



EXPLORING USER-UPTAKE OF DIGITAL CONTACT TRACING (D-CT) APPS

A PRACTITIONER GUIDE

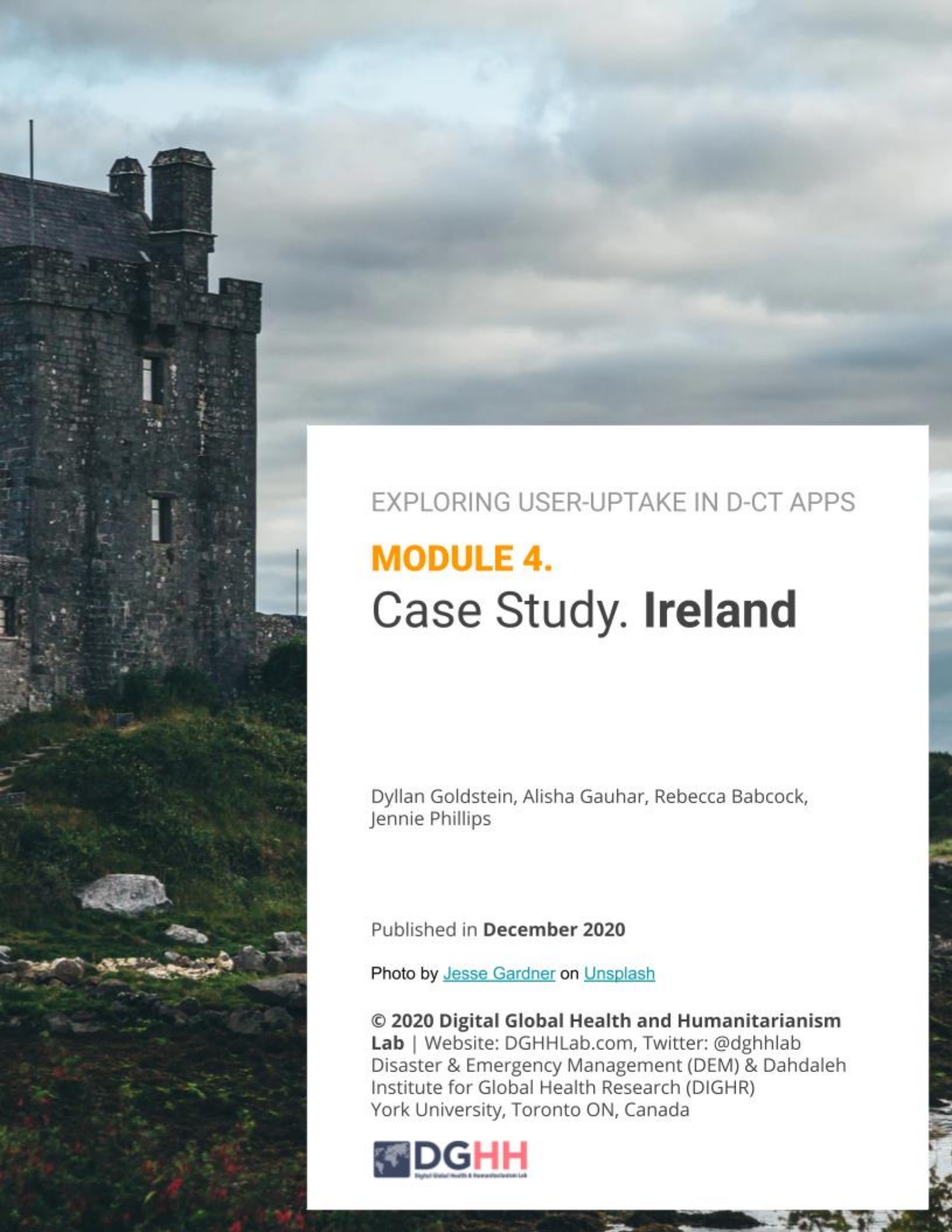
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ABOUT OUR LAB

Our research aims to shed insight into the different ways digital technologies are used in disasters and emergencies, the challenges and risks, and benefits and opportunities associated with digital technology use. We seek to provide strategies for guidance, and support efficacy-focused, ethical, low-risk interventions around the world. Our research adopts systems and complex networked perspectives, where we creating understanding through interconnectivity. We engage experts and organizations, both academic and practitioner, across disciplines to evolve research at the intersection of systems to enhance context-driven understanding.

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EXPLORING USER-UPTAKE IN D-CT APPS

MODULE 4.

Case Study. Ireland

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4.1. Study Overview

4.1.1 Background

At the onset of the COVID-19 pandemic, Digital Contact Tracing (D-CT) emerged as a complement to Manual Contact Tracing (M-CT) to help enhance the capacity of global health systems to track and control the rapid spread and impact of the virus. This innovative approach to contact tracing attracted global attention due to its immense potential to enable faster and more widespread tracing of the virus among symptomatic and asymptomatic infected populations, while also compensating for lower resource availability and physical distancing rules hindering face-to-face care. D-CT apps and interventions from eBracelets to QR codes surged around the world, in the hope that they would make a substantial impact on curbing the global spread of the virus.

