Findings from study:

Preconditions for Covid-19 Apps

Summary for a policy & implementation audience

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This project has been made possible by:

ZonMw

Tilburg University

We draw on anthropological research by Human Futures Studio

Understanding Society

The project team includes organization studies, law, behavioral economics, anthropology and design researchers

Tilburg project team:

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- Project Research Assistant: **Anouk van Anrooij**, Tilburg University
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- **Lien Stolle** and **Naana Kumah**, Tilburg University, provided additional research assistance

International collaborators:

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- **Dr. Paul Hartley**, Executive and Research Director of Human Futures Studio
- **Ms. Kim Hye Young**, Director of the PSSD Lab in Seoul and visiting professor at Younsei University's Underwood International College

About this presentation

- Targeted at policy, technical and action-oriented audiences
- To present key findings
- Sharing to academic audiences at a later date and via papers
- All papers will be open-access

-- Slight question text differences are due to translation back and forth to Dutch --

Agenda

1. Problem & project design
2. Main results
    1. Diagnosing issues
    2. Addressing issues
    3. Informing view of core features
3. Further considerations
4. Next steps
5. Q&A

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Problem [Abridged]

- Countries have launched Covid-19-related **mobile apps** for tracing and tracking infected people

- Many **received criticism** from experts and citizens (Demeyer et al. 2020; Singer, 2020), especially related to functionality, effectiveness, and human rights issues such as **privacy**; also in the news

- For apps to work, an estimated **60% install base is necessary** (Doffman, 2020). To achieve such adoption, residents' and experts' concerns will need to be taken seriously, in addition to usability and technical feasibility.

- Track and trace technology adoption in **South Korea**, Singapore and Taiwan has been relatively smooth in comparison to many countries in Europe or the Americas, though there are side-effects (Kim & Denyer, 2020).

Policy objective

Develop design and communication recommendations for building technology-backed informational and service products that can help to better prepare a population for new corona waves or future pandemics, by:

1. Diagnosing issues
2. Informing view of core features
3. Uncovering heterogeneity
4. Informing positioning

We are particularly interested in **understanding privacy concerns** and how much they really matter for peoples' intentions to install

How important is Coronamelder for fighting COVID-19?

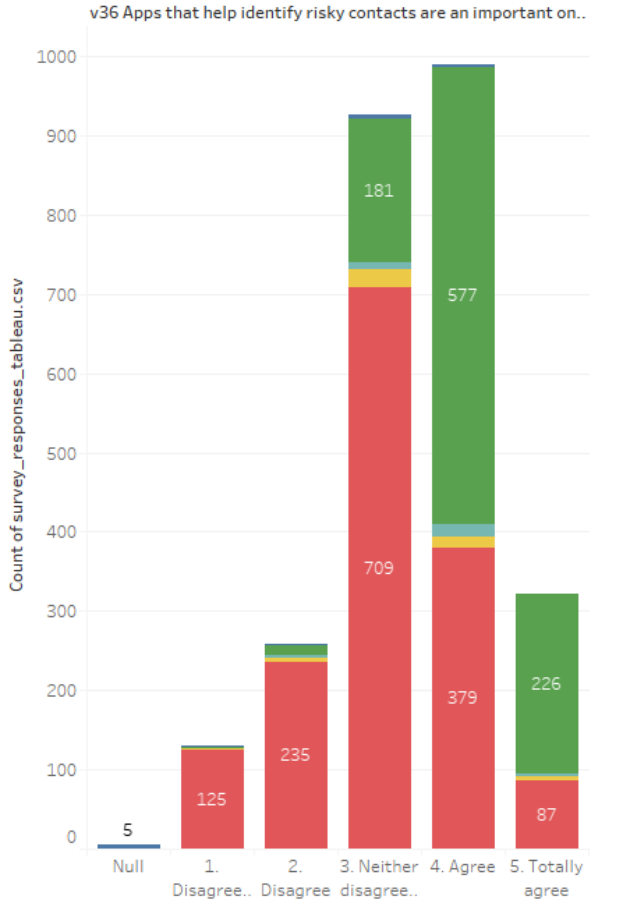
A related study reports:

Residents respond:

CoronaMelder will effectively contribute to coronavirus control	**53.4%**
CoronaMelder contributes to the protection of vulnerable people	48.8%

By Dr. Nynke van der Laan for Ministry of Health, Welfare and Sport

Our survey:



KEY for descriptive information:

v59 Have you installed or are you planning to install the CoronaMelder app?

- Null
- 1. I have installed or plan to install the app
- 2. I have installed the app but I plan to delete it
- 3. I have installed the app in the past but deleted it
- 4. I have not yet installed the app and do not intend to install it in the future

Roughly half of survey respondents believe that COVID apps are an important aspect of handling the pandemic

Experts in our study:

- Cost/benefit unclear
- Need more data about usefulness over time
- Effective and efficient tracking and tracing can help open workplaces

Two-part **project design** to understand more about track and trace app acceptance:

	Survey S	Delphi D
Purpose	• Understand Dutch residents' perception of **privacy** and topics related to adoption	• Understand key stakeholders' views on opportunities and risks for the Dutch Covid-19 app • Contextualize survey responses
Sample	• Representative sample of the **Dutch population** • 2631 responded to the questionnaire, (3,329 panel members / 79% response). • 1388 final sample used in models • LISS panel administered by CentERdata	• **Experts**: policymakers, technical, legal, privacy and healthcare - involved in or stakeholders of - app implementation • From the Netherlands, Canada and South Korea. • 25 respondents, not to all questions
Analysis	• Regressions • Descriptive statistics in Tableau	• eDelphi • Qualitative coding in Atlas.ti

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Detailed methodology will be explained in academic papers and available upon request

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Appendix: Further results and background

Testing various models of acceptance

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Diagnosing issues

BASELINE

Control variables

- Tech savviness
- Demographics
- Corona beliefs
- Data sharing
- App efficacy

Intentions to install
(& already installed)

Control variables

Tech-savviness. The **fluency of individuals in using mobile technologies** was operationalized using two indicators. The first tech-savviness measure was a dichotomous variable specifying whether a person knew the operating system of his or her smartphone. The second measure used for operationalizing the construct pertained to the number of items that a person installed on his or her smartphone, and was assessed using an ordinal scale with four answer categories ranging from “0” to “20+”.

Demographics. The demographic indicators used for specifying the baseline model included *age*, *marital status*, *number of children*, *number of household members*, *neighborhood population density*, *origin, gross income, and education*.

Corona beliefs. The skepticism of individuals about the virus was measured using a Likert scale with three items pertaining to **whether they perceived COVID 19 as a threat to their health** and that of their family members. The scale showed to have sufficient reliability with Cronbach's alpha of 0.864.

Data sharing. The two indicators of data sharing captured the extent to which **individuals willingly give their data away in return for free services** (general sharing) and **regularity with which people used location-based apps on their phone (location-based).** Both indicators were assessed with a single item with answer categories ranging from “completely disagree” to “completely agree”.

App efficacy. The app efficacy scale assessed the extent to which **individuals perceived contact tracing apps as positively contributing to the management of the COVID 19 pandemic.** Among other things, the scale captured the concerns people have about “false” app signals and the extent to which CoronaMelder could help them be more protected from virus exposure. The alpha value of the app efficacy scale was equal to 0.775, thus indicating sufficient reliability.

Variables with significant positive impact on intention to install

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Diagnosing issues

BASELINE

Control variables

- Tech savviness
- Demographics
- Corona beliefs
- Data sharing
- App efficacy

Intention to install (& already installed)

- Tech savviness (b = 0.295, p < 0.001)
- Age (b = 0.059, p = 0.022)
- Number of household members (b = 0.385, p = 0.014)
- Usage of applications that require location sharing (0.226, p = 0.002)
- Perceived efficacy of contact tracing apps (b = 2.029, p < 0.001)

Variables with no significant impact on intention to install (in black)

BASELINE

Control variables

- Tech savviness
- Demographics
- Corona beliefs
- Data sharing
- App efficacy

→ Intention to install (& already installed)

- Tech savviness (b = 0.295, p < 0.001)
- Age (b = 0.059, p = 0.022)
- Number of household members (b = 0.385, p = 0.014)
- Gender (b = -0.144, p = 0.325)
- Number of children (b = -0.318, p = 0.074)
- Marital status (b = 0.160, p = 0.358)
- Education
- Corona beliefs (b = 0.022, p = 0.833)

Corona beliefs do not seem to be a problem, but they are not driving adoption, either

- Usage of applications that require location sharing (0.226, p = 0.002)
- Perceived efficacy of contact tracing apps (b = 2.029, p < 0.001)

