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Marginal cost of contextualizing stigma of zoonotic diseases

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Abstract: In the scientific sphere, understanding the way naming rules strengthen the integrity and quality of naming zoonotic diseases and viruses remains nominal rather than substantial. Arguably, the looming worry is that the public is susceptible to the stigmatized proper names like *German measles* in the leading journals. Our survey indicates that some stigmatizing names have always come at the cost of unintentional sociocultural impacts, despite their seemingly harmless origins. This study first unveils that terminological evolution of *German measles* is on the wrong side of history.

Keywords: zoonotic diseases; naming convention; *German measles*; *Middle Eastern Respiratory Syndrome*; *Swine flu*

Marginal cost of contextualizing stigma

Less aligned emphasis has been placed on the stigmatized proper names of some zoonotic diseases. The idiomatic usage of *German measles* implies that some strongly-held but flawed names may brand discrimination and stoke panic (*1*, *2*). In the early 19th century, the name *rubella* was proposed as a substitute for German *Rötheln*, then the epidemic neologism *German measles* was accepted gradually (*3*). Arguably, the looming worry is that such usages with potential stigma might fuel the infodemic unconsciously (*4*).

In recent years, humans have witnessed several outbreaks of pathogenic diseases, with proper names given by stakeholders. However, each round of naming practice is not always successful. For example, *Middle Eastern Respiratory Syndrome* (MERS) (*5*) and *Swine flu* (*6*, *7*) were accused of unintentional social impacts and economic damage. In response to these incidents, in May 2015, WHO released some naming conventions for new human diseases (*8*). Naming conventions are not merely for naming a disease but for the vitality of science and the promotion of social progress. Therefore, the marginal cost of contextualizing stigmas is far beyond financial damage (**Fig. 1**).

Admittedly, understanding the way naming rules strengthen the integrity and quality of naming practices with the original mission remains nominal rather than substantial. In the COVID-19 infodemic, multifarious monikers have become explicit consideration in the COVID-19 paper tsunami, and the global profusion of tangled hashtags has found its ways in daily communication. Just as the remarks of the editorial of *Nature*, "As well as naming the illness, the WHO was implicitly sending a reminder to those who had erroneously been associating the virus with Wuhan and with China in their news coverage — including *Nature*. That we did so was an error on our part, for which we take responsibility and apologize" (*9*). The stigmatized names somewhat aggravate the collective perceptual biases and contribute to recent backlash against Asians and

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diaspora (*10*, *11*). Thus, scientists must verse themselves in naming conventions and do not feed the trolls.