To date however, little research exists demonstrating the true impact of these tools. Specifically, despite the widespread implementation of these tools, there is little evidence that shows that D-CT tools (most often apps) do more good than harm. Coupled with issues pertaining to human rights, privacy, efficacy, and digital inclusion, one of the major problems faced with D-CT interventions (mainly those that are voluntary) is the low level of user engagement in these apps – engagement meaning uptake of the app (download and registration), but also using and updating the app, reporting a positive diagnosis through the app, and reacting to an exposure alert received through the app (see our four-stage continuum of D-CT app engagement outlined in Module 1). Looking at uptake of D-CT apps alone, rates vary drastically across different contexts. Ireland and Iceland, for example, have some of the highest rates of the countries studied at approximately 43% and 40% respectively, while places like Cyprus or South Africa fall below 1%. And, while many argue that any degree of uptake can make a difference,¹ the dominant perception is that all of these rates are insufficient to make a substantial impact on tracing and controlling the virus. In an effort to better characterize the relationship between user engagement and app effectiveness, taking into account there is currently no magic uptake number, research is needed to understand why user-uptake varies between countries.

Through a preliminary literature review and an interdisciplinary workshop, our research team found this problem can be partly attributed to the lack of recognition and understanding of the target users of these apps. Yet, little is known regarding what incentivizes versus inhibits people from downloading these apps around the world, how context plays a role, as well as the association of perceived benefits and risks with user engagement. As part of [The Digital Global Health and Humanitarianism \(DGHH\) Lab's](#) larger study on the factors impact user-engagement across the four-stage continuum, this study focuses specifically on trying to address this gap by exploring stage 1 – user-uptake of D-CT apps – across various countries.

4.1.2 Methodology

This research asks the following research question:

¹O'Neill, P. (2020, June 5). No, coronavirus apps don't need 60% adoption to be effective. MIT Technology Review. Retrieved from <https://www.technologyreview.com/2020/06/05/1002775/covid-apps-effective-at-less-than-60-percent-download/>

Why is there higher user-uptake of D-CT apps in some countries over others?

This question is addressed with the following sub-questions:

- i. How does uptake vary across contexts?
- ii. What factors influence uptake across contexts?
- iii. How does risk-benefit perception influence uptake?

To answer these questions, we first established the scope of our research. Our focus is on user-uptake of D-CT apps (the most prevalent form of D-CT interventions worldwide) implemented by governments around the world at the national level, that are voluntary to download, and primarily decentralized in their data collection (a measure that mitigates privacy and human rights concerns that are widely recognized as a factor that deters app engagement).² Second, a multiple case study approach was used to generate country-specific understanding of user-uptake of D-CT apps and address our research questions. Cases selected include: Iceland, Cyprus, Ireland, Scotland, and South Africa. Data was collected through interdisciplinary workshops, interviews, and meta-analysis of existing peer-reviewed and grey literature. Research findings were analyzed through a systems-approach based on Bronfennbrenner's ecological systems theory to identify varied contextual factors that influence uptake (through a risk-benefit lens).³ Bronfennbrenner's theory aims to define user behaviour as a product of intrinsic and extrinsic interactions and influences with different levels in their surrounding system: individual (micro-level), community (meso-level), and system (macro-level). Research findings are presented through a series of modules (identified in Section 4.1.4 below) through an introduction to D-CT and user-uptake; case study; systems analysis of factors identified that influence uptake; and recommendations and future research. For a more detailed overview of our research approach, please see the full methodology.

4.1.3 Overview of Cases & Factors Identified

As will be shown through the five case studies, **eight factors** that can explain uptake across the individual (micro), community (meso), and system (macro) level dimensions have been identified. Each factor is explained below.

1. **Perceptions of Data Collection & Management** - how people perceive actual data collection and management as it relates to privacy and trust; and individual understanding of privacy and security (independent of actual privacy and security measures built into D-CT apps).
2. **Sense of Community** - the level of shared trust, shared identity, sense of duty, and/or communitarian values individuals have in relation to their community; and the strength of ties/connectedness individuals have with each other.

² Lomas, N. (2020, April 6). EU privacy experts push a decentralized approach to COVID-19 contacts tracing. TechCrunch. Retrieved from <https://techcrunch.com/2020/04/06/eu-privacy-experts-push-a-decentralized-approach-to-covid-19-contacts-tracing/>

³ Wikipedia Contributors. (2019, February 10). Ecological systems theory. Wikipedia; Wikimedia Foundation. Retrieved from https://en.wikipedia.org/wiki/Ecological_systems_theory

3. **Communications & Misinformation** - the timeliness, transparency, method, and nature of information provided to the nation alongside the prevalence, spread, and control of misinformation.
4. **Accessibility & Inclusion** - the degree to which D-CT apps are equally accessible to, usable for, and inclusive of, the entire population, as well as the level of discrimination and marginalization that results from interventions that fail to account for the digital divide or socially vulnerable populations.
5. **Trust in Public/Private Institutions** - the widespread level of trust and faith in public institutions (e.g. government, response agencies) and private institutions (e.g. internet corporations like Google, Apple, as well as the developers of D-CT apps).
6. **Policy & Governance** - the use of, and adherence to, policies and governance mechanisms that regulate the development, implementation, and use of the app.
7. **Response Infrastructure** - the ability of the health infrastructure alongside the first-line response and emergency management infrastructure to manage the COVID-19 pandemic (such as access to testing, and the capacity to respond to and treat the virus).
8. **Digital Capability** - the ability of D-CT apps to effectively and efficiently serve their purpose and facilitate the management of the pandemic.

