

Zombie Papers: A threat to science

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Abstract

Zombies are the walking dead. In scientific literature, the Zombie Papers continue to exist and do not die even after the retraction which in itself is a slow process, inconsistent, and inadequate. The top-level evidence and practice guidelines based upon systematic review and meta-analysis get contaminated by the false data from paper mills and Zombie Papers. Science relies on trust. The research and publication of evidence must be ethical and trustworthy. The research publication is a transnational process. It requires the collaboration of stakeholders including readers, editors, institutions, and society beyond the national boundaries. Awareness of Zombie Papers and misconduct is necessary to maintain the integrity of science.

Keywords: misconduct, research writing, scientific publication, zombie literature, zombie paper

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INTRODUCTION

Zombies are the walking dead. In the scientific publication, the Zombie Papers are the ones that do not die and continue to exist in the scientific literature despite being removed, banned or retracted.¹⁻⁵ The research publication is transnational and the assessment process of correction for questionable papers is slow, inconsistent and inadequate because of the complex digital technology.⁵⁻⁸ Top levels of evidence like, randomized control trials (RCTs) and systematic review of meta-analysis (SRMA) may be contaminated by such papers and by the articles manufactured on demand from paper mills.^{5,9,10} The

Zombie Papers and misconducts in research, writing, and publications may affect the practice guidelines developed from fraudulent publications.¹⁰⁻¹³

The public health policies and the social justice system have been influenced by Zombie Papers for a long, for example, since the era of measles. The 'no-vax' theories drawn from misinformation, disinformation, and malinformation complicated the trust of evidence for coronavirus disease 2019 (COVID-19) pandemic.¹⁴⁻¹⁹ Therefore, stakeholders should be aware of the Zombie Papers and fraudulent publications to maintain the ethical research and publication. The information and awareness on why and how Zombie

Papers exist are important to control them and to maintain the integrity of science. This requires a combined effort from researchers, reviewers, journal editors, and policymakers.

The zombie literature and Zombie Papers

Historically, the term Zombie (walking dead), derived from the West African words 'nzumbi' meaning corpse (Gabon) and 'nzambi' meaning spirit of a dead person (Kongo), became popular in French and British culture introduced by the African slaves from Voodoo culture of Haiti.¹ In scientific literature, the Zombie Papers do not die and continue to exist even after their documented errors and retractions.²⁻⁵ The correction for the integrity of questionable papers, their assessment, and the process to notify the public is slow, inadequate, and inconsistent.⁶

The Zombie Papers are increasing globally, reaching up to 17% reported in an investigation, and majorities come from China, India, Iran, South Korea, and Japan; but there are also plenty of sophisticated manipulation, fabrication, and falsifications of data from the USA, UK, and Europe.^{5,7} Thus, naming countries may be a quick fix and requires an in-depth methodology for analysis because of the collaboration in research and mobility of researchers, the transnational nature of research and publication, and the existing ideas and discoveries from within and outside national boundaries.⁸ Transparency in collaborations and transnational activities may help in avoiding un-real scientific literature and Zombie Papers.

Importance of awareness for Zombie Papers

The RCTs and SRMAs are the top-level evidence and may be contaminated by the false data from Zombie Papers and articles manufactured on demand by the paper mills.^{5,9,10} The infamous paper on bogus data linking Measles, Mumps, and Rubella (MMR) vaccine to autism was 'manufactured' at a London medical school and published in *The Lancet* in 1998 which existed till 2010 before it was officially retracted, but the damage it caused was irreparable because of public health scare against the vaccine, depriving children of the vaccine with lifelong consequences.

This paper included a case series of 12 patients who were recruited through anti-MMR vaccine campaigners and were funded for planned litigation.²⁰ Many other questionable papers influenced the clinical practice, for example, peri-operative analgesia based on fabricated data that were taken up by SRMAs²¹, papers on colloids²², postoperative nausea and vomiting (PONV)^{23,24}, all existing as zombies for a long time causing considerable damages. The retraction even when it happens, is a slow process and covers only a fraction while many continue to exist as a zombie.

