

# *The state of altmetrics*

**A tenth anniversary celebration**

October 2020



## A message from Altmetric CEO Kathy Christian

Altmetric was founded in 2011 by my delightful predecessor, Euan Adie, for a simple purpose: to help researchers see the influence of their work in real time.

The pace of research may have accelerated over the past decade but this year it feels like we've kicked into a gear we didn't know we had. While 2020 has been frenetic on many fronts, it has been amazing to see how creativity and ingenuity can flow from a very difficult situation. It has come not just from researchers themselves, but also from those across the wider community: universities, governments, publishers, and businesses - all rapidly adapting the technologies and processes they use to manage research throughout its lifecycle.

*The state of altmetrics* discusses this rapid change and what we can expect in the future. We were lucky to receive contributions from global thought leaders. When I read them I was struck by the notion that the altmetrics of today are just the beginning. There are simply so many opportunities to serve and support the research community. Contributions touched on important, recurrent themes:

The need for responsible use of altmetrics in research evaluation. We cannot repeat the oversimplification of previous generations of research impact indicators;

The importance for altmetrics users, researchers, and providers alike to move beyond simple counting and correlations, towards contextualized indicators and qualitative impact evidence;

The field of altmetrics has flourished due to a diverse ecosystem of commercial and nonprofit innovators and

data providers. We need to protect this ecosystem by ensuring altmetrics data remains open for researchers to study, and that data sources remain open for collection and integration into altmetrics services;

Data science techniques offer a great deal of promise for mapping the full landscape of engagement with research: how communities coalesce around particular topics, where altmetrics can be signals of deeper impact (e.g. disease monitoring), and identifying and dealing appropriately with "inorganic" sharing of research (e.g. bots); and

Altmetrics have grown tremendously in their use and recognition within academia, and there is likely much more growth to come.

Altmetric is proud to have spent the last decade as a change leader in the wider field of altmetrics. We have also been a student of the community, constantly learning how we can improve our products and services to better meet the needs of all.

In publishing *The state of altmetrics*, we hope to give back. In the following pages, you will hear from the authors of the original *Altmetrics manifesto*, researchers using altmetrics as social-spatial sensors to track emerging diseases, humanists keen to understand the ethics of altmetrics, and many others.

On behalf of the entire team at Altmetric, as you read this report I invite you to reflect upon an incredible decade, and imagine the future to come.



— Kathy Christian, CEO, Altmetric

# Contents

|                                                                                                                                                                                                                                                                                                                             |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>1 Altmetrics, Ten Years Later</b>                                                                                                                                                                                                                                                                                        | <b>3</b>  |
| <i>Euan Adie (Altmetric (founder) &amp; Overton)</i>                                                                                                                                                                                                                                                                        |           |
| <b>2 Reflections on Altmetrics</b>                                                                                                                                                                                                                                                                                          | <b>5</b>  |
| <i>Gemma Derrick (University of Lancaster), Fereshteh Didegah (Karolinska Institutet &amp; Simon Fraser University), Paul Groth (University of Amsterdam), Cameron Neylon (Curtin University), Jason Priem (Our Research), Shenmeng Xu (University of North Carolina at Chapel Hill), Zohreh Zahedi (Leiden University)</i> |           |
| <b>3 Worldwide Awareness and Use of Altmetrics</b>                                                                                                                                                                                                                                                                          | <b>13</b> |
| <i>Yin-Leng Theng (Nanyang Technological University)</i>                                                                                                                                                                                                                                                                    |           |
| <b>4 Leveraging Machine Learning on Altmetrics Big Data</b>                                                                                                                                                                                                                                                                 | <b>15</b> |
| <i>Saeed-UI Hassan (Information Technology University), Naif R. Aljohani (King Abdulaziz University), Timothy D. Bowman (Wayne State University)</i>                                                                                                                                                                        |           |
| <b>5 Altmetrics as Social-Spatial Sensors</b>                                                                                                                                                                                                                                                                               | <b>20</b> |
| <i>Vanash M. Patel (West Hertfordshire Hospitals NHS Trust), Robin Haunschild (Max Planck Institute for Solid State Research), Lutz Bornmann (Administrative Headquarters of the Max Planck Society)</i>                                                                                                                    |           |
| <b>6 Altmetric's Fable of the Hare and the Tortoise</b>                                                                                                                                                                                                                                                                     | <b>24</b> |
| <i>Mike Taylor (Digital Science)</i>                                                                                                                                                                                                                                                                                        |           |
| <b>7 The Future of Altmetrics: A Community Vision</b>                                                                                                                                                                                                                                                                       | <b>26</b> |
| <i>Liesa Ross (Altmetric), Stacy Konkiel (Altmetric)</i>                                                                                                                                                                                                                                                                    |           |