4.1.4 Practitioner Guide Outline

The findings of this study are presented through eleven modules including:

Module 00 – Executive Summary

Module 0 - Methodology

Module 1 - Digital Contact Tracing (D-CT) and User-Uptake: A Primer

Module 2 - Case Study: Iceland

Module 3 - Case Study: Cyprus

Module 4 - Case Study: Ireland

Module 5 - Case Study: Scotland

Module 6 - Case Study: South Africa

Module 7 - Analysis of User-Uptake Factors: Individual- & Community-Level Influences

Module 8 - Analysis of User-Uptake Factors: System-Level Influences

Module 9 - Recommendations & Future Research

4.2. Module Overview

This module aims to explore Digital Contact Tracing (D-CT) developed and implemented in Ireland for the COVID-19 response. Focus is on their D-CT app, *COVID Tracker Ireland*, and understanding user-uptake. The case study begins with a brief overview of the country's overall response to COVID-19 and the impact of the virus on the country. Following, we explain Ireland's app by describing how it emerged, how it is designed and functions, how users engage with the app across the whole user-engagement process, and what user-uptake looks like in the country. The next section describes the main factors that emerged in

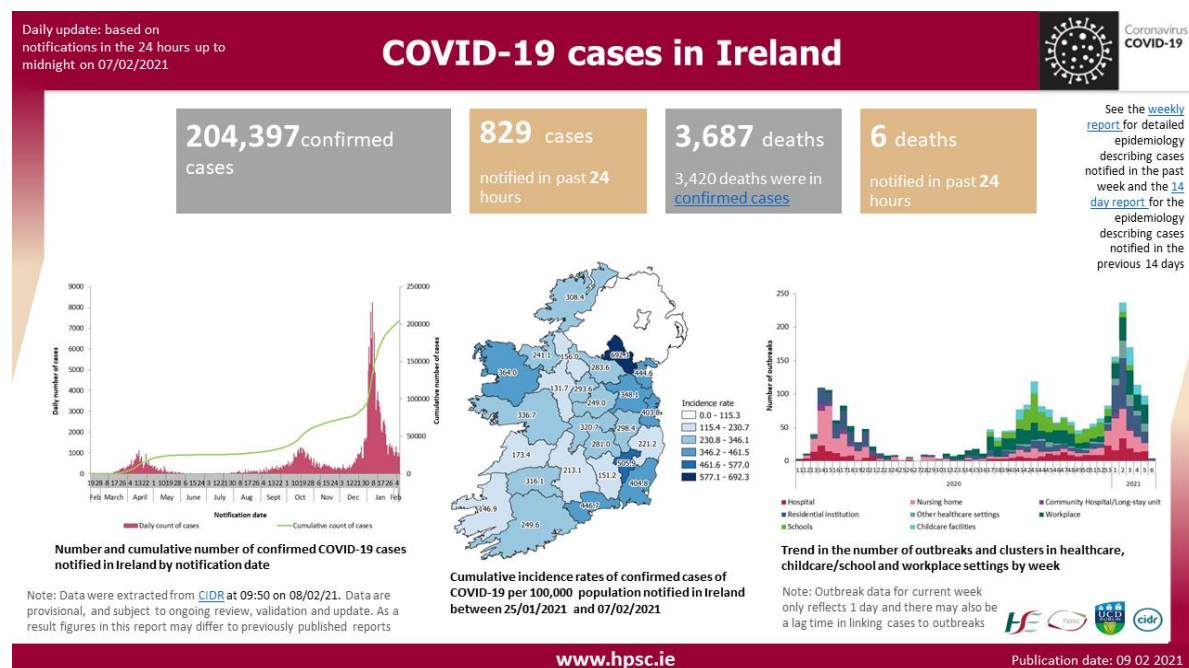
our research for this country that suggest influencing user-uptake within the country's context. This section ends with a brief conclusion.

4.3. Case Study

4.3.1. COVID-19 in Ireland

Ireland reported its first case of COVID-19 on 29 February 2020. As of 9 February 2021, Ireland has seen upwards of 204,940 cases and 3,752 deaths.⁴ The country was able to flatten the curve after its first and second waves (in April and October respectively) due to instituting more stringent health and safety measures.⁵ There was a significant spike in cases however, at the end of December 2020 and early January 2021.⁶ The country appears to be on a fall from this third wave as cases steadily drop. In the heavily populated Dublin area, the case count remains significantly higher than elsewhere throughout the sparsely populated nation. Ireland has a fairly low population density elsewhere, which may contribute to the slower spread of the virus in more rural areas.⁷

Ireland is currently operating off of their Resilience and Recovery Plan, which has varying stages of restrictions and lockdowns based on incidences of the virus. They are currently at a Level 5 of 5 due to the recent surge in cases throughout the country.⁸



⁴ Geohive. (2020). Ireland's COVID19 Data Hub. Retrieved from <https://covid19ireland-geohive.hub.arcgis.com/>

⁵ Ibid.

⁶ Ibid.

⁷ Ibid.

