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# Platform matters -- Differences in COVID data collected from Android and iOS app users

Check for updates

**Winter et al.'s recent investigation, "A Comparison of Self-Reported COVID-19 Symptoms Between Android and iOS CoronaCheck App Users," reveals differences in the demographics and COVID-19 symptoms reported by users of Android and iOS systems. These findings not only provide more information about the varied experiences of individuals during the COVID-19 pandemic but also suggest that conclusions reached in studies using one operating platform may not be generalizable to users of other platforms.**

While it has been five years since the start of the COVID-19 pandemic, and many have turned their attention away from this global health crisis, Winter et al.'s recent study "A Comparison of Self-Reported COVID-19 Symptoms Between Android and iOS CoronaCheck App Users"<sup>1</sup> demonstrates that data collected during COVID-19 remain pertinent in guiding broader mobile health research. In their recent study, Winter et al.<sup>1</sup> analyze data collected by CoronaCheck, an application for users to describe symptoms and exposure status, and receive COVID-19 risk-stratification guidance. Analysis of CoronaCheck data provides insight into patterns of COVID-19 symptoms and infection rates. However, the significance of Winter et al.'s findings is not limited in scope to the pandemic. Rather, by identifying differences in demographics and symptoms reported by Android and iOS users, Winter et al.<sup>1</sup> reveal that data collected from one platform may not be generalizable to users of other platforms.

## CoronaCheck App: findings and limitations

From April 2020 through February 2023, individuals worldwide entered data about possible COVID-19 symptoms and exposures into the CoronaCheck app, and in turn received information about their likelihood of SARS-CoV-2

infection. Users of CoronaCheck had the opportunity to share their demographic and symptom information for scientific analyses, and Winter et al.<sup>1</sup> analyzed data from 23,063 global participants. While previous research has focused on differences in COVID-19-related app functionality and availability across Android and iOS platforms<sup>2,3</sup>, Winter et al.<sup>1</sup> were instead interested in examining differences in the symptoms and demographic backgrounds of platform users, rather than differences inherent to the technologies. By focusing on these user differences, Winter and their team<sup>1</sup> identified variations not only in user demographics but also in the number of COVID-19 symptoms reported, the type of symptoms reported, and the likelihood of having suspected COVID-19.

Specifically, the authors found that Android users of CoronaCheck were more often younger males with fewer than 12 years of education, a pattern that holds true across other studies<sup>3,4</sup>. Android users also reported more COVID-19 symptoms and experienced higher rates of certain symptoms, including cough, headache, and weakness. In contrast, iOS users were more likely to experience diarrhea. Accordingly, Android users were twice as likely to be classified as having a suspected SARS-CoV-2 infection or being at high risk for infection. Overall, these findings point to notable differences in the COVID-19 experiences of Android and iOS CoronaCheck app users.

Still, Winter et al.'s<sup>1</sup> findings must be considered within the limitations posed by this cross-sectional study. While Android dominates around 90% of the mobile operating system market<sup>5</sup>, iOS is more prevalent in some countries<sup>1</sup> (e.g., within the U.S., iOS holds a market share of 57%<sup>6</sup>), and thus the study composition (90% Android vs. 10% iOS users) may limit the study's generalizability in places where iOS is more popular. The generalizability of Winter et al.'s findings is additionally limited by the fact that over half of the app users included in the study were from only three countries (Germany, India, and South Africa), and the app was only available in English and German. Moreover, participants were not randomly selected to use the app, and symptoms and diagnoses were not confirmed. Future research is therefore needed to identify

whether self-reported differences in COVID-19 symptoms and infection rates align with objective data, and whether these results hold true across more linguistically and geographically diverse populations. Slight differences in the user interface of the Android and iOS CoronaCheck apps additionally raise questions about the impact app presentation may have on data entry. As such, additional studies could focus on whether Android and iOS differences persist across uniform versions of mobile health apps.

Finally, sociodemographic background must be considered when analyzing differences in symptoms reported by Android and iOS users. Previous studies have demonstrated age<sup>7</sup> and sex-based<sup>8</sup> variation in COVID-19 symptom burden, and Winter et al. similarly found that men and younger individuals experienced higher rates of suspected COVID-19. Nonetheless, while Android users in the study cohort were more often younger men, differences between Android and iOS users remained significant even when controlling for these sociodemographic factors. Furthermore, while it is possible that unmeasured factors (i.e., income or device usage rates) could contribute to differences in symptom reports among platform users, even demographic-driven differences in mobile health data warrant further consideration.

## The bigger picture

Despite the limitations of this investigation, the differences Winter et al. identified in self-reported demographic and symptom data between Android and iOS users have broad implications for mobile health research. On the one hand, incorporating mobile health tools (like CoronaCheck) into clinical research promises to transform the scale of data collection by allowing for continuous monitoring and diminishing requirements for in-person visits that only capture snapshots of data isolated to distinct timepoints. Already, companies like Apple have launched major initiatives to analyze health data collected by their apps and wearable devices<sup>9</sup>, and companies like Whoop have used data from their devices to link changes in the menstrual cycle to cardiovascular health<sup>10</sup>. Moreover, many physicians already consider data from patients' wearable

health devices, and clinical use of such mobile health data is only expected to grow in the coming years<sup>11</sup>. On the other hand, the findings from Winter et al.'s study warn that data collected by one device or platform may not reflect patterns across broader populations. For example, using only data from Android users of CoronaCheck, nearly one out of every four individuals who reported symptoms on the app were classified as having a likely SARS-CoV-2 infection.

In contrast, data from iOS users suggests that only around one out of every ten users was likely to have SARS-CoV-2. More research is required to identify the source of differences in symptom burden reported across Android and iOS platforms, and to assess whether these differences stem from differences in sociodemographics, platform interfaces, or other as-of-yet identified factors. However, despite ongoing uncertainty about the source of these differences, the fact that differences in user health data exist confirms that capitalizing on the potential of mobile health tools requires scrutiny to ensure that patterns identified on one platform hold true across others. The current global landscape of mobile health research, with most mobile health studies occurring within the U.S.<sup>12</sup>, where iOS disproportionately dominates the market, further underscores the need for data scrutiny and multi-platform collaboration. Cited barriers to cross-company collaboration include interoperability challenges<sup>13</sup>, competitive incentives, and concerns about the privacy of patient data<sup>14</sup>. Still, Winter et al.'s findings warn that such cross-company collaboration (or at the very least, verification) is necessary to account for the differences in the user demographics and health experiences that may exist across mobile health platforms.

## Data availability

No datasets were generated or analysed during the current study.

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## Author contributions

E.E. wrote the first draft of the manuscript. K.H. and B.L. contributed to additional drafts and provided revisions. J.C.K. provided critical revisions. All authors have read and approved of the final manuscript.

## Competing interests

JCK is the editor-in-chief of npj Digital Medicine. All other authors declare no competing interests.

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