# Altmetrics as Social-Spatial Sensors

## Vanash M. Patel

West Hertfordshire Hospitals NHS Trust, London, United Kingdom,  
e-mail: [vanash.patel06@imperial.ac.uk](mailto:vanash.patel06@imperial.ac.uk)

## Robin Haunschild

Max Planck Institute for Solid State Research, Stuttgart, Germany,  
e-mail: [R.Haunschild@fkf.mpg.de](mailto:R.Haunschild@fkf.mpg.de)

## Lutz Bornmann

Administrative Headquarters of the Max Planck Society, Munich, Germany,  
e-mail: [lutz.bornmann@gv.mpg.de](mailto:lutz.bornmann@gv.mpg.de)

Citations have long been used to measure research impact, but they have been criticized by many for not being able to reflect the broader impacts of research, such as educational, cultural, environmental, and economic impact<sup>1,2</sup>. The exponential growth of digital technology, particularly in the last decade or so, has enhanced scientific productivity, significantly expanding the methods in which research is communicated, archived, and assessed<sup>3</sup>.

One such example is that researchers increasingly use Twitter as a communication platform, and tweets can contain mentions of scientific papers<sup>4</sup>. Twitter mentions—defined as “direct or indirect links from a tweet to [research outputs] online”<sup>5,6</sup>—can become part of a rapid dialogue between users which may express and transmit academic impact and support traditional citation analysis. Twitter mentions can reflect a broader discussion of research that crosses traditional disciplinary boundaries and represents “attention, popularity or visibility”<sup>7</sup> rather than what is commonly understood to be scholarly influence.

Studies have shown that tweets can be used as ‘social sensors’, which is the concept of replacing a physical sensor in the real world with social media analysis. Tweets can be regarded as sensory information and Twitter users as sensors. Studies have demonstrated that tweets analysed as social sensors can provide insight into major social and physical events like

---

<sup>1</sup>Bornmann, L. (2016). Scientific revolution in scientometrics: The broadening of impact from citation to societal. In C. R. Sugimoto (Ed.), *Theories of informetrics and scholarly communication* (pp. 347-359). Berlin, Germany: De Gruyter.

<sup>2</sup>Bornmann, L., & Haunschild, R. (2017). Does evaluative scientometrics lose its main focus on scientific quality by the new orientation towards societal impact? *Scientometrics*, 110(2), 937-943. doi:10.1007/s11192-016-2200-2

<sup>3</sup>Markusova, V., Libkind, A., & Bogorov, V. (2018). Usage metrics vs classical metrics: analysis of Russia’s research output. *Scientometrics*, 114(2), 593-603.

<sup>4</sup>Priem, J., & Costello, K. L. (2010). How and why scholars cite on Twitter. *Proceedings of the American Society for Information Science and Technology*, 47(1), 1-4. doi:10.1002/meet.14504701201

<sup>5</sup>Priem, J., & Costello, K. L. (2010). How and why scholars cite on Twitter. *Proceedings of the American Society for Information Science and Technology*, 47(1), 1-4. doi:10.1002/meet.14504701201

<sup>6</sup>Sakaki, T., Okazaki, M., & Matsuo, Y. (2010). Earthquake shakes Twitter users: real-time event detection by social sensors. Paper presented at the Proceedings of the 19th international conference on World wide web.

<sup>7</sup>Mas-Bleda, A., & Thelwall, M. (2016). Can alternative indicators overcome language biases in citation counts? A comparison of Spanish and UK research. *Scientometrics*, 109(3), 2007-2030. doi:10.1007/s11192-016-2118-8

earthquakes<sup>8</sup>, sporting events<sup>9</sup>, celebrity deaths<sup>10</sup> and presidential elections<sup>11</sup>. Twitter data can contain location information that can be converted into geo-coordinates and be spatially mapped. In this way, tweets can also be used as social-spatial sensors to demonstrate how research diffuses within a population<sup>12</sup>.

We have studied how Twitter data mentioning research can be used as social-spatial sensors in several scenarios. We set out to investigate whether research on certain diseases reaches the populations that are especially affected by the diseases. The diseases we included in our study were tuberculosis, human immunodeficiency virus (HIV), and malaria, which the World Health Organisation (WHO) ranks as the top three causes of death worldwide by a single infectious agent. Whilst we were undertaking our study, a novel infectious agent called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged causing Coronavirus disease 2019 (COVID-19), and the WHO declared this disease a pandemic on 11 March 2020<sup>13</sup>. The global impact of COVID-19 compelled us to also include this disease in our research<sup>14</sup>.

We used three kinds of data in our study:

- Incidence rates of the diseases (WHO)
- Publications related to these diseases (bibliographic databases)
- Tweets that mention these publications (Altmetric.com API & Twitter API)

Plotting user locations for tweets that mentioned publications related to the diseases on worldwide maps revealed that high Twitter activity corresponded to high incidence rates of the diseases (Figure 5.1). Additional statistical analysis significantly showed that higher Twitter activity was associated with higher incidence rates of the diseases and number of publications, although the influence of the number of publications was greater than the incidence rates of the diseases.