⁸ Government of Ireland. (2020, September 15). Resilience and Recovery 2020-2021: Plan for Living with COVID-19. Retrieved from <https://www.gov.ie/en/campaigns/resilience-recovery-2020-2021-plan-for-living-with-covid-19/>

Figure 4.1.0: COVID-19 Spread in Ireland ^{9*}

4.3.2. Evolution of the Digital Contact Tracing App

In an effort to leverage available technologies to support contact tracing efforts, *COVID Tracker Ireland* was implemented mid-March 2020. It was developed by the Irish Health Service Executive (HSE) alongside open source development company Nearform.¹⁰

Earlier efforts favored a GPS-based app to help establish COVID-19 hotspots. Around the time Singapore saw relative success with its centralized Bluetooth exposure notification system. Given this and other influences, the decision was made to pursue a centralized system similar to that of Singapore.¹¹

Initially, the digital contact tracing system was developed using a centralized approach but due to the various trade-offs involved, the team decided to pursue a decentralized pandemic response app with proximity tracking, exposure notification, and symptom tracking capabilities. The team built and released a functioning app within a few weeks. Shortly after, the software was donated to the Linux Foundation Public Health,¹² titled COVID GREEN, giving other nations the opportunity to utilize the app for use in their own pandemic response. The app is now interoperable with several other countries that utilize the same base software, as well as several EU nations committed to interoperable apps.

At the time of writing, only one other digital contact tracing technology has been released in Ireland. Health Passport Ireland is meant to function as a health tracker and COVID-19 status indicator for use by businesses within the country.¹³

4.3.3. COVID-19 in Ireland

Table 4.1.0: *COVID Tracker Ireland* Details

	Ireland
Name of the App	COVID Tracker Ireland
Developer(s)	Nearform
Decentralized or Centralized Data Collection	Decentralized
Bluetooth, GPS, Both, Other	Bluetooth
Type of App: GAEN or Other	Google Apple Exposure Notification API
Mobile Requirements: e.g. iOS, Android, version	iOS 13.5 and up Android 6.0 and up
Alternate functionality?	❖ Provides users with Irish COVID statistics;

⁹ Health Protection Surveillance Centre. (2021). COVID-19 Cases in Ireland. Retrieved from <https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/casesinireland/>

* as of 7 February 2021

¹⁰ Nearform. (2020, September 07). Covid App Development. Retrieved from <https://www.nearform.com/work/covid-app-development>

¹¹ Personal communication, October 27, 2020.

¹² Linux Foundation Public Health. (2020, October 09). Retrieved from <https://www.lfph.io/>

¹³ Health Passport Ireland. (2020). Retrieved from <https://www.healthpassportireland.ie/>

	❖ optional daily health check in for users
Data Collected (Voluntarily) By App	❖ Phone number ❖ Demographic info (county/town, age group, gender) ❖ Symptoms experienced ❖ COVID-19 status
Data Collected (Voluntarily) By Third Parties	❖ Phone number ❖ Demographic info (county/town, age group, gender) ❖ Symptoms experienced ❖ COVID-19 status
Data Collection permission	Voluntary
Data Deletion period	14 days for: ❖ Diagnosis keys ❖ Exposure notification service identifiers 28 days for: ❖ daily symptom check-in

COVID Tracker Ireland is a decentralized, Bluetooth-based app developed by Nearform using the Google Apple Exposure Notification API (GAEN API). As such, the app is designed with privacy in mind. The choice to download the app is voluntary. Furthermore, any data collected via the app occurs only with consent. Potential voluntary data collection includes: phone number, demographic information (county/town, age group, gender), symptoms experienced, and COVID-19 status. Of this data, any exposure-related information is deleted after 14 days. Symptom check-in data is deleted after 28 days. The app is only functional on mobile phones that have iOS 13.5 and up or Android 6.0 and up. Finally, it is categorized as a pandemic response tool¹⁴ as it goes beyond proximity tracking and exposure notification to provide users with pandemic statistics and a daily symptom check-in function.¹⁵

4.3.3.1. The App Engagement Process

Phase One: Downloading and Setup

COVID Tracker Ireland can be downloaded through Google Play or the Apple store. Bluetooth must be enabled for the app to function properly. Beyond this, the user is given the option to enter personal data such as: age range, location, telephone number, and gender.

¹⁴ Personal communication, October 27, 2020

¹⁵ COVID Tracker. (2020) App. Retrieved from <https://covidtracker.gov.ie/privacy-and-data/>



Figure 4.2.0. Getting Started with COVID Tracker Ireland¹⁶

Phase Two: Usage

The app runs in the background and does not need to be opened for its proximity tracing function to work. The app additionally contains a voluntary personal symptom tracking service and information hub. The symptom tracking information can be voluntarily shared with the HSE for use in future research or app improvement.¹⁷ The symptom checker and information hub were included to encourage uptake and use.¹⁸

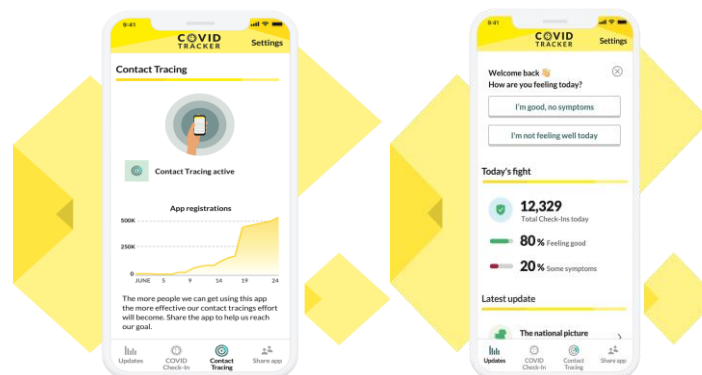


Figure 4.3.0. COVID Tracker Ireland's Contact Tracing Screen (left)¹⁹ and Symptom Check-In Screen (right)²⁰

Phase Three: Reporting

If a user were to test positive for COVID-19, the HSE's contact tracing team will phone the user and ask the user if they are willing to upload the anonymous IDs the phone has shared over the past 14 days. If the user consents to sharing this anonymous data, the contact tracing team will send an 'upload code' via text message which the user will enter into the app to enable the IDs to be uploaded to the HSE.