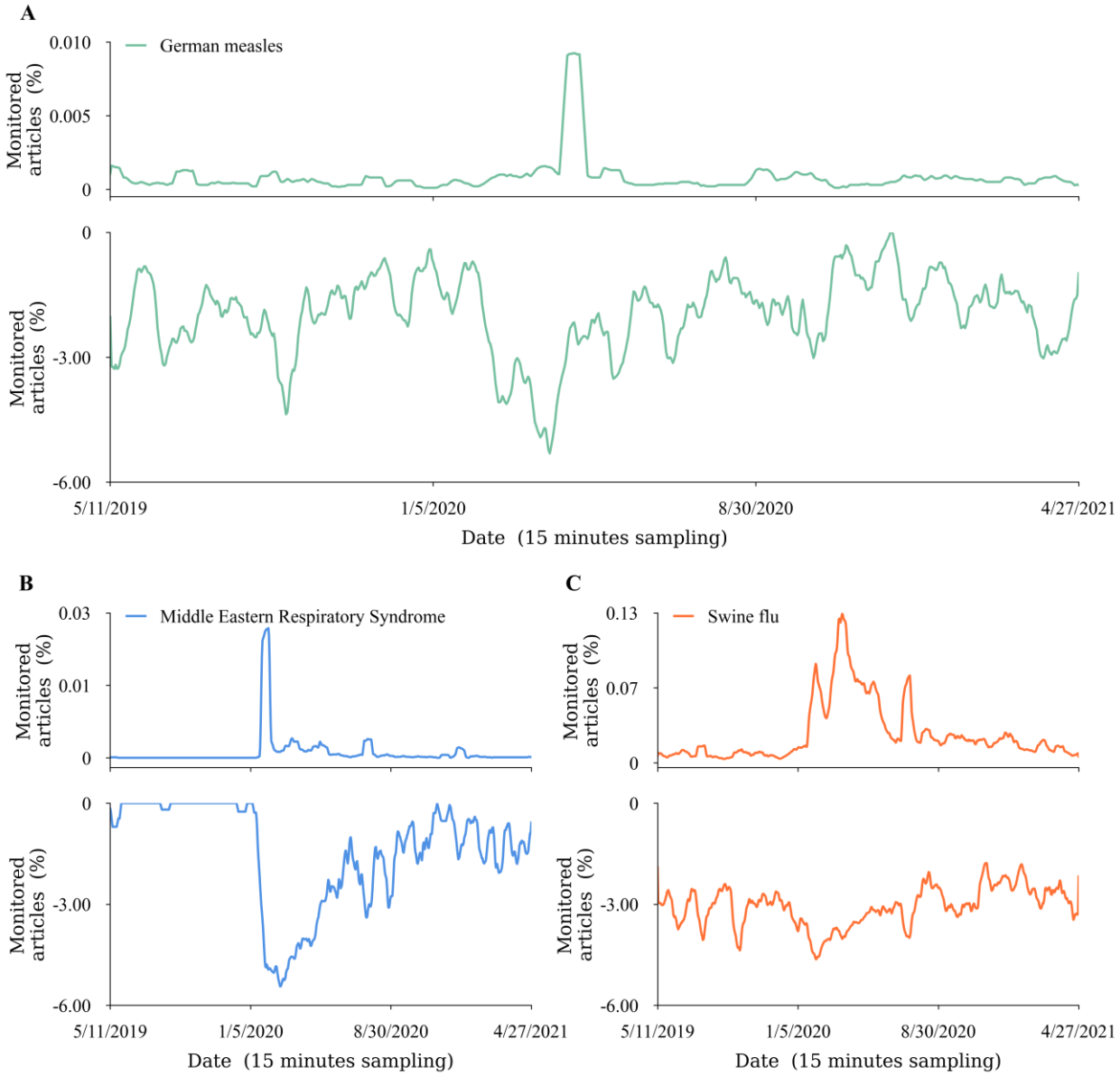

Fig. 1. Diachronic discourse and emotional tone of stigmatizing names in the past two years through GDELT Summary. The global instant news portfolio summarizes the textual and visual narratives of different queries in 65 multilingual online news: **A**, *German measles*; **B**, *Middle Eastern Respiratory Syndrome*; and **C**, *Swine flu*. The upper panels display the percent of all global online news coverage over time. The lower panels show the average emotional tone of all news coverage from extremely negative to extremely positive. The temporal resolution of sampling is 15 minutes per day.

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Terminological evolution on the wrong side of history

The diachronic discourse and lexical dynamics of synonyms *rubella* and *German measles* remain unclear (*1*, *3*, *12–15*). Arguably, the lexicographical and historiographical study promises to articulate the bedrock of scientific storytelling (**Fig. 2**).

