

APPROVED: 7 December 2018

doi: 10.2903/j.efsa.2019.e17011

Editorial: The future of data in EFSA

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Data have been at the heart of EFSA's 2020 Strategy and activities, and we continually strive to widen our evidence base and maximise access to data. As we begin developing our next strategy cycle for 2021–2027, the process of reflecting on how we currently use data and what our data landscape will look like in the future is at the forefront of our thinking. Horizon scanning and consultations with EFSA staff, experts and stakeholders are ongoing. We have also taken account of current trends and predictions in the wider global context within which food safety data, and specifically European food safety data, are used, managed and evaluated.

Whilst data are critical to our business processes, so too are the methods we use to access, evaluate, curate, appraise and integrate data. The openness and transparency with which we approach our tasks are fundamental to sustaining EFSA's reputation for sound science underpinning evidence-based risk assessment. We need that to continue as we move into the next years when so many aspects of data availability and use will evolve rapidly.

- What could our data landscape look like in 2027?
- To what extent are current approaches moving us towards that goal?
- And what else do we need to do to get there?

Four themes of evolution are foreseen in the recently documented 'Concept paper on the future of data in EFSA' (Gilsenan et al., 2018) derived initially from the experience of EFSA scientific staff and discussed with EFSA management and the EFSA Advisory Forum. In November, we took the opportunity to gain insights to this vital topic from the 2nd Annual EFSA Stakeholders' Forum.

Taking each of these themes individually and as part of a data analysis ecosystem, we encourage stakeholders to consider what they see as the future of data to underpin evidence-based risk assessment in food safety.

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Suggested citation: Cappè S, Gilsean M, O'Dea E, Richardson J and Verloo D, 2019. Editorial: The future of data in EFSA. *EFSA Journal* 2019;17(1):e17011, 3 pp. <https://doi.org/10.2903/j.efsa.2019.e17011>

ISSN: 1831-4732

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The EFSA Journal is a publication of the European Food Safety Authority, an agency of the European Union.



Scientific innovation and new data streams

It is widely acknowledged that the vast majority of worldwide data has been created in recent years and is unstructured. With this trend increasing exponentially, the data available for analysis will expand continuously in terms of all the 'V's' of big data¹ – including velocity, volume, variety (Gartner Inc.) and many more. EFSA is actively engaged in working with the scientific community to identify how data are created and captured in innovative research and what new and currently unknown or unexplored data streams we should be accessing to further expand our evidence base.

Making data openly available and accessible is a key principle of EFSA. We are actively establishing relationships with partners such as GODAN, IPCHEM, ECHA, EMA and European open data portals. 2018 has seen the finalisation of a technical report on the publication of scientific data from EU-coordinated monitoring programmes and surveys. This is the output of a working group composed of member state experts and is an essential step towards publication of open data sets through our curated, open repository for the exchange of evidence and supporting materials used in food and feed safety risk assessments (Knowledge Junction on Zenodo).

We are looking into novel information streams, crowd-sourcing, real-time monitoring systems throughout the food chain, 'Internet of Things', combining standards to improve data exchange capability and much more to ensure we create a growing pool of large, complex scientific data sets accessible with minimal manual intervention.

Distributed data: from 'data collection' to 'data connection'

Increasingly, the nature of EFSA's scientific work requires access to data not traditionally collected by the agency and it is timely to consider a shift in focus from 'data collection' to 'data connection'. An Application Processing Interface (API) is the back-end technology to facilitate this transition – effectively an electronic 'shop front' to EFSA's data for machines. APIs are becoming more mainstream in everyday consumer transactions and are increasingly being used by organisations to allow automatic exchange of information via the internet without the need for human intervention. In EFSA's context, the Knowledge Junction on Zenodo is an essential digital tool to improve accessibility to EFSA's data and evidence. Exploration of mechanisms to automatically connect to and retrieve data from outside EFSA is a logical next step.

Ultimately, an ecosystem of APIs has the potential to provide EFSA with access to up to date, relevant data without duplication and storage overheads. Each data creator in the ecosystem could collect, validate, store, maintain and operate appropriate access controls. In addition, the availability of cloud computing will enable more effective processing of data.

Quantitative and data-driven methods

Having identified and accessed relevant new data sources, the next challenge will be to ensure the data quality (fitness for purpose) is adequate to ensure EFSA's standards of scientific rigour are maintained. Building on the conclusions of the Prometheus report, our quantitative methods for data appraisal and validation will need to continue to develop in parallel with changing approaches to data identification and retrieval so we ensure appropriate transformation of big data into sound scientific evidence. EFSA's work in advancing our approach to automation, machine learning and artificial intelligence will build on ongoing work towards interoperability standards and domain ontologies.

We see enormous opportunity to work in collaboration with stakeholders to test complex predictive models and machine learning in the field of risk assessment, expert knowledge elicitation and the tracing of food contamination events throughout the food chain.

Exploring the living opinion

A key feature of data use in risk assessment is timeliness and this will continue to increase in importance in the future. Moving towards more real-time data analysis and risk communication is expected to be increasingly important. Making that analysis readily accessible to practitioners, scientists and consumers in a reproducible and transparent way will also be driven by modern data visualisation and dissemination services.

EFSA's work towards more efficient and effective data use, sharing and analysis has already begun moving us towards what we see emerging as the future of data. The four thematic areas identified relating to scientific data are being explored as part of our evolving strategy renewal to ensure EFSA

¹ In the context of this concept paper, *big data* refers to data that do not fit comfortably – or at all – into EFSA's current data management system.

remains agile, relevant and connected to 2027 and beyond. We welcome the ongoing engagement of our stakeholders and partners in continually working towards improved approaches to our work to protect consumers.

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