¹⁶ Health Service Executive. (2020.). COVID Tracker Ireland. Google Play. Retrieved from <https://play.google.com/store/apps/details?id=com.covidtracker.hse>

¹⁷ COVID Tracker. (2020). Privacy & How We Use Your Data From The COVID Tracker App. Retrieved from <https://covidtracker.gov.ie/privacy-and-data/>

¹⁸ Personal communication, October 27, 2020

¹⁹ Health Service Executive. (2020). COVID Tracker Ireland. Google Play. Retrieved from <https://play.google.com/store/apps/details?id=com.covidtracker.hse>

²⁰ Ibid.

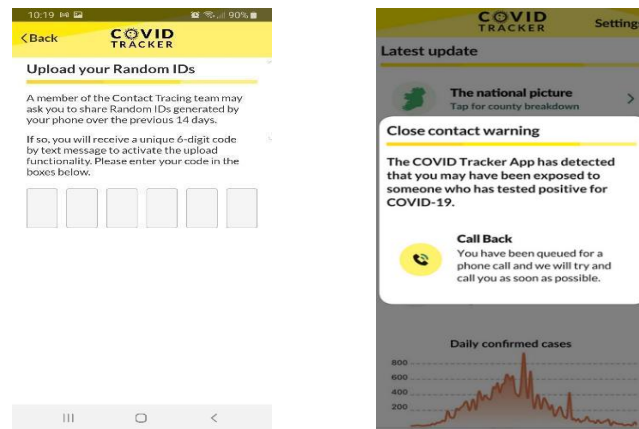


Figure 4.4.0. Unique Code Screen to Upload Random IDs (left)²¹ and Exposure Notification Warning (right)²²

Part Four: Reacting

Every two hours, the app checks to see if COVID-19 positive IDs match the IDs that the user has been exposed to. Exposure is determined as being within 2 meters for more than 15 minutes of another person.

If the IDs match with the user's exposure history, they will receive an exposure notification on the app. Those who have shared their phone number will be contacted by a member of the HSE's contact tracing team. If there is no connected phone number, the app will provide the information needed to continue the contact tracing process. In this way, the app has been integrated into the manual contact tracing process.²³

4.3.4. App-Uptake

4.3.4.1. Uptake Summary

Table 4.2.0: COVID Tracker Ireland Uptake Summary

	Ireland
Uptake (#downloads)	~2.10 million ²⁴
Uptake (active users)	~1.38 million users ²⁵
General Uptake (# of downloads general population)	~43%

²¹ Ibid.

²² Our Health Service. (2020, December 21). Why use the COVID Tracker app. Our Health Service. Retrieved from <https://covidtracker.gov.ie/why-use-covid-tracker/>

²³ COVID Tracker. (2020). How The COVID Tracker Free Mobile App From The HSE Works. Retrieved from <https://covidtracker.gov.ie/how-the-app-works/>

²⁴ Health Service Executive. (2020). COVID Tracker Ireland. Google Play. Retrieved from <https://play.google.com/store/apps/details?id=com.covidtracker.hse>

²⁵ Personal communication, October 27, 2020

Age Appropriate Uptake (# of downloads / people over age allowed to download)	~62% - 68% ^{26 27}
Digital Uptake (# of downloads / connected population)	~49% ²⁸
Digital Capability Uptake (# of downloads / app-compatible population)	~43%

4.3.4.2. Uptake Description

The general uptake of 43% is based on a population of roughly 4,950,000 million. In terms of age appropriate uptake, *COVID Tracker Ireland* has been developed for persons ages 16+. Therefore, calculations were made using the 2016 census numbers²⁹ to roughly determine that Ireland has a population of about 3.83 million individuals over the age of 16 which suggests that 62-68% of the eligible population has uploaded the app.³⁰ Digital uptake was determined based on 2019 data that suggests 88% of the Irish population used mobile phones to access the internet, thereby providing a rough estimate that 49% of the connected population has downloaded the app. In terms of digital capability uptake, no data could be found on how many residents had smartphones that had the necessary operating system to download the app. Yet, 99.81% of smartphone users have either Android or iOS,³¹ so a very rough estimate could suggest that approximately 43% of the eligible population in terms of digital capability has downloaded the app. Of course, there are major limitations to these percentage estimates, including but not limited to: not accounting for changes in population size between 2016 and 2020, not accounting for smartphones that cannot run the app, lack of accuracy when using downloads as a measure of uptake, users and those with smartphones, and generally the issues with examining app success via uptake measures (see Module 1, Section 1.5, for a more complete description of the issues surrounding measurements of uptake).

4.4. Uptake Factors

4.4.1. Summary of Uptake Factors

Table 4.3.0: Summary of Uptake Factors for Ireland

Factor	Micro, Meso, and/or Macro	Brief Description
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²⁶ Central Statistics Office. (2018, October 04). Census 2016 Summary Results - Part 1 - CSO - Central Statistics Office. Retrieved from <https://www.cso.ie/en/csolatestnews/presspages/2017/census2016summaryresults-part1/>

²⁷ Central Statistics Office. (2017, July 26). Census 2016 Profile 3 - An Age Profile of Ireland - CSO - Central Statistics Office. Retrieved from <https://www.cso.ie/en/csolatestnews/presspages/2017/census2016profile3-anageprofileofireland/>

²⁸ Central Statistics Office. (2019, October 18). Information Society Statistics Households 2019. Central Statistics Office. Retrieved from <https://www.cso.ie/en/releasesandpublications/ep/p-isshh/information societystatistics-households2019/>

²⁹ Central Statistics Office. (2018, October 04). Census 2016 Summary Results - Part 1 - CSO - Central Statistics Office. Retrieved from <https://www.cso.ie/en/csolatestnews/presspages/2017/census2016summaryresults-part1/>

³⁰ This does account for population growth and is intended as only a rough estimate.