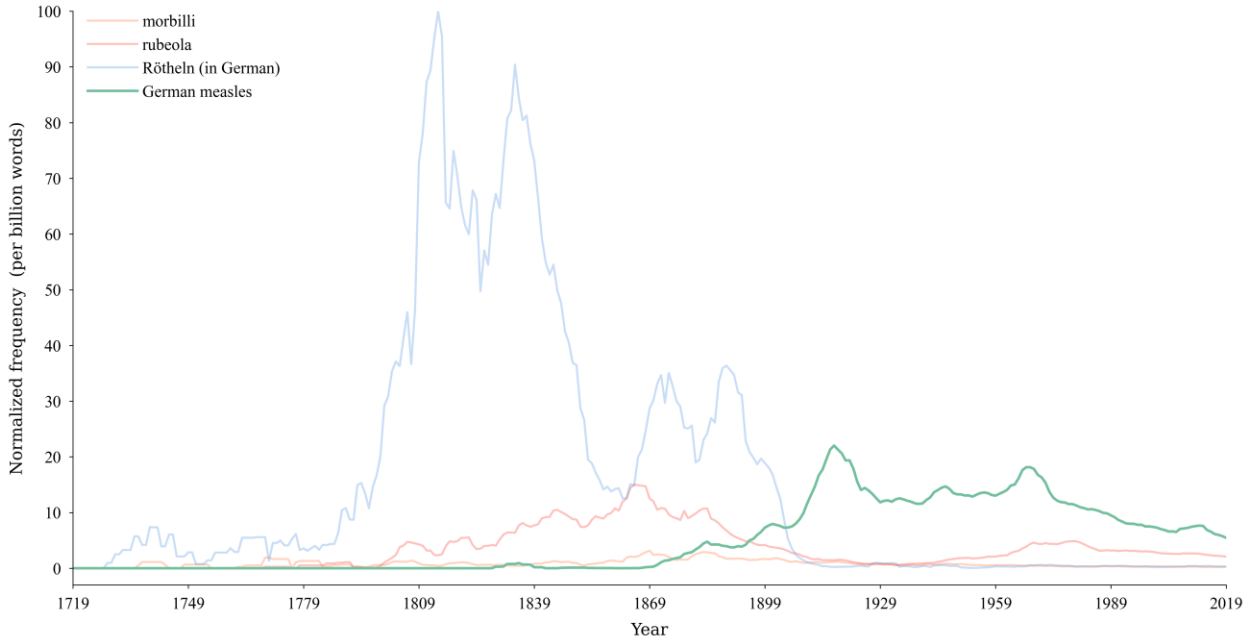

Fig. 2. Historiographical study. Google Books Ngram Corpus (GBNC) facsimiles the diachronic discourse of *morbilli* (English corpus), *rubeola* (English corpus), *Rötheln* (German corpus), and *German measles* (English corpus) from 1719 to 2019.

According to the *Oxford English Dictionary Online* (OED Online), the earliest known references to *German measles* and *rubella* date back as far as 1856 and 1866, respectively. In fact, their earliest usages could be stemmed back to about 1814 and 1768, respectively.

Clinically first described in 1740, and confirmed in 1752, the term *German Measles* was established as a separate disease in 1814, with the name *rubella* first used in 1768, and official recognition by the International Congress of Medicine in 1881. Shortly before (1768), for more learned occasions, *Rötheln* and *morbilli* seem more decidedly to mark a distinct disease, than any other yet proposed (*3*, *15*). Sauvages first applied the term *rubeola* in his Nosology to what had been previously termed *morbilli* in 1768. And while almost immediately after him, the German physicians, Selle, Orlow, and Ziegler, clearly laid down the distinctive marks between *rubeola* and *morbilli*. On April 4, 1814, Dr. George W. Maton read a paper entitled "*Some Account of a Rash Liable to be Mistaken for Scarlatina*" at the Royal College of Physicians in London (*16*), which results in the name *German measles* as a substitute for *Rötheln* (*3*, *12*). Then, the epidemic term *German measles* was accepted gradually as a synonym of *rubella*. *German measles*, *Rötheln* or *rubeola per se*, was officially ratified as a distinct disease at the 7th International Congress of Medicine, London, August 2 to 9, 1881 (*14*, *17*). A quarter-century later, the term *German Measles* has ultimately become the predominant usage. However, a curated name of human disease should

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be scientifically pithy and socially acceptable, with the faith of minimizing unintentional negative impacts on nations, economies, and people.