Efficacy could be a lever

Testing models of acceptance focused on the roles of privacy and culture

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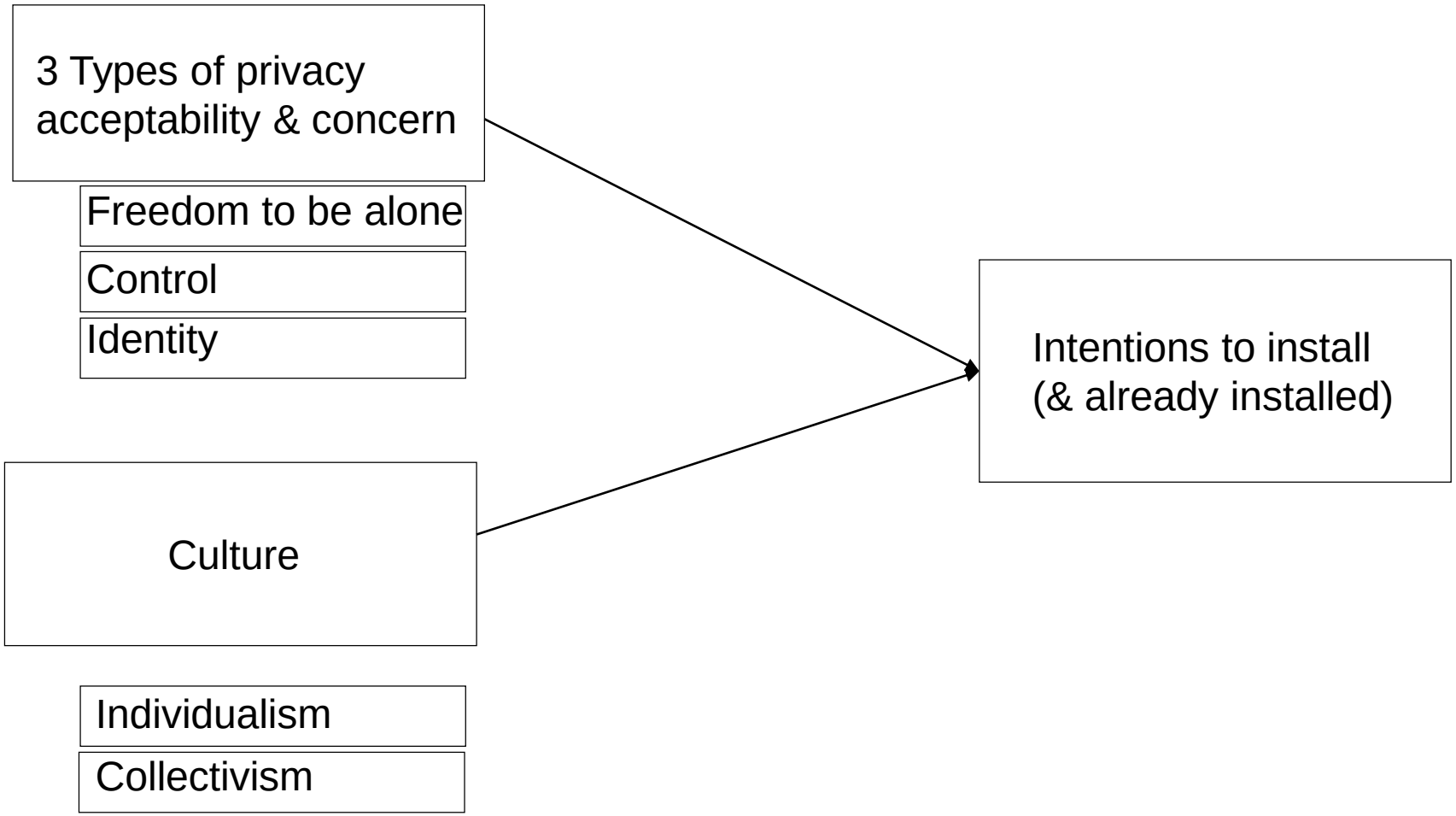
Diagnosing issues

PRIVACY & CULTURE

BASELINE

Control variables

- Tech savviness
- Demographics
- Corona beliefs
- Data sharing
- App efficacy



Independent variables

Privacy concerns

Freedom to be alone.
The first measure of privacy concerns assessed the extent to which individuals find it acceptable for the contact tracing apps to **determine their physical location** and inform app users about the presence of infected others around them. Similar to the scales used for gauging the standings of individuals on other types of privacy concerns, freedom to be alone was measured using a five-point Likert scale with four items. The value of Cronbach's alpha was equal to 0.897, indicating sufficient construct reliability.

Identity.
The part of privacy concerns related to the identity of individuals comprised items referring to the **threats of anonymity revelation** posed by the contact tracing app. The identity scale had good reliability with Cronbach's alpha of 0.889.

Control.
A set of items measuring control-related privacy concerns assessed the extent to which individuals find it acceptable **to share information** about their Corona-related symptoms and positive test results with governmental authorities and other app users. Although lower than that of two other privacy concern measures, the reliability of the control scale was still close to sufficient, as evidenced by Cronbach's alpha of 0.689.

Culture

Collectivism and Individualism.
The two dimensions of culture were measured using the Culture Orientation Scale of Triandis and Gelfland (1998). The "vertical collectivism" and "horizontal individualism" were each assessed with four Likert-scale items, and had sufficient reliability, as indicated by Cronbach's alpha values of 0.728 and 0.768 respectively.

Privacy concerns are very significant predictors of intentions to install

PRIVACY & CULTURE

BASELINE

Control variables
- Tech savviness
- Demographics
- Corona beliefs
- Data sharing
- App efficacy

3 Types of privacy acceptability & concern
- Freedom to be alone (b = 0.646, p < 0.001)
- Control (b = 0.557, p < 0.001)
- Identity (b = -0.924, p < 0.001)

Culture
- Individualism (b = -0.197, p = 0.003)
- Collectivism (b = -0.038, p = 0.503)

Intentions to install (& already installed)

People's **privacy concerns matter more** than tech savviness, demographics or corona beliefs – they are **the most important predictor of disinterest in the app**.

Individuals with higher **individuality scores** had a lower probability of intending to install Coronamelder, but the relationship is more nuanced (and we will not elaborate now)

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Which variables can be influenced, and how?

Addressing issues

IDENTIFIED ISSUES / POINTS TO CONSIDER	POSSIBLE ACTIONS
1. **App efficacy was significant;** could be a lever	
2. **Corona beliefs** are not statistically important for intentions to install; but people do believe in COVID	
3. Many factors matter; but **privacy concerns** matter a lot	
4. **Individualistic cultural** views matter	
5. **Usage of applications that require data sharing** – a point of further discussion	

Experts: People believe track/trace is necessary; focus on solving the problem

D Addressing issues

Emerging Consensus from Korean respondents

- People are more **concerned about the pandemic** than they are about privacy
- Compliance in South Korea is not about rule following or lack of privacy concerns (as some media have reported)
- Privacy is a necessary and temporary tradeoff and the government has made provisions

Exemplary quotes

"Compliance will rise if an app can be pretty clearly tied to **safety benefits**. Ideally, this would be coupled with proper democratic oversight and transparency, but in reality that is probably not necessary if the health and safety benefits are clear enough."

Possible actions to point 1

Addressing issues

IDENTIFIED ISSUES / POINTS TO CONSIDER	POSSIBLE ACTIONS
1. **App efficacy was significant;** could be a lever	• Continue to promote its ability to help • Invest in studies to prove effectiveness
2. **Corona beliefs** are not statistically important for intentions to install; but people do believe in COVID	
3. Many factors matter; but **privacy concerns** matter a lot	
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5. **Usage of applications that require data sharing** – a point of further discussion	

Though the influence of Corona beliefs was not significant for app use, people generally do see COVID-19 as a risk