³¹ StatCounter. (2020). Mobile Operating System Market Share Ireland. StatCounter GlobalStats. Retrieved from <https://gs.statcounter.com/os-market-share/mobile/ireland/2016>

Perceptions of Data Management & Collection	Micro	There is a disconnect between Irish beliefs about perceived risk and actual risk of the app – particularly surrounding privacy and how personal data should be, and is being, managed – which is likely acting as an uptake barrier.
Sense of Community	Meso	General Irish attitudes towards community and social responsibility, such as the strong desire to protect friends and family, may be seen as an incentive to download the app.
Communications & Misinformation	Meso-Macro	The HSE has maintained a clear and consistent messaging campaign which may assist in app-uptake, yet disparaging memes and inaccurate social media content may similarly dissuade people from downloading the app.
Accessibility & Inclusion	Macro	Despite many efforts to make the app more inclusive, digital literacy and other barriers to accessibility – including smartphone compatibility with the app – must still be researched and addressed.
Trust in Public/Private Institutions	Macro	The choice to use an open source, seemingly trustworthy developer for the app alongside high trust towards Ireland's Healthcare System likely creates a context in which people may be more trusting to download a contact tracing app

4.4.2. Factor Descriptions

4.4.2.1. Perceptions of Data Management & Collection

In the Irish context, public privacy concerns appear to focus on the *kinds* of data that is being collected and *whether* the government is going to abide by its claims regarding the use of said data. This public perception, misguided or not, on the invasiveness of data collection seems to be an uptake barrier that appears early on in the app's development. For instance, in late July, professors Douglas Leith & Stephen Farrell from Trinity College raised concerns as to perceived weaknesses within the app.³² Despite most of these concerns being deemed misplaced by the HSE,³³ this reflects some of the fears that have been publicized through news³⁴ and within some of the social media scrapes undertaken for this study. Some of this fear and misperception may be derived from misunderstandings of the app and relevant technology. For example, due to the specific Bluetooth function (Bluetooth Low Energy) that is used for *COVID Tracker Ireland*, location services must be turned on for the app as of Android 6.0 and up.³⁵ Some already concerned users may mistake this for an indication that the app is providing the government with personal location information.³⁶

Indeed, many of the privacy concerns seem to be entirely separated from the reality of the risks actually posed by the app.³⁷ In line with the path established by the GAEN API, *COVID Tracker Ireland* was designed with privacy in mind. All data entry is voluntary, anonymized, and regularly deleted. This apparent disconnect between perceived risks and actual risks is a concern, as despite the good work done

³² Irish Council for Civil Liberties. (2020, July 21). Serious privacy and data harvesting concerns about technology underlying HSE app. Retrieved from <https://www.iccl.ie/news/serious-privacy-and-data-harvesting-concerns-about-technology-underlying-hse-app/>

³³ Foxe, K., & Brennan, C. (2020, October 13). Dept of Health officials dismissed criticism of Covid tracker app as "incorrect." Irish Examiner. Retrieved from <https://www.irishexaminer.com/news/arid-40063898.html>

³⁴ Weckler, A. (2020, May 10). Ireland's contact-tracing app may struggle - and not just on privacy. Independent.ie Retrieved from <https://www.independent.ie/business/technology/irelands-contact-tracing-app-may-struggle-and-not-just-on-privacy-39192270.html>

³⁵ Android. (2020). Android 6.0 Changes: Android Developers. Retrieved from <https://developer.android.com/about/versions/marshmallow/android-6.0-changes>

³⁶ Personal communication, October 22, 2020

³⁷ Personal communication, October 15, 2020

by the Linux Foundation Public Health (LFPH) and other organizations on security audits and the like,³⁸ misconceptions remain. There is not a clear pathway for technical explanations to reach end users. This communication difficulty may in itself be a barrier towards further uptake as it may limit the degree to which concerns can be allayed.

4.4.2.2. Sense of Community

For many, using the app appears to be considered a duty, similar to “washing your hands, or wearing a mask.”³⁹ Pro-social actions appear to be highly valued within Irish society. This has been indicated in various places, including in app-focused behavioral studies undertaken by the HSE. In these studies, it was found that communitarian messaging tested better among respondents than did messaging reflecting a more individualistic mindset.⁴⁰ There is further support for this notion through the findings of O’Callaghan *et al.* (2020),⁴¹ where protection of family and friends ranked higher than protection of self as a reason to install the app. From the same work,⁴² one can see a general willingness to download the app (82% acceptance) prior to the release of the app itself. Exactly why is unclear, though following along the previously mentioned survey findings, and taken in tandem with social values descriptors such as those done by GLOBE,⁴³ this willingness may be partially due to a national leaning towards communitarian values. As these values were targeted in the app’s official public messaging,⁴⁴ Ireland may be an apt demonstration of the effective leveraging of social values to improve app-uptake.