Stopping the Zombie Papers

Scientific misconduct in research, writing, and publication is a global concern for all: readers, editors, institutions, and society.¹⁰⁻¹² Stakeholders need to work collectively to maintain trust in science, its integrity based on ethical research and publication to avoid misconduct like manipulation, falsification, fraud, plagiarism, etc., found in Zombie Papers.¹³ By the time correction happens, the misinformation is spread and the damage is already done. Even after retraction, papers continue to be cited, further spreading the misinformation as per Retraction Watch (<http://retractiondatabase.org/>).^{25,26} The retracted articles should not be cited. The author should take responsibility for such citations, and explain why a retracted article is being cited, clearly mention the word 'retracted' in the main text and also in the reference list.²⁷

It is interesting to note that among 10 highly cited articles in high-impact factor journals until December 2020, the Zombie Papers continued to exist and received a large number of citations; for example, the #2 most cited paper in *Lancet* received 642 citations post-retraction compared to 780 citations pre-retraction.²⁸ Retraction may be because of a genuine error in the paper, but more commonly it is due to misconduct and affects the reputation of not only the researcher but also the reviewers and journal editors. This is one possible reason why stakeholders take a cautious approach, or may even try to avoid retraction. Zombie Papers continue to haunt science with their existence even after their demise, after

retraction. A recent analysis of RCTs found that 73 (14%) had false data and 43 (8%) were Zombie Papers.²⁹ During the last 3-decades there has been an increase in the number of zombie literature and of more concern is they continue to be cited.^{30,31}

Reasons for the existence of Zombie Papers

Reasons for the continued existence of Zombie Papers can be summarized into 5-domain^{4,5,7,10,17,29,30}: 1) ignorance of citing the retracted papers without explicit reason; 2) failing to mention 'retraction' in-text and reference list; 2) citing from other author's reference list without accessing and without actually reading it; 3) retraction not clearly mentioned or displayed openly in the main text of the retracted journal article, especially in third-party websites like Google Scholar, ResearchGate, Sci-Hub, etc; 4) failing to cross-check reference lists for possible retraction at the source and/or on Retraction Watch database before citing them in the publication of a manuscript; 5) unawareness to zombie and paper mills that manufacture papers on demand.

The influence of Zombie Papers extends beyond science

The zombie pollutes the good science with flawed studies. The zombie phenomena of bad science influence public health policies, and the social justice system, for example, the vaccine hesitancy ('no-vax' theories).¹⁴

Publication of good science and critical evaluation of online scientific information requires reevaluating the credibility before a conclusion is drawn from the source (the person/s who authored the content) and appraisal for the mis-, dis-, and malinformation. The degree of severity ranges from falseness to intent to harm. Misinformation is the unintentional mistakes,

for example, inaccurate photo captions, dates, statistics, translations, or when satire is taken seriously when false information is shared without an intent to cause harm; Disinformation on the other hand is fabricated or deliberately manipulated audio/visual content, conspiracy theories or rumors created intentionally and when such false information is knowingly shared to cause harm; whereas, malinformation is sharing genuine information with an intent to cause harm and often the private information is shared publically, such as revenge porn.^{18,19,32,33} The change of context, date, or content became more evident in the "post-truth" era like in 2016 after the US presidential campaign of online misinformation that led individuals not to believe in evidence-based facts of validated knowledge, and rather to rely more on personal beliefs and feelings in disregard of good science and credibility of information.^{15,16}

The COVID-19 pandemic has been a significant lesson on how the infodemic can undermine the trust in science with the overflow of manipulated information and negative sentiment in disregard for the guiding principles of trust.^{34,35} The need for timely and trusted information for dissemination is important to counteract the 'infodemic' which was seen during the COVID-19 with an overabundance of accurate as well as inaccurate information. In the early phase of COVID-19 at beginning of 2020, WHO tested ads in English message displayed above results of Google Search queries to rapidly optimize the public health campaigns. In this campaign, 71 text ads, and messages generated 13 million views with 1.4 million click-through to the WHO website showing the potential of collaboration between big technology, governments, and global health agencies.³⁵

