Some practical difficulties in creating field-normalized altmetrics

“There is only one thing in life worse than being talked about, and that is not being talked about.” Oscar Wilde

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Introduction

• Researching subject-based variations in different forms of altmetrics for PhD

• One practical outcome is to underpin approaches to creating subject-normalized altmetrics

• This is particularly important as altmetrics are being increasingly examined for research evaluation: users are expressing an interest in analysis

• Furthermore, two distinct use-cases:
  • to read “off the page” when an article is “highly shared”;
  • to perform more nuanced evaluation work, typically with a portfolio

• Citation has a long history of subject normalized metrics, eg, FWCI, NCI, and ‘top-slicing’ – ie, analysing the top 10% for citation

• It is tempting to simply follow these approaches, but these metrics make assumptions about the data that don’t necessarily follow
Data set

- 9610 articles drawn from the NIH’s publication database
- Classified into 13 subject areas on an article-by-article basis using machine learning (not journal classification)
- Subject areas > 200 articles are analysed:
  - Biochemistry and Cell Biology; Cardiorespiratory Medicine and Haematology; Clinical Sciences; Genetics; Immunology; Medical Microbiology; Neurosciences; Oncology and Carcinogenesis; Other Physical Sciences; Paediatrics and Reproductive Medicine; Physical Chemistry; Psychology; Public Health and Health Services

- Citations from NIH’s icite tool
- Mendeley data direct from Mendeley’s API
- Altmetric data from Altmetric.com’s API

- Taylor “Engineers Don’t Blog” – poster at 2AM - https://figshare.com/articles/Engineers_Don_t_Blog_and_Other_Stories_why_Scopus_uses_subject_area_benchmarking_/1568135
Methodology

- Four data points considered:
  - Citations
  - Mendeley readers & Citeulike saves
  - Altmetric Attention Score
  - Social Network activity (Twitter, Facebook, Reddit, Google+)

- Articles with zero values in each four data are placed in a distinct category

- Articles with non-zero values are placed into deciles (NB collisions are an issue, eg, Social Network count of 1 straddles more than one decile)

- Examining the number of documents in each classification / decile, and the mean values within that decile
  - How does ‘zero’ compare to a decile?
  - Are deciles reasonably evenly distributed?
# articles in deciles - citation

Distribution of Documents in Citation Deciles

- Biochemistry and Cell Biology
- Genetics
- Physical Chemistry
- Cardiorespiratory Medicine and Haematology
- Psychology
- Public Health and Health Services
- Paediatrics and Reproductive Medicine
- Oncology and Carcinogenesis
- Neurosciences
- Medical Microbiology
- Immunology
- Clinical Sciences
Distribution of Documents in Mendeley and Citeulike Deciles

- Biochemistry and Cell Biology
- Genetics
- Physical Chemistry
- Cardiorespiratory Medicine and Haematology
- Psychology
- Public Health and Health Services
- Paediatrics and Reproductive Medicine
- Oncology and Carcinogenesis
- Neurosciences
- Medical Microbiology
- Immunology
- Clinical Sciences
# articles in deciles – Altmetric Attention Score

Distribution of Documents in Altmetric Attention Score Deciles

- Biochemistry and Cell Biology
- Genetics
- Physical Chemistry
- Cardiorespiratory Medicine and Haematology
- Psychology
- Public Health and Health Services
- Paediatrics and Reproductive Medicine
- Oncology and Carcinogenesis
- Neurosciences
- Medical Microbiology
- Immunology
- Clinical Sciences
# articles in deciles – Social Network Activity

Distribution of Documents in Social Network Deciles

- Biochemistry and Cell Biology
- Genetics
- Physical Chemistry
- Cardiorespiratory Medicine and Haematology
- Psychology
- Public Health and Health Services
- Paediatrics and Reproductive Medicine
- Oncology and Carcinogenesis
- Neurosciences
- Medical Microbiology
- Immunology
- Clinical Sciences

Decile Distribution:
- 0.00%
- 10.00%
- 20.00%
- 30.00%
- 40.00%
- 50.00%
- 60.00%
- 70.00%
- 80.00%
- 90.00%
- 100.00%
Mean values in deciles - citation

Order change might stabilize with geometric mean.
Mean values in deciles – Mendeley & Citeulike

Average Mendeley and Citeulike Save Per Decile

- Biochemistry and Cell Biology
- Genetics
- Physical Chemistry
- Cardiorespiratory Medicine and Haematology
- Psychology
- Public Health and Health Services
- Paediatrics and Reproductive Medicine
- Oncology and Carcinogenesis
- Neurosciences
- Medical Microbiology
- Immunology
- Clinical Sciences
Mean values in deciles – Altmetric Attention Score

Average Altmetric Attention Score Per Decile

- Biochemistry and Cell Biology
- Genetics
- Physical Chemistry
- Cardiorespiratory Medicine and Haematology
- Psychology
- Public Health and Health Services
- Paediatrics and Reproductive Medicine
- Oncology and Carcinogenesis
- Neurosciences
- Medical Microbiology
- Immunology
- Clinical Sciences
Mean values in deciles – Social Network

Average Social Network Share Per Decile

- Decile
- Average Social Network Share

- Biochemistry and Cell Biology
- Genetics
- Physical Chemistry
- Cardiorespiratory Medicine and Haematology
- Psychology
- Public Health and Health Services
- Paediatrics and Reproductive Medicine
- Oncology and Carcinogenesis
- Neurosciences
- Medical Microbiology
- Immunology
- Clinical Sciences

Decile 0 to 100

Social Network Share 0 to 70
Observations using Social Network data

The order of the disciplines in the upper decile is different to mid-range deciles.

Upper-range trend approximates to log growth \((y = x^{m_2})\).

Mid-range trend approximates to arithmetic growth \((y = m_1x)\).

Only limited similarity between high log growth and low zero %.

To some extent, these observations can be made to all four data source, and for all disciplines.

Is there equivalence between a mean score of 5, and a mean score of 65?

Difference between max and min in upper decile is multiple of mid-range.

Distribution of Documents in Social Network Deciles

Documents (%) re Per Decile
Research questions

- Does each data source and each discipline exhibit three Zero, Arithmetic, Log (ZAL) features?

- Can we identify the range where log growth exceeds arithmetic?
  - (Look at linear and log divisions, regression analysis, confidence)

- Are growth states independent? Does an article with log growth require an arithmetic stage? Is it an error to see arithmetic and log growth as being the same type of activity?

- Can we reliably quantify $m_1$ and $m_2$ for the different disciplines? (And probability $P$ for zero-values)

- Should platforms allow for analysis using ZAL values?

- For different data sources, the balance between ZAL importance will shift: eg, $Z$ is less important for Mendeley, $L$ will rarely be an issue for policy documents. How can we support analysts to use the most relevant metric?

- Does it matter if very few chemistry papers are ‘highly shared’, compared to psychology, compared to a baseline of 10%