Thus, we believe that Twitter mentions of research can be used as social-spatial sensors to monitor research diffusion for diseases that have significant worldwide impact. Our results suggest that research broadcast through Twitter reaches populations that are concerned about the diseases in this study.

Our study can serve as proof-of-concept for future studies on Twitter data as indicators of research impact<sup>15</sup>. We welcome the community to test our approach, and suggest that future studies could incorporate thematic analysis of the tweets in terms of their content (e.g., are tweets referring to disease testing, therapies, or vaccines), quality (e.g., whether tweets are referring to original research or correspondence), or who tweeted these (e.g., researchers, members of the public, universities, or pharmaceutical industries).

Our study has illustrated a glimpse of the relationship between diseases, research outputs, and Twitter activity, and conveys the importance of social media platforms for knowledge transfer. Therefore, we urge governments to pause censorship of social media platforms such as Twitter

“Higher Twitter activity was associated with higher incidence rates of the diseases and number of publications.”

<sup>8</sup>Sakaki, T., Okazaki, M., & Matsuo, Y. (2010). Earthquake shakes Twitter users: real-time event detection by social sensors. Paper presented at the Proceedings of the 19th international conference on World wide web.

<sup>9</sup>Takeichi, Y., Sasahara, K., Suzuki, R., & Arita, T. (2014). Twitter as Social Sensor: Dynamics and Structure in Major Sporting Events. Paper presented at the ALIFE14.

<sup>10</sup>J. Sankaranarayanan, J., Samet, H., Teitler, B. E., Lieberman, M. D., & Sperling, J. (2009). TwitterStand: news in tweets. Paper presented at the Proceedings of the 17th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems.

<sup>11</sup>Shamma, D. A., Kennedy, L., & Churchill, E. F. (2009). Tweet the debates: understanding community annotation of uncollected sources. Paper presented at the Proceedings of the first SIGMM workshop on Social media.

<sup>12</sup>Bornmann, L., Haunschild, R., & Patel, V. M. (2020). Are papers addressing certain diseases perceived where these diseases are prevalent? The proposal of Twitter data to be used as social-spatial sensors. <http://arxiv.org/abs/2004.13974>.

<sup>13</sup>Ghebreyesus, T. A. (2020). WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020 [Press release]. Retrieved from <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19-11-march-2020>

<sup>14</sup>Patel, V., Haunschild, R., Bornmann, L., & Garas, G. (2020). A call for governments to pause Twitter censorship: a cross-sectional study using Twitter data as social-spatial sensors of COVID-19/SARS-CoV-2 research diffusion. *medRxiv*, 2020.2005.2027.20114983. doi:10.1101/2020.05.27.20114983

<sup>15</sup>Thelwall, M. (2017). Web indicators for research evaluation: A practical guide. London, UK: Morgan & Claypool.

during these unprecedented times to support the scientific community's battle against diseases such as COVID-19, using monitoring and prediction methods like altmetrics.



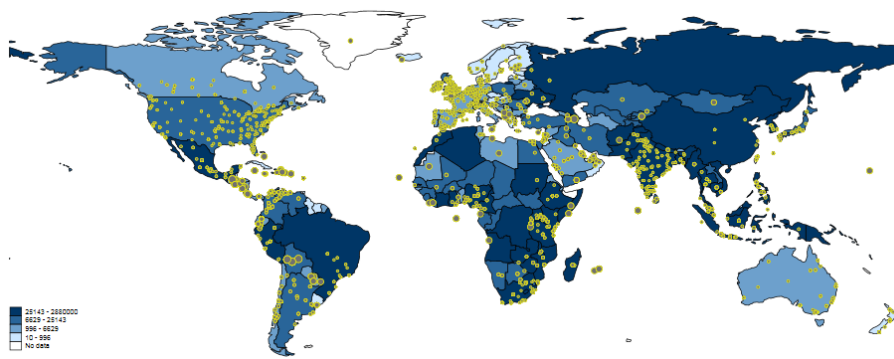
**Vanash Patel** is a consultant colorectal surgeon at West Hertfordshire Hospitals NHS Trust, UK. During his surgical training, he completed a PhD at Imperial College London, investigating academic performance metrics. Vanash is currently an honorary research fellow at Imperial.