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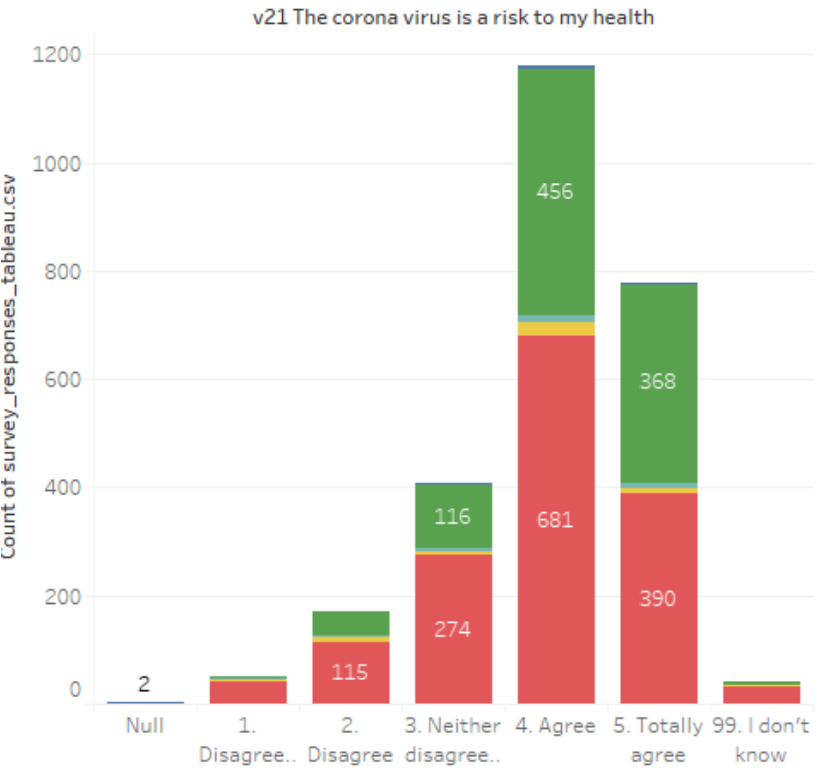
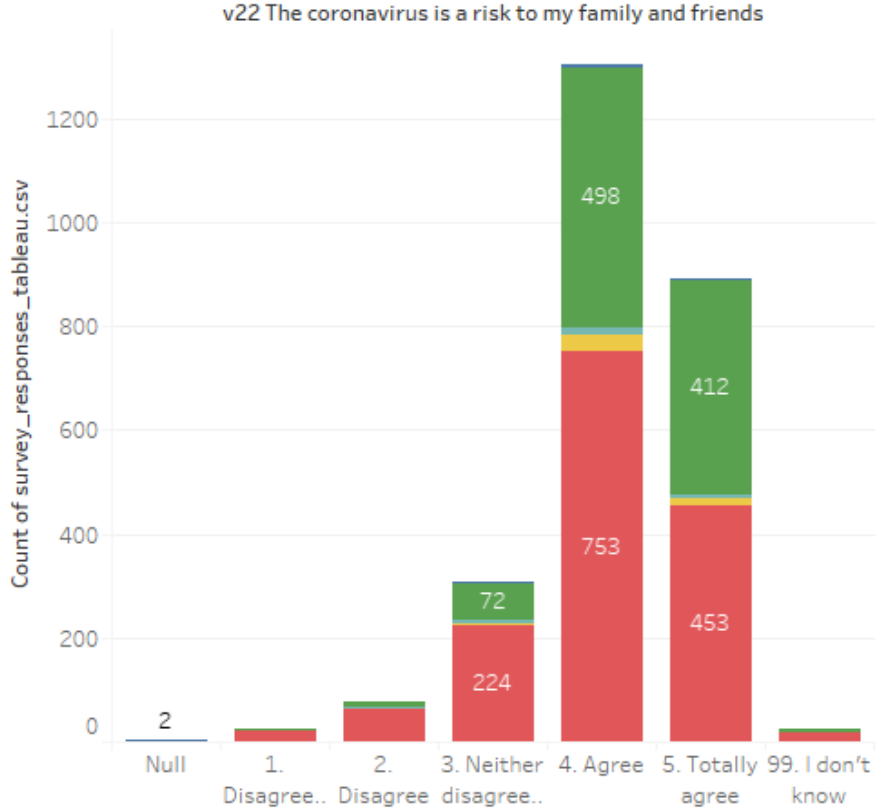
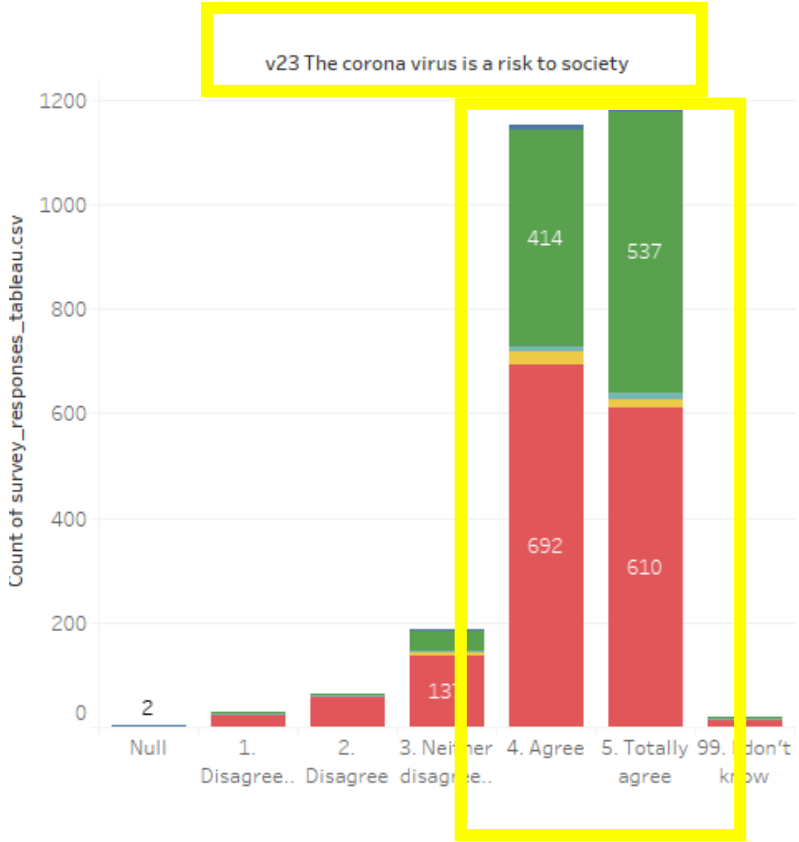
Addressing issues

Corona beliefs (Cronbach's alpha = 0.864)
v21: I see the Coronavirus as a risk to my personal health
v22: I see the Coronavirus as a risk to my family and friends
v23: I see the Coronavirus as a risk to society

People identify it as a risk to society; possibly something that happens to 'other people'







Possible actions to point 2

Addressing issues

IDENTIFIED ISSUES / POINTS TO CONSIDER	POSSIBLE ACTIONS
1. **App efficacy was significant;** could be a lever	• Continue to promote its ability to help • Invest in studies to prove effectiveness
2. Corona beliefs are not statistically important for intentions to install; but people do believe in COVID	• Opportunity to more firmly link people's understanding of the severity of the disease for society with app efficacy in positioning/marketing the app
3. Many factors matter; but **privacy concerns** matter a lot	
4. **Individualistic cultural** views matter	
5. **Usage of applications that require data sharing** – a point of further discussion	

While reflecting on **privacy concerns**, experts note the role of media:

D Addressing issues

"the media is strongly focused on **conveying unambiguous negative messages.** There is little or no room for a nuanced story. This leads to an oversimplified response in society"

"Privacy concerns were only discussed **after foreign media picked up on privacy concerns** (…) people are used to giving out their information."

People may not actually care much about privacy, but they become afraid by the media

Prior research indicates that people are often willing to trade privacy for benefits

Experts' views on managing privacy concerns

D Addressing issues

Emerging principles

Clearly articulate limited-use

Transparency

Time-bound

Trust-first

Exemplary quotes

"People want to know exactly **how long their information is being used**, for how long, why, and when the information will be deleted (and how) (…) the government made it clear that all data would be **deleted after two weeks."**

"Not every citizen trusts the government to do this, to be sure, but so far no definitive evidence has emerged to prove otherwise."

Possible actions to point 3

Addressing issues

IDENTIFIED ISSUES / POINTS TO CONSIDER	POSSIBLE ACTIONS
1. **App efficacy was significant;** could be a lever	• Continue to promote its ability to help • Invest in studies to prove effectiveness
2. Corona beliefs are not statistically important for intentions to install; but people do believe in COVID	• Opportunity to more firmly link people's understanding of the severity of the disease for society with app efficacy in positioning/marketing the app
3. Many factors matter; but **privacy concerns** matter a lot	• Articulate more nuance to the media • Consider time-bounded management, and clearly articulating it; transparency • Identify ways to trade-off concerns for benefits
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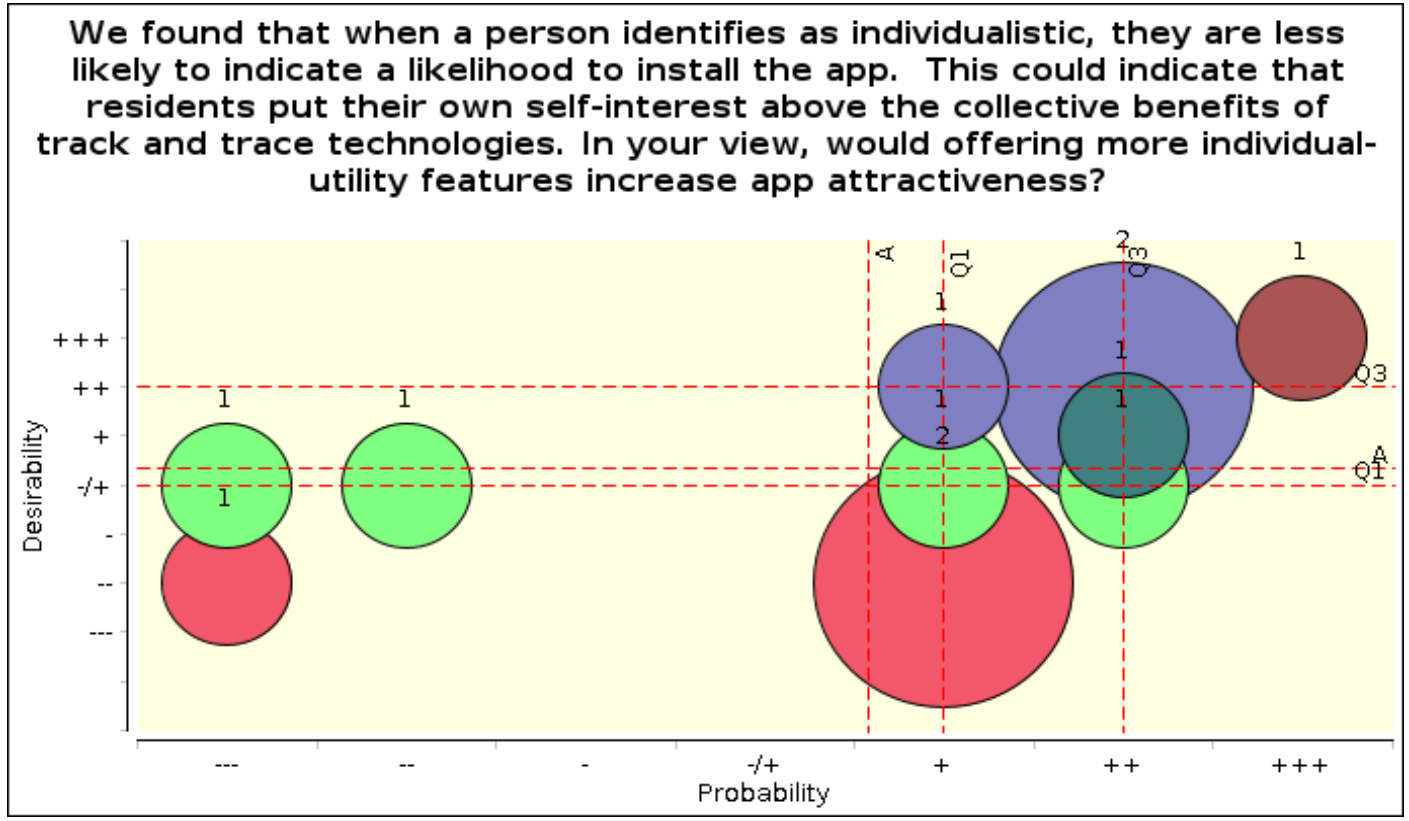
Adding to the benefit side of the tradeoff: Possible additional features

- From previous research and suggested in this study, we know that **people are unwilling to give up privacy without gaining something**.