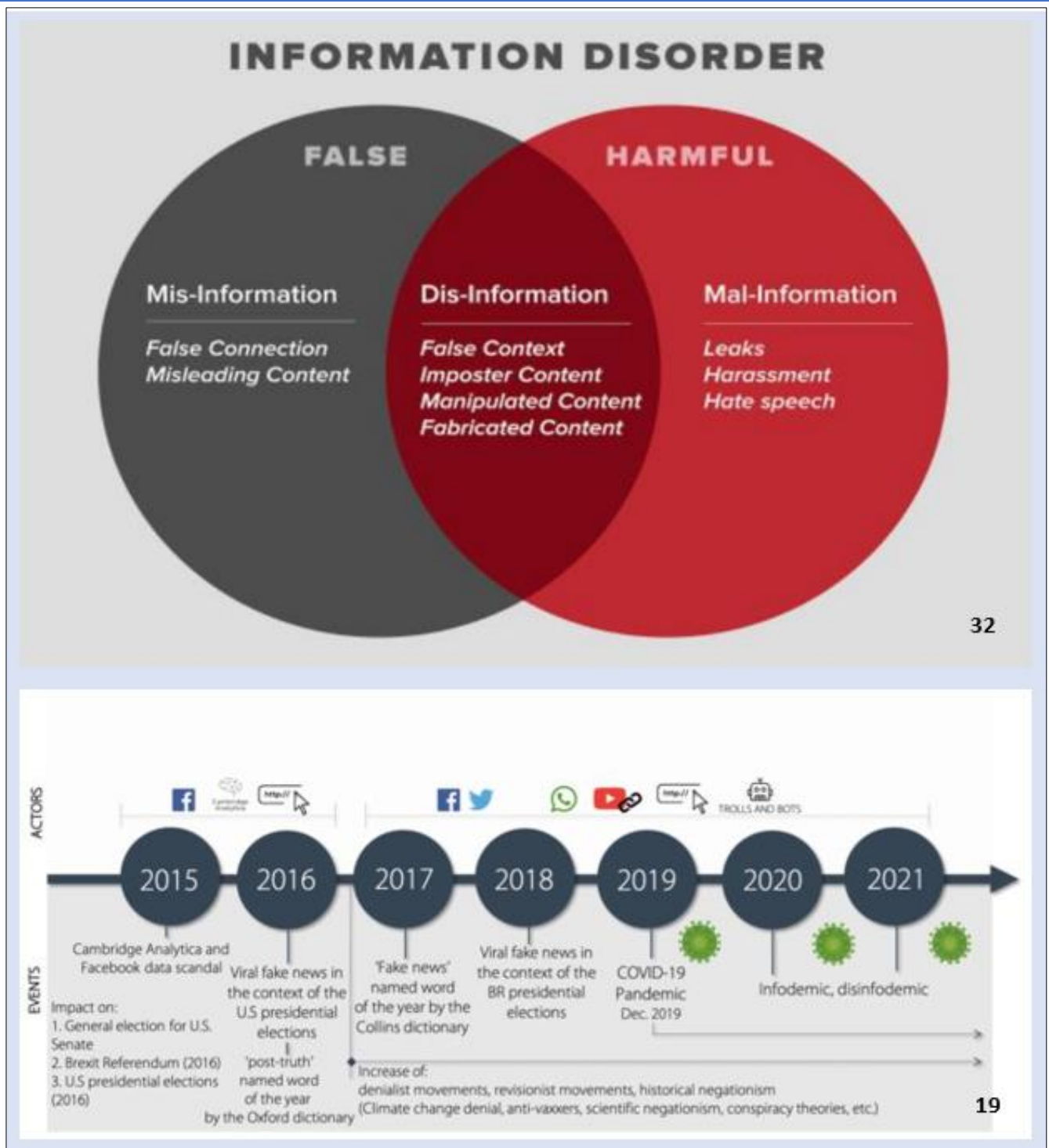


Figure 1. The mis-, dis-, mal- information can be used strategically to cause harm and may contribute to Zombie papers; Sources ^{18,19,32,33}

The pandemic publications have influenced the research and publication with speed and volume.¹⁷ The positive outcome of research publication is obvious with the successful development of vaccines and treatment protocols for COVID-19 in a short period. However, this has also led to inadequately

designed studies, research duplication, data problems, fraud, and retractions that will continue to shape future research publications. The emphasis on unbiased designs and robust assessment for the global good is the basis of ethical research and publication. Transnational collaboration of researchers and

involvement of universities and industry across the national boundaries are some of the issues of the complexity of policies, funding, and motivations that impact people globally. The lack of trust in information negatively affects the adoption of risk protective measures necessary for public health during the crisis.

THE WAY FORWARD

The Zombies Papers continue to haunt and affect science and public health policies even after being

disproved and retracted from literature. Therefore, all stakeholders including researchers, authors, reviewers, journal editors, and the judicial system need to be vigilant against bad science and stop Zombie Papers from walking the scientific literature. Awareness of scientific misconduct and control of Zombie Papers are necessary for ethical research publication practices to maintain the integrity of good science.

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