4.4.2.3. Communications & Misinformation

The narratives surrounding D-CT technologies may directly influence user perceptions of the app. Sentiments of pride and responsibility have developed around *COVID Tracker Ireland*, as is evident through both news coverage and social media posts. This is especially visible on social media such as Twitter, where in mid October, retweets and original posts celebrating the app’s success (especially in comparison to the UK app), dominated much of the discussion.⁴⁵ These positive narratives can provide an incentive for user-uptake. These narratives can be partially attributed to the early⁴⁶ and consistent messaging on the part of the HSE. Some brief examples of this take the form of:

- Messages of responsibility via government and expert releases.
- An image of transparency built by making the source code public and donating the app to the Linux Foundation.

³⁸ Personal communication, October 21, 2020

³⁹ Personal communication, October 27, 2020; Personal communication, October 22, 2020

⁴⁰ Personal communication, October 27, 2020

⁴¹ O’Callaghan, M. E., Buckley, J., Fitzgerald, B., Johnson, K., Laffey, J., McNicholas, B., ... Glynn, L. (2020). A national survey of attitudes to COVID-19 digital contact tracing in the Republic of Ireland. *Irish Journal of Medical Science*. <https://doi.org/10.1007/s11845-020-02389-y>

⁴² Ibid.

⁴³ Global Leadership and Organizational Behaviour Effectiveness. (2020). Results - Ireland GLOBE Project. Retrieved from <https://www.globeproject.com/results/countries/IRL?menu=list>; For critiques detailing contradictory measurement systems see: Allik, J., & Realo, A. (2004). Individualism-Collectivism and Social Capital. *Journal of Cross-Cultural Psychology*, 35(1), 29–49. <https://doi.org/10.1177/0022022103260381>

⁴⁴ For examples of the language used in the pro-social messaging, see: Government of Ireland. (2020). Minister for Health welcomes launch of contact tracing apps in New York and New Jersey based on the Irish contact tracing app. Retrieved from <https://www.gov.ie/en/press-release/02080-minister-for-health-welcomes-launch-of-contact-tracing-apps-in-new-york-and-new-jersey-based-on-the-irish-contact-tracing-app/>

⁴⁵ Based on samples taken from Twitter during October, 2020.

⁴⁶ ITV News. (2020, June 24). ‘Vast majority’ of Irish adults willing to download Covid-19 contact tracing app. Retrieved from <https://www.itv.com/news/2020-06-24/vast-majority-of-irish-adults-willing-to-download-covid-19-contact-tracing-app>

- Stressing the volume of exposure chains being broken to increase perceptions of efficacy.



Figure 4.5.0. Drake meme relating to download contact tracing apps

Less positive is the disparaging content found in the form of memes and messages. Much of it recycles content about privacy or data security risks, regardless of accuracy of the claims. These anti-app sentiments are not always specifically aimed at the Irish app, but their rapid proliferation through the internet ensures they reach Irish users. Overall, what narratives exist (be they positive or negative) and what meanings are being created is not entirely clear. This can be in part attributed to the complexity of narrative formation, and in part to limited capacity to monitor all that is being said on the subject.⁴⁷

Overall there has been some degree of success with the HSE's approach. A positive narrative appears to be an incentive for use, while its opposite acts as a barrier. Importantly, because the process of narrative formation started early in Ireland's app development, concerns from both lay and expert communities were able to be raised and discussed early.⁴⁸

4.4.2.4. Accessibility & Inclusion

The digital divide, or the unequal distribution of digital communication technologies, has been identified several times as a source of concern regarding D-CT technologies.⁴⁹ Due to the limitations created by the ENS API, there is currently no way for those in Ireland with older phones to access the app. This is by no means a uniquely Irish problem. Including those without smartphones, upwards of 2 billion people globally cannot access ENS API apps due to technological barriers.⁵⁰ The accuracy of this number, as well as the proportion of these individuals that reside in Ireland remains to be seen. That fact that this number is unknown is a problem in itself, as it provides a major potential blind spot for the HSE. To combat issues arising from phone access, there has been some discussion of supplying compatible tech to those who could not otherwise access the app.⁵¹ Since the first few discussions of this issue occurring early in the pandemic, there has been little visible movement on the subject.

⁴⁷ Personal communication, October 27, 2020

⁴⁸ This is nowhere more apparent than in the interchange described here: Foxe, K., & Brennan, C. (2020, October 13). Dept of Health officials dismissed criticism of Covid tracker app as "incorrect. Irish Examiner. Retrieved from <https://www.irishexaminer.com/news/arid-40063898.html>

⁴⁹ Watts, G. (2020). COVID-19 and the digital divide in the UK. *The Lancet Digital Health*, 2(8), 395–396. [https://doi.org/10.1016/s2589-7500\(20\)30169-2](https://doi.org/10.1016/s2589-7500(20)30169-2)

⁵⁰ Bradshaw, T. (2020, April 20). 2bn phones cannot use Google and Apple contact-tracing tech. Financial Times. Retrieved from <https://www.ft.com/content/271c7739-af14-4e77-a2a1-0842cf61a90f>; Doffman, Z. (2020, April 20). Apple and Google Contact-Tracing Surprise: 2.5 Billion Users Will Miss Out. Forbes. Retrieved from <https://www.forbes.com/sites/zakdoffman/2020/04/20/apple-and-google-major-contact-tracing-surprise-25-billion-users-lose-out/?sh=4e912629190a>