- Previous research has indicated that in the **healthcare domain**, data privacy is relatively less important to people, whereas in other domains both privacy and the favorability of the outcome from using the technology (for the user) are equally important (Kodapanakkal, Brandt, Kogler & van Beest, 2020).

- Individualism could also drive self-interest in benefits

Experts broadly agreed about adding individual features



For example, a feature that displays pertinent COVID-related news on a map, was viewed favorably:

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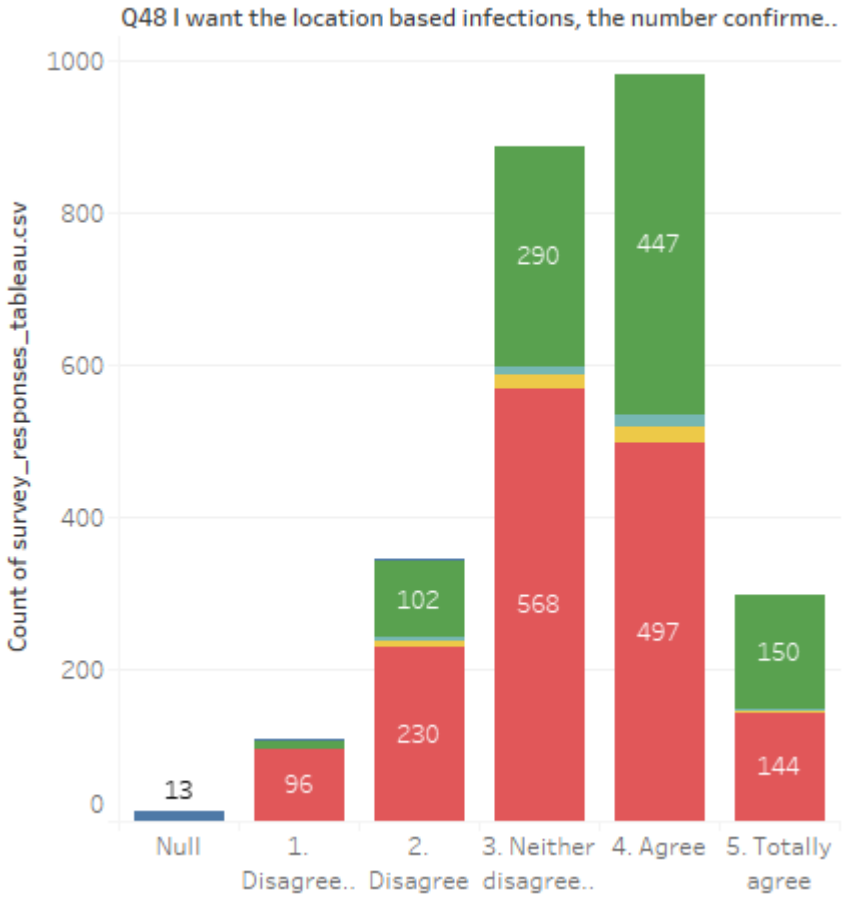
Addressing issues

…even by people who do not plan to install the app



People seem to agree that a core individual benefit of the app is useful

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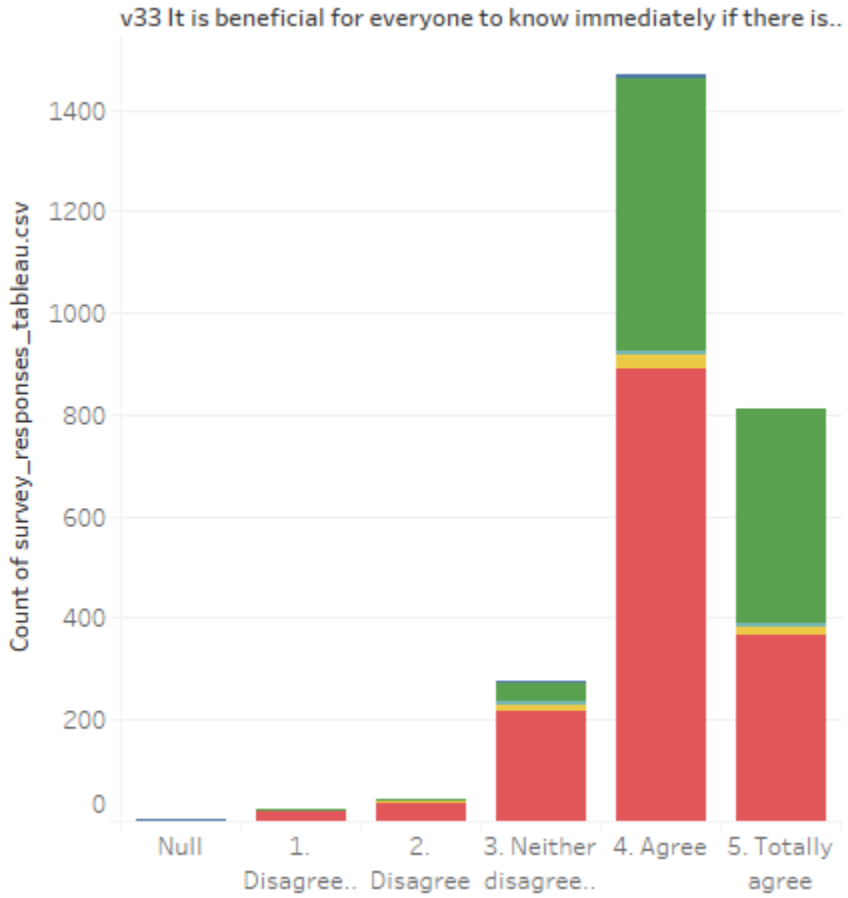
Addressing issues

v33 It is beneficial for everyone to know immediately if there is a potential risk of infection, so that action can be taken (go into home quarantine and / or get tested)



Opportunity to articulate & market

A feature could involve automatic updates to change:

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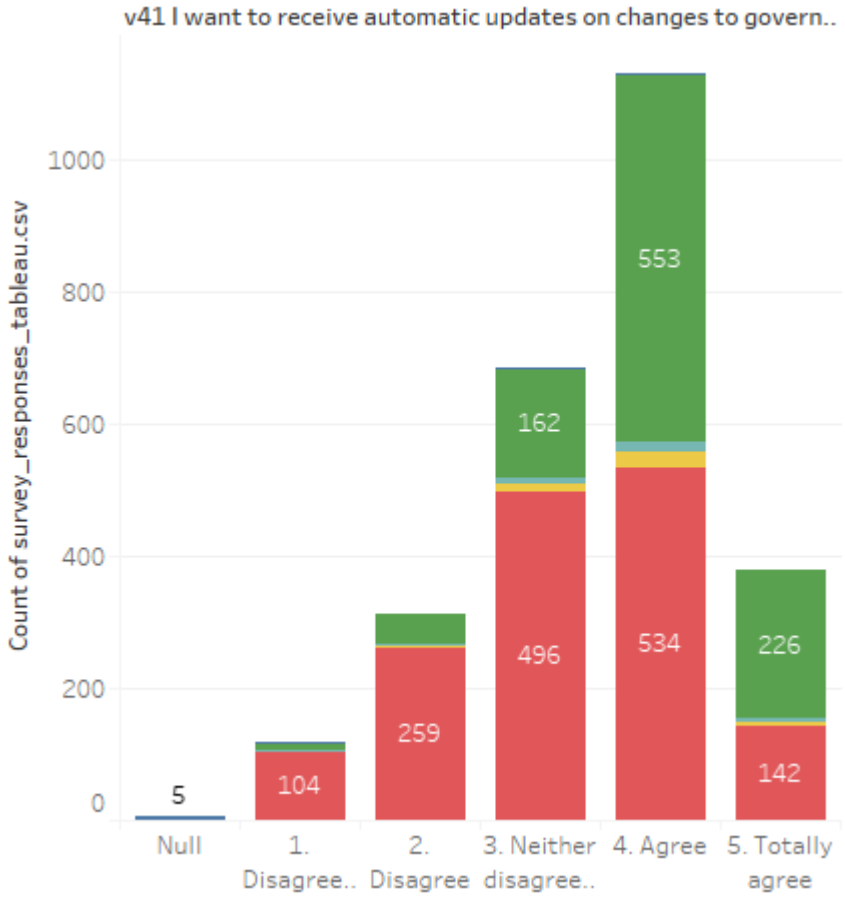
Addressing issues

v41 I want to receive automatic updates on changes to government advisories so that I stay informed (eg guidelines for the use of masks, regional lockdowns)



Messaging could also target individual benefits

Emerging principles

Clearly articulate benefits

Convenience sells

Part of collective effort

Exemplary quotes

“In Canada I've seen government messaging about apps that **benefit and convenience the individual.**
I've not seen much about apps and benefit to the community, even with the COVID-19 track and trace apps. I'd expect people to do use app for **their own benefit**, but not necessarily for the community.”

“Messaging about **helping others or being part of a collective effort are an important part of messaging**. Interestingly, there has also been some messaging directed at individual self interest (talking about using apps "to protect yourself" or to be safe.”

Messaging can be done by medical professionals

D Addressing issues

Emerging principles

Medical experts are in charge

Clear messages

Exemplary quotes

“Mixed messaging in certain countries led to anxiety and distrust in government. The one thing that South Korea did was **leave the messaging to the medical experts** from Day 1, and not the politicians. While privacy was never a major concern, I think this played a major role in alleviating people's anxieties, if any, when it comes to track and trace.”