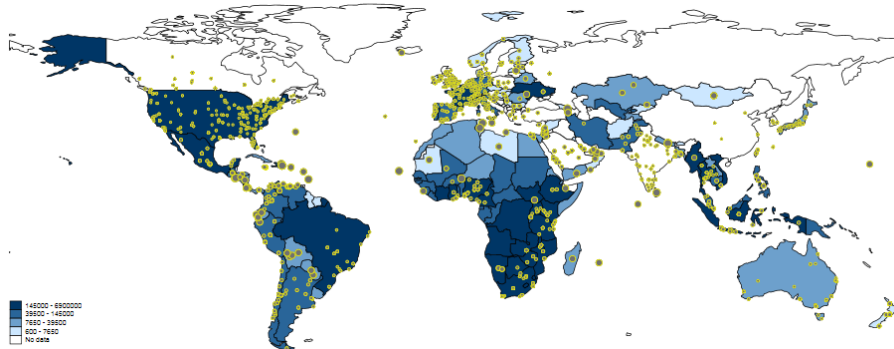
**Robin Haunschild** is a chemist by training and joined the Max Planck Society in 2014. His current research interests include the study of bibliometrics and altmetrics as well as their application to specific fields of natural sciences, e.g., chemistry and climate change.



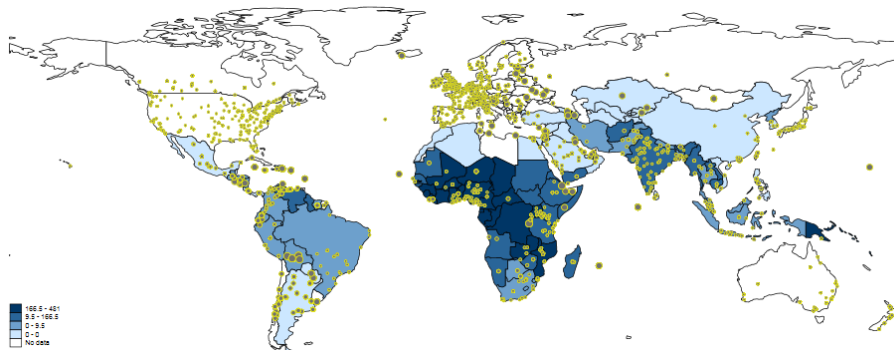
**Lutz Bornmann** is a habilitated sociologist of science and works at the Division for Science and Innovation Studies of the Max Planck Society. His current research interests include research evaluation, peer review, bibliometrics, and altmetrics.



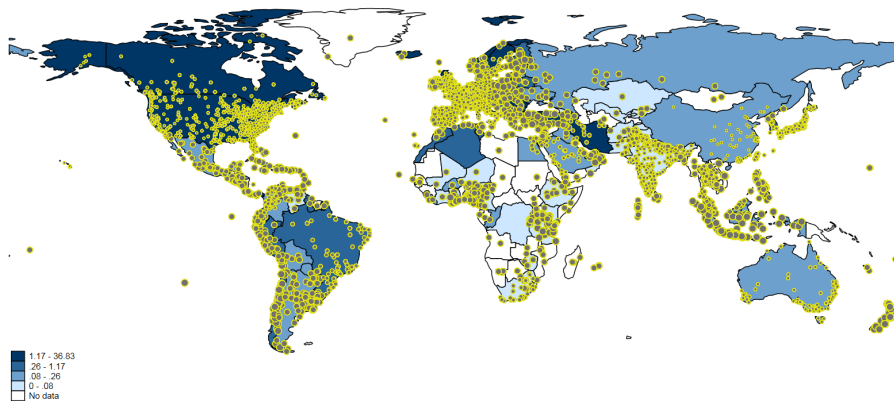
(a) Tuberculosis



(b) HIV



(c) Malaria



(d) COVID-19

Figure 5.1: Tweeting on publications dealing with (A) tuberculosis, (B) HIV, (C) malaria and (D) COVID-19 worldwide. Each tweet is inversely weighted with the number of publications published by authors in the corresponding country: the larger the dots, the smaller the research activity. The countries are colored according to the incidence rates of the disease. For some countries, e.g. Greenland, no data are available. Countries such as China and Iran block internet access to Twitter or its content.

**Altmetric's** mission is to help others understand the influence of research online. We collate what people are saying about published research in sources such as the mainstream media, policy documents, social networks, blogs, and other scholarly and non-scholarly forums to provide a more robust picture of the influence and reach of scholarly work. Altmetric works with some of the biggest publishers, funders, businesses and institutions around the world to deliver this data in an accessible and reliable format. Find out more at [www.altmetric.com](http://www.altmetric.com).

#### **Contact**

Altmetric, 6 Briset Street, London EC1M 5NR, UK. [info@altmetric.com](mailto:info@altmetric.com)

#### **Copyright**

Copyright © 2020 the contributors. This work is licensed under the Creative Commons Attribution 4.0 International License CC-BY.

#### **Cite as**

Konkiel, S. (Ed.). (2020). *The State of Altmetrics: A tenth anniversary celebration*. London, UK: Altmetric. doi: <https://www.doi.org/10.6084/m9.figshare.13010000>