⁵¹ Clarke, V. (2020, September 25). Covid-19: Half of Ireland moving in the wrong direction, expert warns. Irish Examiner. Retrieved from <https://www.irishexaminer.com/news/arid-40054628.html>

Beyond the barriers arising from the digital divide, some barriers may also stem from the app's user interface. Sensory disabilities, digital literacy, or other factors often out of the users' control are an additional barrier to uptake for many communities. In many ways, the team developing *COVID Tracker Ireland* has done an excellent job mitigating some of these possible barriers. Early on in the process, the team is reported to have consulted with the Irish Counsel for the Blind to ensure that it was accessible to a broad range of visually impaired users.⁵² The HSE also has provided an instructional video in sign language (ISL).⁵³ Both of the previously mentioned measures are important and valuable, but efforts to broaden accessibility must be continued. Beyond what has been done it is currently unclear what other accessibility efforts must still be made. Researching and understanding this will be important to improving uptake in many vulnerable communities.

Without understanding and mitigating the barriers that arise from accessibility, large portions of the population are excluded from the benefits of this app. To compound this issue, many of those excluded because of these barriers will be members of traditionally vulnerable groups such as the elderly, low income minorities, or those living with disability.

4.4.2.5. Trust in Public/Private Institutions

The institutions that are involved in the development process likely impacts user-uptake. Specifically, it is the trust that users have in these institutions (both public and private) that will influence the app's use. Some of those involved in the app's development⁵⁴ see the decision to work with a privacy centric developer (Nearform), with a history of creating open source solutions, as a trust building feature of the app. This appears to be accurate, as given the level of concern surrounding data privacy and protection, concerned individuals would need to feel secure that those creating the app would not act against their interests. A lack of controversy surrounding those building *COVID Tracker Ireland*, means that user-developer or user-government trust started in relatively neutral territory. Though purely speculative, had the solution been solely developed by a larger multinational corporation (Google, Amazon, Apple), much greater effort might have been needed to build the requisite levels of trust to bring in new users. The O'Callaghan *et al.* (2020)⁵⁵ study found that the most reported reason for concern in downloading the app was that it would lead to increased surveillance from private industry. Given this, it is no stretch of the imagination to see that having an apparently trustworthy developer would be mitigative of the public fears surrounding this subject.

On the public side of the equation, trust in public institutions also influences user-uptake.⁵⁶ Though of lesser concern to respondents of the O'Callaghan study, worries of increased government surveillance still proved fairly common. Fortunately, Ireland's residents have a high level of trust in their health care

⁵² Personal communication, November 3, 2020

⁵³ Our Health Service. (2020). COVID-19 Deaf and Hard of Hearing Communications Resources. Our Health Service. Retrieved from <https://www.hse.ie/eng/services/news/newsfeatures/covid19-updates/partner-resources/covid-19-irish-sign-language-isl-resources/covid-19-irish-sign-language-isl-resources.html>

⁵⁴ Personal communication, October 15, 2020

⁵⁵ O'Callaghan, M. E., Buckley, J., Fitzgerald, B., Johnson, K., Laffey, J., McNicholas, B., ... Glynn, L. (2020). A national survey of attitudes to COVID-19 digital contact tracing in the Republic of Ireland. *Irish Journal of Medical Science*. <https://doi.org/10.1007/s11845-020-02389-y>

⁵⁶ Discussion of this can be seen dating back to June: Digital Repository of Ireland. (2020, June 18). COVID-19 and Contact Tracing Apps - What Should Ireland Do. Digital Repository of Ireland. Retrieved from <https://www.dri.ie/covid-19-and-contact-tracing-apps-what-should-ireland-do-0>

system, specifically when compared against the rest of Europe.⁵⁷ It is likely that this has helped develop the foundations of trust necessary to reduce many such concerns.

4.5. Conclusion

COVID Tracker Ireland is a pandemic response app with exposure notification and proximity tracking capabilities. It runs off a decentralized model of data management, utilizing the Google-Apple ENS API. It uses Bluetooth to connect and share anonymous IDs with other users, and upon discovering contact with a COVID positive individual, will alert the phone's user to their potential exposure. Personal health information is routinely deleted. The app also contains a symptom tracker and statistics hub to encourage continued user engagement and uptake.

As of November, it has been downloaded more than 2 million times and has more than 1.38 million active users. The app itself has been widely lauded as a success, and has seen uptake not just within Ireland, but throughout the world as its base code is used throughout the UK and the United States. It has also been one of the first apps to boast select inter-app compatibility.

Ireland may be fortunate that its residents seem to support the concept of contact tracing apps, and appear to believe that social responsibility is an important value. The government has been apt to use this, as they developed communication and marketing to fit this narrative. Those who do not align with this set of beliefs may be missed, and along with those who cannot access the app (due to technological or physical limitations) do not have a clear means to do so. Beneficial to all current and potential users of the Irish app, has been the transparent and privacy-centric approach used by both the development company (Nearform) and the Irish government. By making the app open source, and donating it to the Linux Foundation, they have given the app a level of integrity and transparency that may have been an important incentive for those who are considering its use.

Overall, the HSE and Nearform have been proactive in their approach to removing barriers and creating incentives for app use. This does not mean there is not work to be done, especially in addressing questions of technological limitations or public discourse. Given the collaborative and engaged development process up until now, it can be expected that where solutions can be found, they will be pursued.

⁵⁷ Eurofound. (2016). European Quality of Life Survey 2016 - Data visualisation. Eurofound. Retrieved from <https://www.eurofound.europa.eu/data/european-quality-of-life-survey>