Moderate to positive responses about possible benefits and messages

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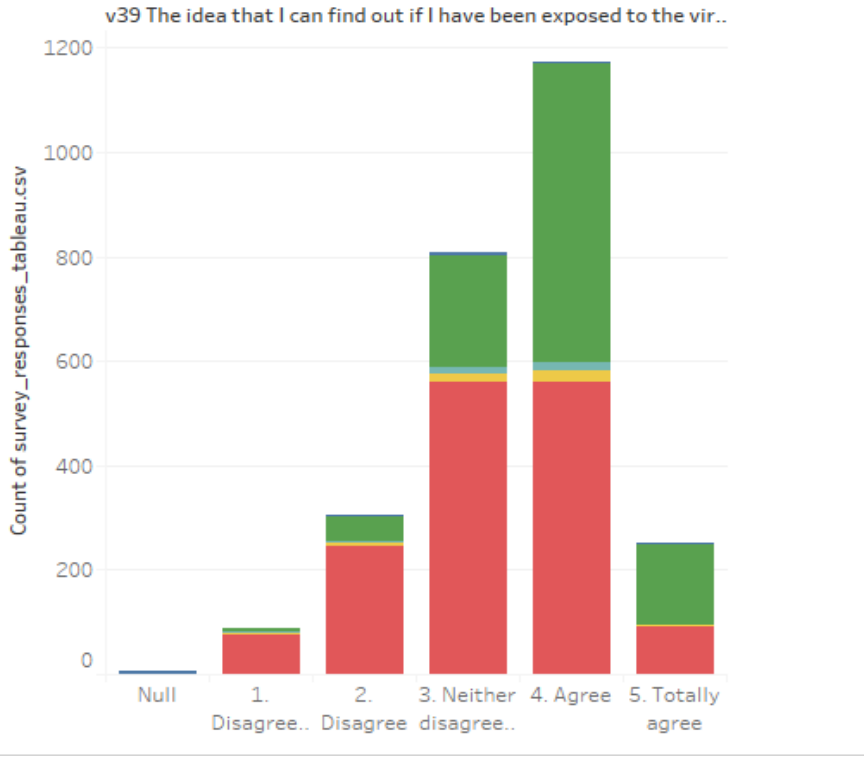
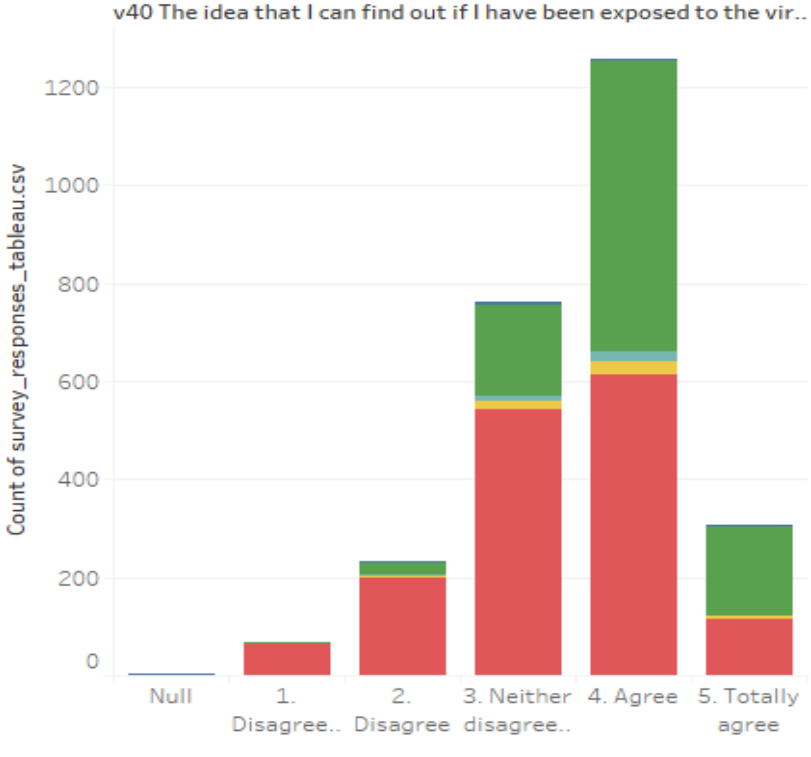
Addressing issues

v39 The idea that I can find out if I have been exposed to the virus gives me more control over my health



v40 The idea that I can find out if I have been exposed to the virus gives me more control over the health of my loved ones



‘Playing your part’ a potential message

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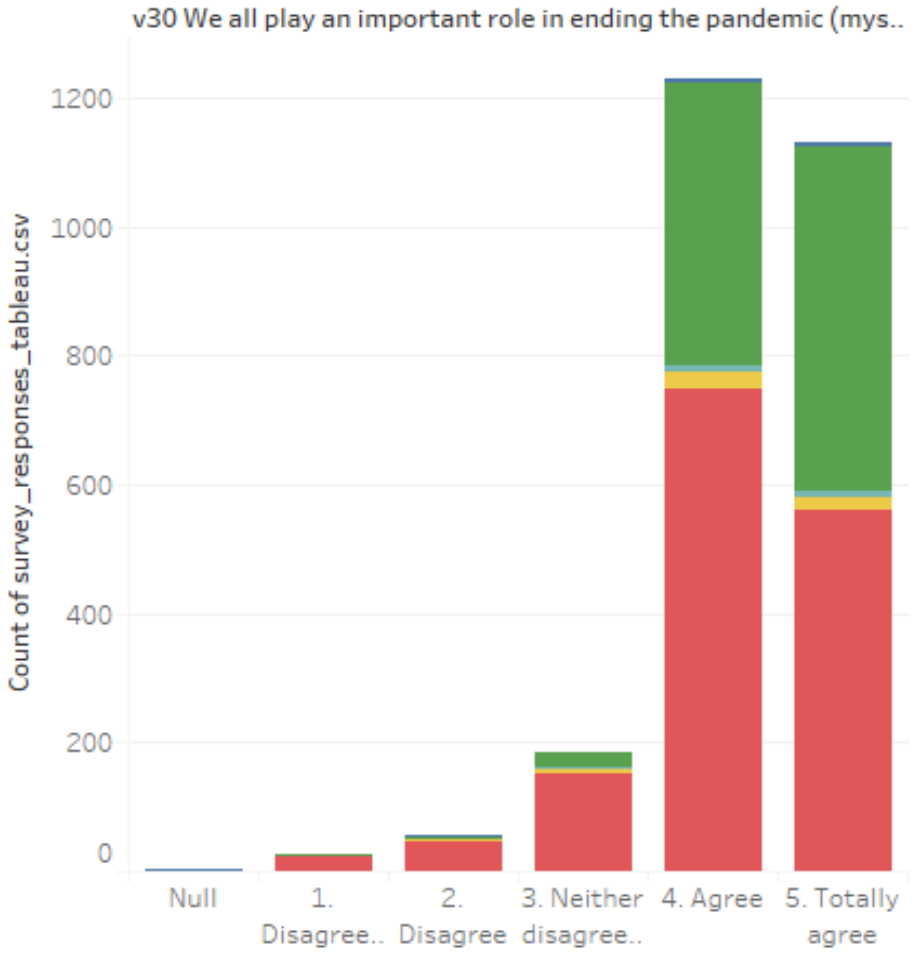
Addressing issues

v30 We all play an important role in ending the pandemic (myself, us as citizens, the GGD, the government, scientists working on a vaccine, etc.)



Experts were moderately positive that messaging could help overcome privacy concerns

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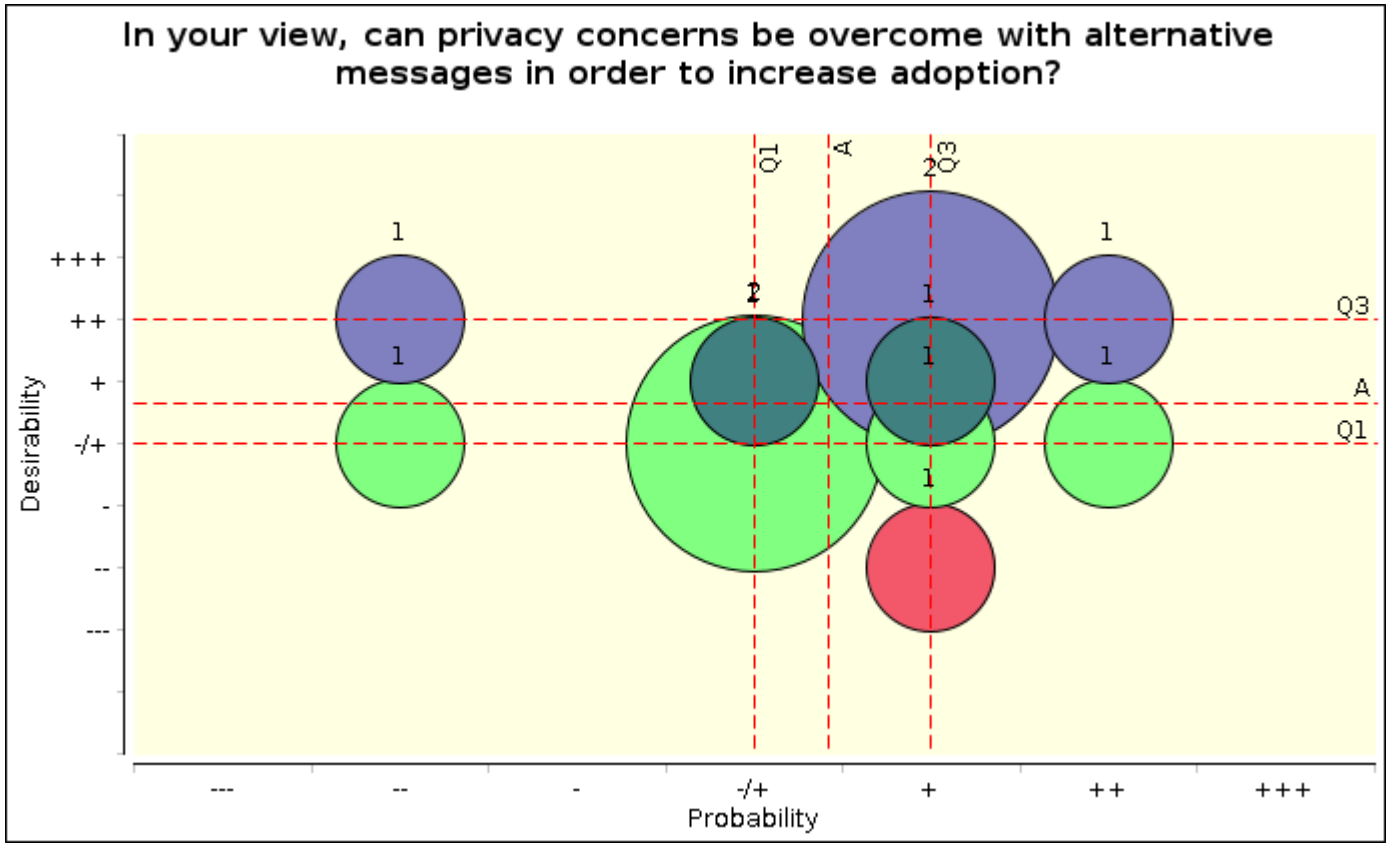
Addressing issues



