

COVID-19 surveillance in England: lessons for the next pandemic



Knowing the size of an epidemic and whether it is increasing or decreasing is core to any response to it, be it by individuals, organisations, or governments. Julii Brainard and colleagues¹ have compared 12 COVID-19 surveillance systems that were used in England from the start of the second wave of the pandemic (Sept 1, 2020) to just before Omicron emerged (Nov 30, 2021). Compared with the most accurate measures from the Office for National Statistics (those most representative of the whole population), which are least timely (10–24-day lag), they found that “laboratory-confirmed case counts and emergency department attendances were the most timely and also independent indicators of concurrent epidemic status”.¹

Brainard and colleagues¹ also found the self-reporting symptoms app called ZoeApp to be very timely and it correlated well with data from the Office for National Statistics, even using archived Zoe data from the date it was published, rather than the current retrospectively adjusted estimates.¹ Although, as they point out, the app has always used data from the Office for National Statistics to adjust its estimates before publishing them, so it is not an independent surveillance system.¹ If the other timely surveillance systems were also adjusted to correlate with data from the Office for National Statistics, then they would also probably perform better.

In future pandemics, a variety of timely systems could be combined and adjusted to fit with representative but less timely Office for National Statistics-like data to produce accurate and timely surveillance data on the size of the epidemic, and whether it is increasing or decreasing, in a single publicly available dashboard. The combining of accurate and timely surveillance systems should be done using open access data with all details of the statistical models used to produce the estimates also freely available, which will allow the estimates to be reproducible, encourage peer-review and refinement of the methods of estimation, and increase and maintain trust in the estimates.

ZoeApp data, including number of users per day, and all of the adjustment methods the app uses in relation to data from the Office for National Statistics and for vaccination coverage, should be open access. Without

this information being publicly available, how changes in Zoe methodology influence the accuracy of its predictions remains unknown (and is a limitation of the Zoe surveillance system, acknowledged by Brainard and colleagues¹). Processing of data and use of models—including by the Office for National Statistics—varies by surveillance system. Therefore available published data are based on a variety of statistical adjustments (or none) as well as different methodologies and platforms. Adjustments were made by Brainard and colleagues¹ to some of the published data, especially for wastewater sampling as they were not able to use the raw data without first adjusting it, which draws into question the immediate use of the published data for decision making.

For countries unable to fund large-scale representative Office for National Statistics-like surveillance, Brainard and colleagues¹ provide useful findings that some cheaper methods (laboratory confirmed case counts, self-reporting, and hospitalisations) correlate well with the more representative Office for National Statistics system, and others like Google search terms ranks, do not.¹ These findings might not apply to other country contexts, and investigation of the representativeness of such cheaper methods would still be required in each country to understand how accurate they could be in that context. There could be differences, for example, in how widespread or utilised free laboratory testing might be, or in access to health care. Newly proposed epidemic surveillance systems should take both these findings and their context-specific nature into account.

The characteristics of the pathogen and disease and how they change throughout the pandemic are also important variables affecting the accuracy of different surveillance systems in different ways. Asymptomatic cases will affect testing results if free laboratory testing is offered to and used by those with symptoms only. Vaccinations that reduce disease severity will reduce the ability of emergency department and hospital admissions to track the pandemic as seen in the study by Brainard and colleagues¹ from June, 2021, when the vaccine programme had a significant effect in England. Finally, new variants of the pathogen with different properties

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such as omicron, which was excluded from the study by Brainard and colleagues¹, could affect results by having a different incubation period, duration of shedding, or disease severity. All these aspects affect how useful different surveillance systems are overall and over time. The accuracy of different timely epidemic surveillance systems is highly pathogen-specific, disease-specific, and consequently evolving, and this will be true in the next pandemic too. It therefore requires close attention in any integrated surveillance venture, such as the one I propose earlier, if created and used in the next pandemic.

Quantification of the benefits of surveillance beyond providing information on the epidemic is needed, for example, in terms of its contribution to reduced health burden, or wider social or economic effects via action taken as a result of the information provided by the surveillance system. These effects would be hard to quantify both in terms of measuring these outcomes and understanding causal pathways, as well as factors influencing policy independent of the surveillance system and estimating counterfactual outcomes with different courses of action. However, if these effects could be quantified for the COVID-19 pandemic in England, further work could then look at cost-effectiveness of different surveillance systems in relation to these quantified benefits and costs.

Finally, and beyond surveillance, models of potential trajectories of any new pandemic used to inform national response policies should incorporate social, educational, mental health, quality of life, and economic outcomes, as well as health and health services outcomes of both the pandemic and the proposed response policies.² To capture all the above mentioned data/information will require investment in and co-ordination and integration of multi-disciplinary teams of researchers advising government, which is a feat not achieved anywhere for the COVID-19 pandemic.

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