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Competing interests: The authors declare no competing interest.

Data Availability: All the metadata of compiled global online news coverage downloaded from the GDELT Project at https://api.gdeltproject.org/api/v2/summary/summary. All the metadata of historiographical study retrieved from Google Books Ngram Corpus (GBNC) at https://books.google.com/ngrams.

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Supplementary Materials for

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Materials and Methods

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Materials and Methods

Global online news coverage experiments

In the global online news coverage experiments, we orchestrated rich metadata available to unveil the scientific paradigms of the diachronic discourse and emotional tone. Here, the metadata analysis aims to demonstrate the emotional polarity of the public in the context of global online news on *German measles*, *Middle Eastern Respiratory Syndrome*, and *Swine flu* over time respectively.

Firstly, the curated codebook was designed by three main principles: (i) Search interest on the top of the ranks; (ii) Be formal and complete in spelling; (iii) As much as possible consistent with global crowd participant. According to the codebook, the search formulas in this survey are as following:

[1] **German measles**: *("German measles" OR "German Measles") AND PublicationDate>=5/11/2019 AND PublicationDate<=4/27/2021*

[2] **Middle Eastern Respiratory Syndrome**: *("Middle Eastern respiratory syndrome" OR "Middle Eastern Respiratory Syndrome") AND PublicationDate>=5/11/2019 AND PublicationDate<=4/27/2021*

[3] **Swine flu**: *("Swine flu" OR "Swine Flu" OR "swine flu" OR "Swine influenza" OR "Swine Influenza") AND PublicationDate>=5/11/2019 AND PublicationDate<=4/27/2021*

Secondly, based on the curated codebook, the metadata of compiled global online news coverage and emotional tone retrieved through the open project GDELT Summary between May 2019 and April 2021, including the textual and visual narratives of different queries in 65 multilingual online news (https://api.gdeltproject.org/api/v2/summary/summary).

Finally, by leveraging the capacity of GDELT's machine translate and neural network image recognition (*1*), the instant news portfolio in **Figure 1** summarizes the textual and visual narratives of different queries in 65 multilingual online news. The curves in the panels are smoothed by the moving average filter (MAF) technique for reducing random noise while retaining a sharp step response. A moving average filter of length L for an input signal $x(n)$ defined as follows:

$$y(n) = \frac{1}{L}\sum_{k=0}^{L-1} x(n-k) \text{ for } n = 0,1,2,3 \ldots$$

where the n of the moving average corresponds to the length L of the one-dimensional convolution kernel.

The results show that the global news outlets (in 65 languages) enjoy long-standing but flawed naming conventions with extremely negative tones, such as *German measles*, *Middle Eastern Respiratory Syndrome*, *Swine flu,* etc. This new finding suggests that some stereotypes of zoonotic diseases confounded the generally accepted paradigm at the cost of unintentional social impacts (*2–4*).

Historiographical study

The Google Books Ngram Corpus (GBNC) is a unique linguistic landscape that benefits from centuries of development of rich grammatical and lexical resources as well as its cultural context

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(https://books.google.com/ngrams)(*5*). It contains *n*-grams from approximately 8 million books, or 6% of all books published in English, Hebrew, French, German, Spanish, Russian, Italian, and Chinese. The GBNC covers data logs from 1500 to 2019. A unigram (1-gram) is a string of characters uninterrupted by a space, and an *n*-gram (*n* consecutive words) is a sequence of a 1-gram, such as *morbilli* (1-gram), *rubeola* (1-gram), *Rötheln* (1-gram), and *German measles* (2-grams).

In this study, by retrieving the use frequency of a specific lexicon in historical development, we can obtain a glimpse of the nature of historical evolution in **Figure 2**. Indeed, the new finding first bridges the knowledge gap — the terminological evolution of *German measles* is on the wrong side of history.

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