However, focusing on individual benefits and messaging may be missing key points

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Addressing issues

“making people understand the balance between individual rights and people's right to live. Is one worth sacrificing for the other?”

“The big reasons the West has failed so badly on corona are not tech-related. They are instead: slow recognition, bordering on purposeful unwillingness to admit that this was a real crisis; poor government institutions for response; widespread science skepticism (antivaxxers, hoaxers, FoxNews, etc); resentful refusal to mask and follow restrictions. **An app is not going to undo the widespread selfishness that let it spread”**

Raising questions for [Broader discussion and societal reckoning] about extreme individualist attitudes

Possible actions to point 4 / part point 3

Addressing issues

IDENTIFIED ISSUES / POINTS TO CONSIDER	POSSIBLE ACTIONS
1. **App efficacy was significant;** could be a lever	• Continue to promote its ability to help • Invest in studies to prove effectiveness
2. Corona beliefs are not statistically important for intentions to install; but people do believe in COVID	• Opportunity to more firmly link people's understanding of the severity of the disease for society with app efficacy in positioning/marketing the app
3. Many factors matter; but **privacy concerns** matter a lot	• Articulate more nuance to the media • Consider time-bounded management, and clearly articulating it: transparency • Identify ways to trade off concerns for benefits
4. **Individualistic cultural** views matter	• Possible trade-off features could add to benefits • Messaging could involve clarifying individual benefits, such as convenience • [Broader discussion and societal reckoning]
5. **Usage of applications that require data sharing** – a point of further discussion	

Usage of applications that require data sharing

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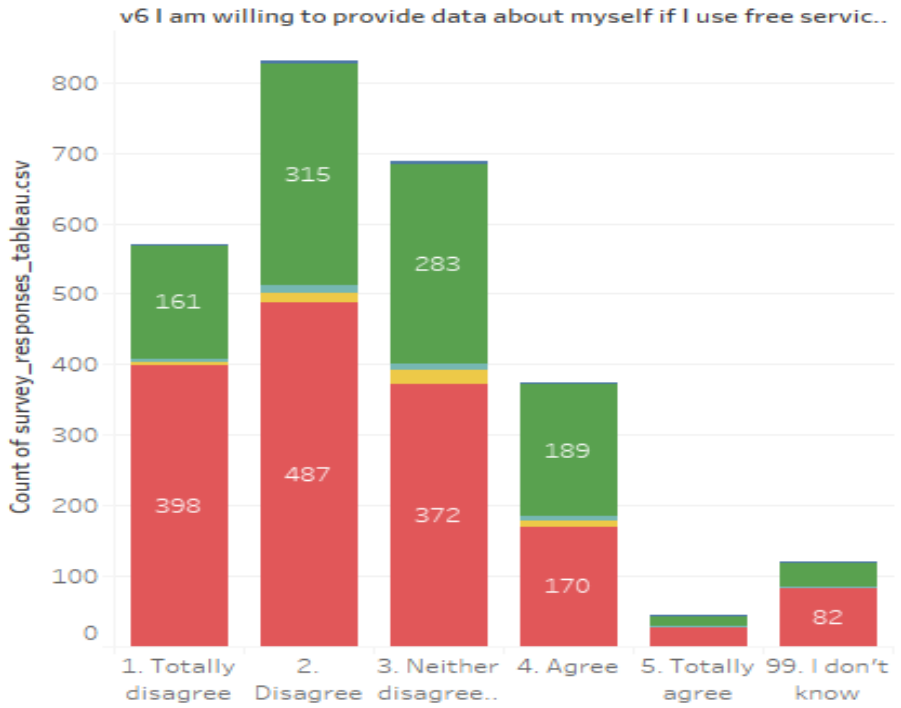
Addressing issues

v6 I am willing to provide data about myself if I use free services (eg. Facebook, Instagram, etc.)



People may be uneducated about data sharing apps in general, despite being 'tech savvy'

Usage of applications that require data sharing

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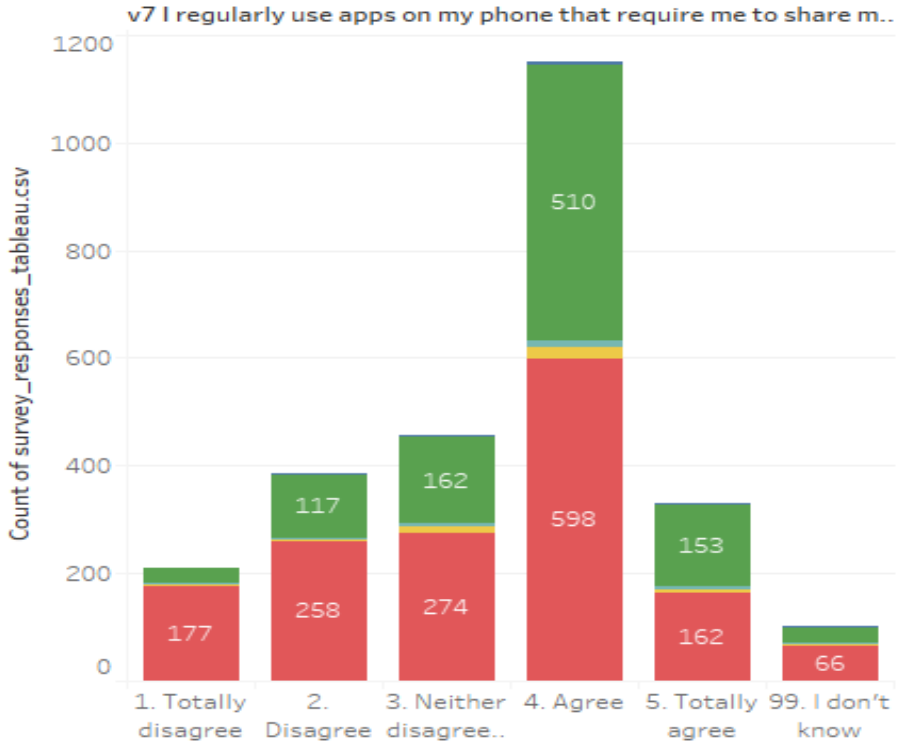
Addressing issues

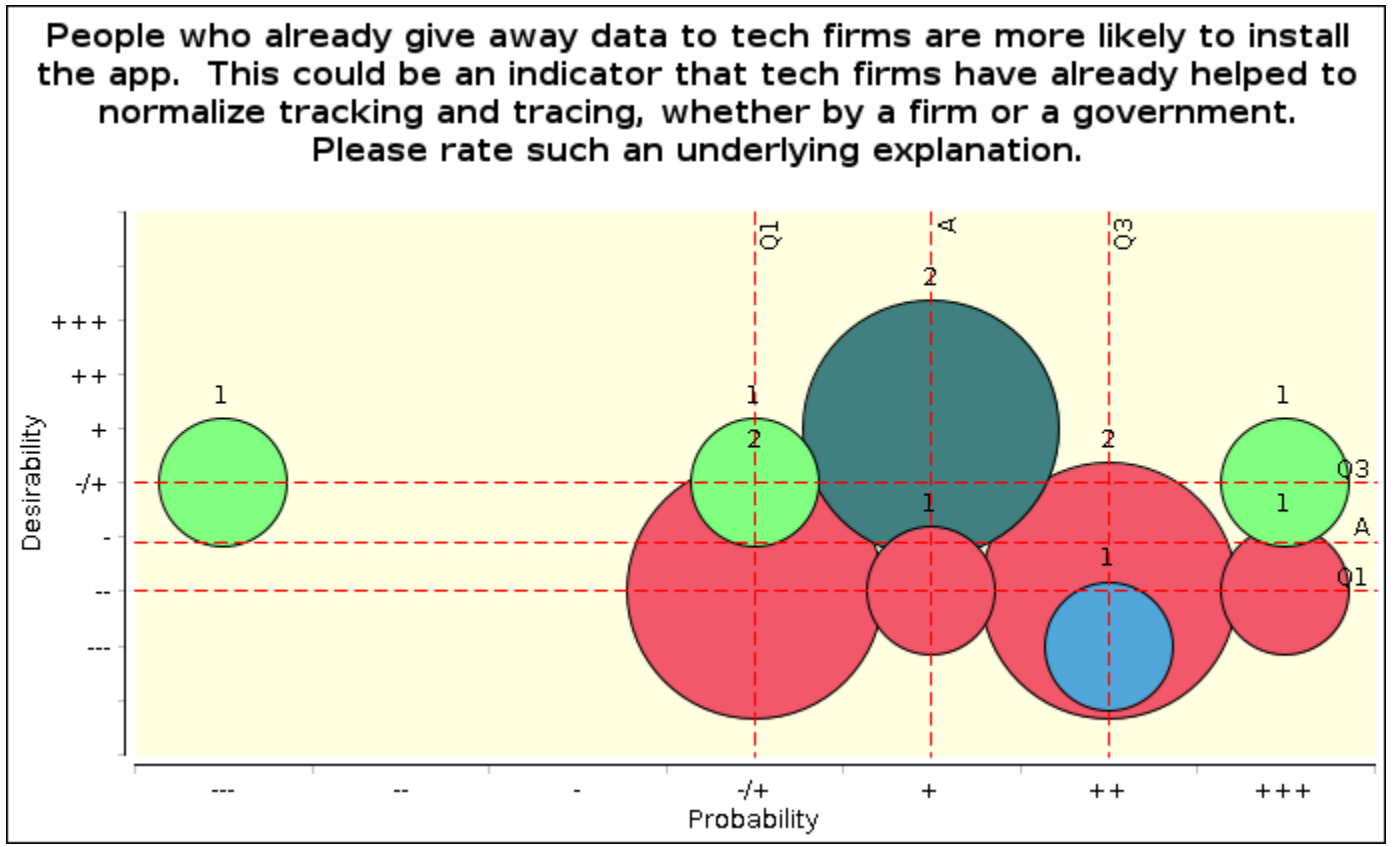
v7 I regularly use apps on my phone that require me to share my location (Maps, location tag photos, etc.)



