authority.

DCT apps risk what some health professionals have termed [“surveillance creep.”](#) Others are worried that DCT apps will provide a [false sense of security](#). A Brookings Report identifies DCT apps as possible [vehicles for abuse and disinformation](#). In Senate testimony, Law [Professor Ryan Calo](#) estimates that the potential for unintended consequences, misuse, and encroachment on privacy and civil liberties will be significant.

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¹Fair Information Practices are imbedded in several other pieces of privacy legislation such as the FCRA (1970), FERPA (1974), CCPA(1984), ECPA (1986), VCPA (1988), TCPA (1991), HIPPA (1996), COPPA (1998).

Universities	University Adoption of DCT Apps
Albion College, MI	Mandatory CT app called Aura ; tracks students' real-time locations
Antioch College	#CampusClear app self-screening survey
Auburn University	Pathcheck Guidesafe app
Bowdoin College	#CampusClear app
Carnegie Mellon	Opt-in NOVID app ; BLE and ultrasound
Columbia University	Symptom self-checking app called " ReopenCU "
Creighton University	Creighton and SUNY Stony Brook developed #CampusClear app for their campus reopening on August 17
Culinary Institute of America	Everbridge Mandatory temperature and symptom check; proximity tracing w/QR code ; builds on emergency notification infrastructure
CUNY Law School/Hostos CC (CUNY)	Everbridge app ; Symptom Checker app ;
Drexel University	QR code based HealthChecker App
Duke University	Symptom Monitoring app , called "SymMon"
Emory University	Opt-in symptom checker, c-19check
Georgia Tech	Uses a voluntary exposure notification app called NOVID
Harvard	Voluntary How We Feel Symptom Study ; asks Age, gender, height and weight, zip code, possible exposure to others with COVID-19 , health conditions, medications, daily symptoms, testing; also developing WiFi TraceFi which has received criticism
Indiana University	Launched university information app over spring break already (reported April 7); mandatory consent agreement and planned technology tracing for the fall
Johns Hopkins	CovidControl Study App ; no information on privacy practices
Molloy University	Kiosks using thermal and facial-recognition tied to student IDs

Northeastern University	SafeZone app ; consent form and student ID that gets disclosed for testing
Northwestern	Mandatory daily Symptom tracker
Oklahoma State University	Collects data from its 5,100 Wi-Fi access points, as well as card-swipe data and class attendance records as part of its contact-tracing program
Rochester Institute of Technology	https://www.rit.edu/ready/daily-health-screen ; https://www.rit.edu/ready/contact-tracing#location-check-in
Southern Methodist University	MIT Pathcheck; GPS location diary
Stanford	Mandatory daily Health Check app ; symptom tracker and EN
Stetson College	Everbridge app ; daily wellness check; color-coded bldg. entry, BLE proximity tracing
SUNY Stonybrook	Co-develops #CampusClear; in use w/100+ colleges , Association of Jesuit Colleges and Universities
Texas A&M University	Free Mental Health and Wellness Apps
University of Alabama	“ Stay Safe Together ”—Plan and online symptom tracker combined with contact tracing app ; rolled out Pathcheck GuideSafe app ; outbreak
University of Arizona	opt-in Covid Watch smartphone app
University of California, Berkeley	app being tested; part of UC App Consortium with 6 other campuses incl. UCSF and UCSD: CA Notify app
UC Irvine	monitors wi-fi signals in crowded buildings with IoT ; other apps in development
UC San Francisco	Opt-in CovidSeeker Study; donating location data and health history through Eureka app ; Questions about whether deidentification adequate .
UC San Diego	Opt-in app
UIUC	Mandatory SaferApp ; plus saliva-based COVID-19 test
University of Nebraska	launched mobile app, 1-Check COVID ; campus community encouraged to use
University of New Hampshire	Mandatory tracking app

UMass, Amherst	Opt-in app with self-checker; also developing WiFi tracing capability w/o app
University of Michigan	ResponsiBlu ; well-developed privacy policy
University of Mississippi	Everbridge app ; outbreak
University of Missouri	#CampusClear symptom monitoring app
University of North Florida	Opt-in self-screening tool accessed through the Safe Ospreys App or online via the Daily Self-Screening Tool .
Ohio State	Daily symptom checker app
University of Tennessee	Mandatory "daily health self-screening form" accessed either online or through an app
University of Texas	Protect Texas Together app ; optional symptom tracker
University of Virginia	Student-developed app ; TracX ; another app assesses risk based on residence
University of Wisconsin-Eau Claire	Mandatory use of a symptom tracking mobile app
University of Wisconsin-Madison	Launched public app called " COVID-19 Wisconsin Connect "; no exposure notification, but mental health resources
Vassar College	Opt-in Pathcheck app; student discomfort with app
Walla Walla University, WA	SaferMe contact tracing app
Whitman College	Everbridge; https://www.whitman.edu/covid-dashboard/health-and-safety
Yale	Optional Hunala app ; network science and machine learning to develop forecasts based on self-check and location data; location, age, health history, prior positive tests for COVID-19 ,

Summary Notes

As of March 2021, [24 states have launched DCTs](#); Texas and Illinois are among the states that have not launched these apps, but several colleges and universities in both states have launched apps. (The same is true for health depts. in Ohio and Mississippi where colleges in both states have launched apps).

Pathcheck Fdn which designed GPS and BLE apps has partnered with TCU and SMU in Texas; University of Alabama, Auburn U, Vassar; also with the states of Alabama, Hawaii, [Minnesota](#) and Louisiana.

Everbridge has adapted emergency response systems into [Covid-19 apps in use at several universities](#) (CIA, CUNY system, Mississippi State, University of Mississippi, Stetson College, Whitman College, [UCI Health](#) and businesses: <https://www.hstoday.us/industry/everbridge-launches-contact-tracing-solution-to-address-privacy-concerns/>)

CampusClear App in use at Creighton, SUNY Binghampton, and [120 other colleges](#); 425K users and 9.8 m reports, but no way to judge whether effective in stopping virus transmission (NYT 3/2/21)

[UCSF](#), [Harvard](#) and [JHU](#) have all recently published studies based on their apps; King's College London has also published two studies on the UK app (one with Harvard).

[UHawaii](#), [UWashington-Seattle](#), and [Princeton](#) have encouraged campus communities to download apps from Hawaii, Washington and NJ Depts of Health; the University of Maryland has declined to use the Maryland State Dept of Health app [citing privacy concerns](#)

[UHawaii](#), [UArkansas](#), [UH and Temple](#) offering contact tracing courses to aid manual contact tracing.

UIdaho, UArizona, Syracuse University and RIT using [Wastewater-testing](#)