People seem ok to share their location, but not data

Usage of applications that require data sharing

Data sharing with tech firms is positively related to intentions to install the app



Experts agree this could relate to a normalizing effect

This is a point to consider:

- *Tech firms are possibly shifting norms about privacy*
- *Adoption of 'surveillance tech' could increase with tech use*
- *Could 'ignorant use' of apps be a problem in the future? For example, when the situation somehow shifts, but people do not fully grasp or agree with actions for societal benefit*

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Possible actions to point 5

Addressing issues

IDENTIFIED ISSUES / POINTS TO CONSIDER	POSSIBLE ACTIONS
1. **App efficacy was significant;** could be a lever	• Continue to promote its ability to help • Invest in studies to prove effectiveness • Consider using more medical experts as spokespeople (further explained later)
2. Corona beliefs are not statistically important for intentions to install; but people do believe in COVID	• Opportunity to more firmly link people's understanding of the severity of the disease for society with app efficacy in positioning/marketing the app
3. Many factors matter; but **privacy concerns** matter a lot	• Articulate more nuance to the media • Consider time-bounded management, and clearly articulating it; transparency • Identify ways to trade off concerns for benefits
4. **Individualistic cultural** views matter	• Possible trade-off features could add to benefits • Messaging could involve clarifying individual benefits, such as convenience • [Broader discussion and societal reckoning]
5. **Usage of applications that require data sharing** – a point of further discussion	• Higher level discussions and strategizing about the relationship between people, technology and society • Further research

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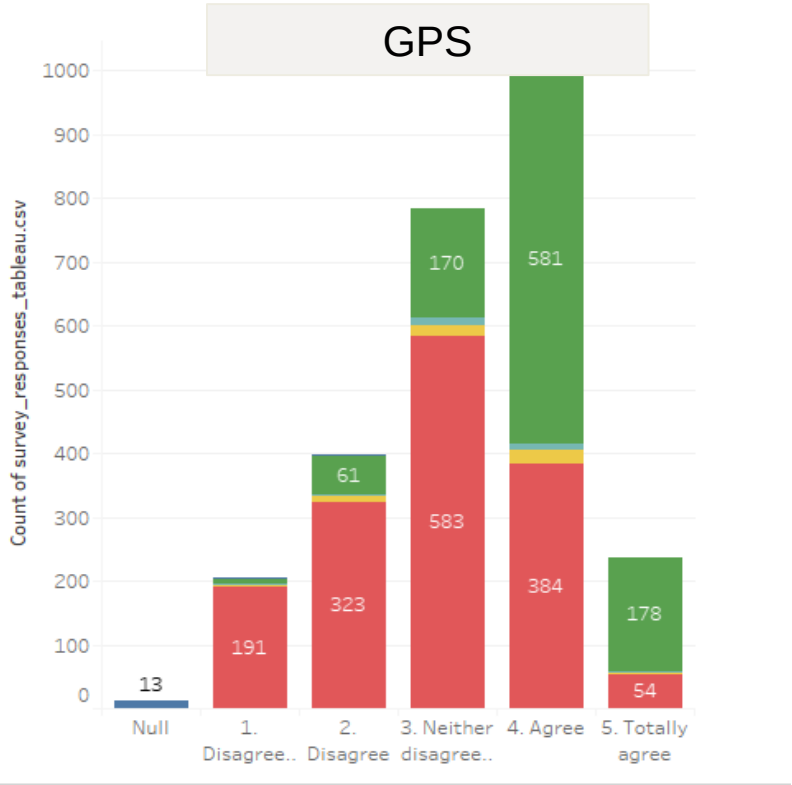
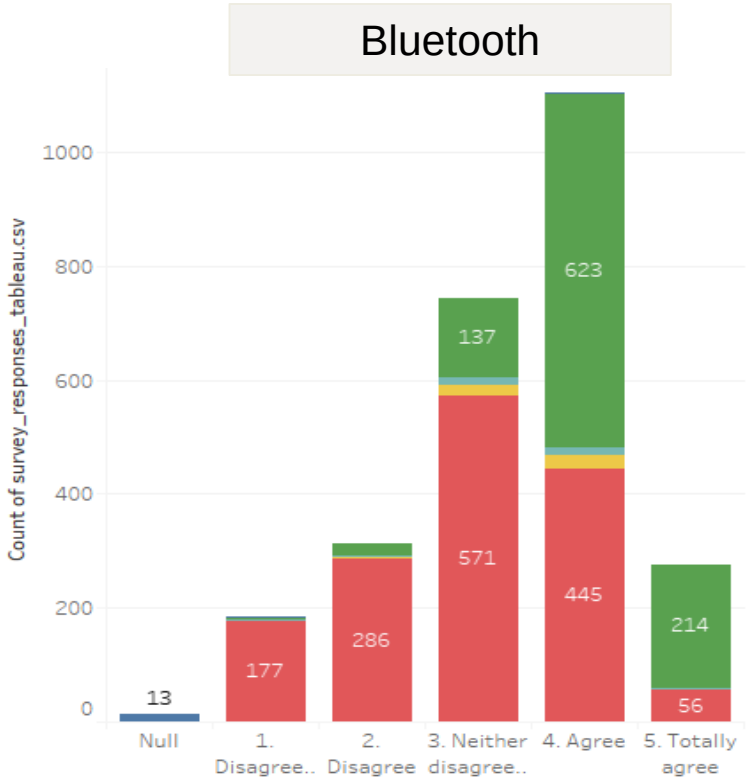
Moderate descriptive differences in views on GPS and Bluetooth

Informing features

I find it acceptable for a contact-tracing app to determine my distance to others based on my **location** (GPS), which would enable me to gain notifications about those who have been near me who become infected.



I find it acceptable for a contact-tracing app to determine my distance to others based on the **proximity** of my phone relative to other phones (Bluetooth), which enables me to gain the benefit of possible risk notification anonymously.



Much ado about Bluetooth; possible lack of real understanding

Moderate descriptive differences between views on features involving sharing symptoms and infection status

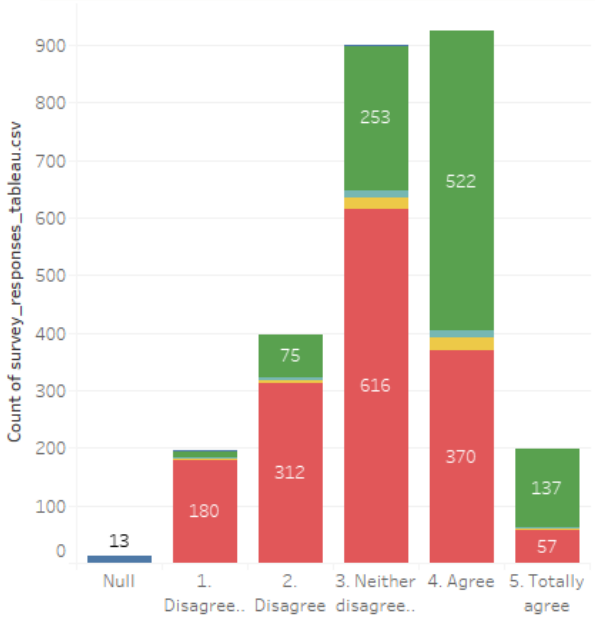
S

Informing features

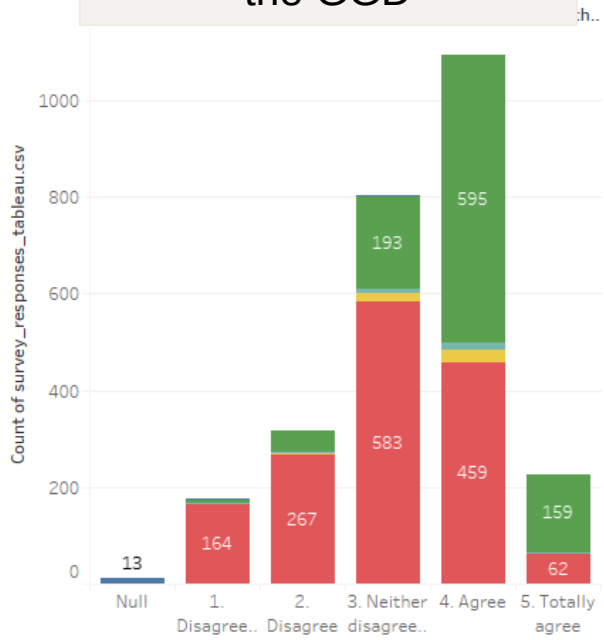
v49: I find it acceptable to share my symptoms OR infection status with the government from the app so they can make informed decisions and more accurate predictions of my own risk

v50: I find it acceptable to share my symptoms OR infection status with the GGD from the app so they can make informed decisions and more accurate predictions of my own risk.

Share symptoms/status with government



Share symptoms with the GGD



People slightly prefer sharing to the GGD than the government

Moderate descriptive differences between views on features involving sharing symptoms and infection status

S

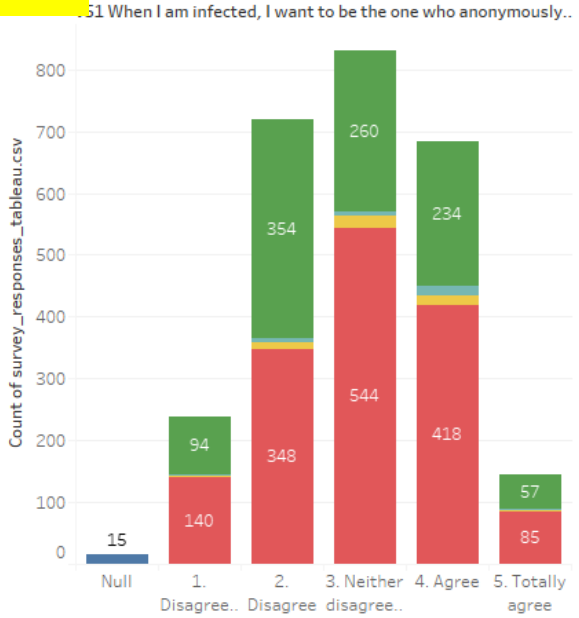
Informing features

v51: If I am infected, I want to be the one to anonymously trigger the alert to the phones that have been near me (not the GGD or the government); and have the choice not to.

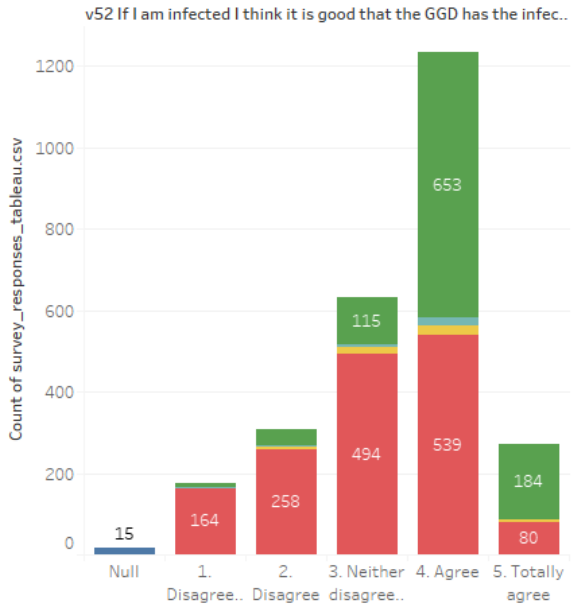
v52: If I am infected, it's acceptable for the GGD to verify the infection on my app and send an anonymous signal from my phone to others I was in contact with.

V51

I self-trigger the alert



GGD verifies, triggers alert



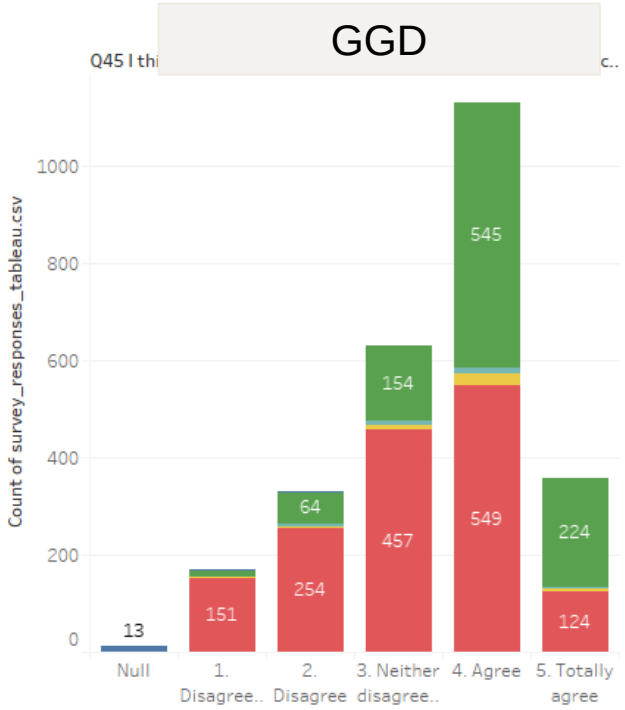
People seem to be less interested in triggering the alert, vs. the GGD

Almost zero descriptive differences in views on the acceptability of **intervention** by the GGD or by the government; interest or indifference to intervention

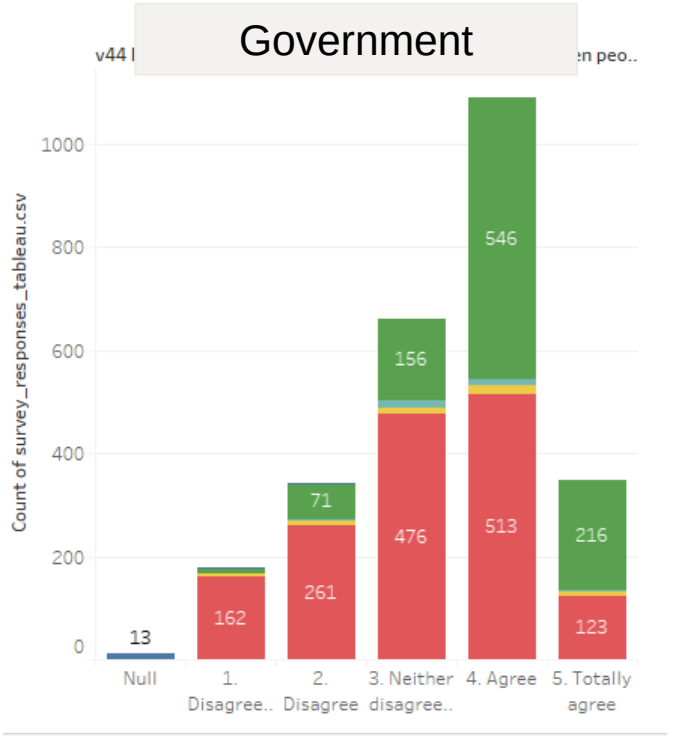
S

Informing features

I find it acceptable for the **GGD** to intervene if infected people (including myself) visited public spaces instead of self-isolating, for example, by sending a warning message to those people; and I am comfortable giving information that allows this.



I find it acceptable for the **government** to intervene if infected people (including myself) visited public spaces instead of self-isolating, for example, by sending a warning message to those people; and I am comfortable giving information that allows this.



Intervention seems counterintuitive with privacy claims and image from news, suggesting that more investigation would be needed and/or privacy concerns could be partly artificial

Agenda

1. Problem & project design
2. Main results
    1. Diagnosing issues
    2. Addressing issues
    3. Informing view of core features
3. Further considerations
4. Next steps
5. Q&A

Other important themes from expert respondents:

- **Tracking functionality in South Korea is integrated and fluid**

  "If it is simple and easy to use-and-forget, people will go along with it. If an app requires constant updates or new information and becomes a hassle, they won't."

- **People don't trust the government**, but they do trust medical experts and the government has been clear and transparent

- **People want information** to avoid getting sick; lack of information causes social anxiety

- **Collective memory** from SARS and MERS has influenced beliefs of the severity of the crisis, as well as changed laws that enabled tracking

Open questions – how the next generation of government public health apps could work, given trends

- Localized / closed-systems workplace track & trace
- The role of privacy trends, e.g. Privacy as a Service; Data as an asset
- Are big tech players allies, enemies, necessary collaborators and how can this relationship evolve safely?

- Possible scenarios for the relationship between individualism, social cohesion and grand challenges like a pandemic

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Next steps

- Delphi
- Academic papers will be open access

  → if you received an invitation to this webinar, you will be sent papers as published. For others, mail: a.e.metz@tilburguniversity.edu
- Further results sharing and discussion
- Further research on intersections between organizations, technology and society

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Discussion summary

- We discussed how the app could be integrated more thoroughly in a pandemic response ecosystem
- Dutch experts observe that the Dutch app stands somewhat alone in overall response; does not have the feel of a piece in an integrated strategy; this was partially intentional to keep it minimal
- Some argue that the app is now irrelevant… others suggest that we only see it as irrelevant because it's not fully integrated. It could be offering information about vaccines; it could be used or planned in a targeted way for workplaces; etc.
- South Korean experts noted how their track and trace functionality is one of many technical tools, and is well-integrated into an overall response
- The attitude in the West (Canada /NL) regarding apps, is understood to suggest a techno solution to a much large problem that is 'doomed to fail' due to its lack of integration in societal attitudes toward the collective and perspectives about the overall pandemic response; The attitude in South Korea sees the function as necessary, and part of the overall effort everyone works towards combatting the virus
- Participants discussed that there is an opportunity to be more specific about the exact function the app serves, while also integrating it better in an overall plan (and sending a message to the public about that plan, as well as its evolution)
- Participants discussed that situations can shift quickly (curfew, riots), and that could change how the app is used, and thus clarifying specific information about privacy could help (e.g. data only kept for 2 weeks)