



# Frequently covered diseases in North Korean internal medicine journal *Internal Medicine* [Naegwa]—Secondary publication

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### Abstract

**Purpose:** This study aimed to investigate the distribution of research fields and diseases in the North Korean internal medicine journal by using a content analysis and a frequency analysis method.

**Methods:** All 2,092 articles published in *Internal Medicine* [Naegwa], a North Korean medical journal, from the first issue of 2006 to the last of 2015, were searched and classified by subspecialty of internal medicines, diseases, and classification codes of the Korean Standard Classification of Diseases version 6.

**Results:** In total, 1,392 out of the 2,092 articles were classified into the internal medicine field, with the remaining 700 classified as basic medicine, family medicine, or anesthesiology. Among the articles on internal medicine, most concerned the digestive system, followed by circulatory, respiratory, renal, and endocrine systems. Among the 700 articles in other fields, articles on gynecology were most common. According to the analysis of diseases, the most commonly studied in internal medicine were gastrointestinal diseases, hypertension, respiratory infectious diseases, glomerular diseases, and diabetes. Meanwhile, cerebrovascular diseases, herpes zoster, mental and behavioral disorders, and urinary tumors were most covered in the other fields. In the distribution by classification code of the Korean Standard Classification of Diseases version 6, circulatory and digestive diseases accounted for 42.4% of articles.

**Conclusion:** The results of this study are expected to be exploited to estimate the disease distribution and disease burden in North Korea.

### Keywords

Classification of diseases; Democratic People's Republic of Korea; Internal medicine; Journal publishing

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## Introduction

Despite some groups and researchers being allowed to contact or enter North Korea, it is difficult to study on North Korea [1,2]. The political and historical consequences of the South-North separation after 1945 and subsequent conflicts add to the difficulties of South Korean researchers seeking to access information on North Korea. In spite of those difficulties, research on North Korea is conducted steadily and actively in fields such as politics, economics, and sociology. However, even in those academic fields, it is still difficult to communicate with North Korean researchers or to acquire North Korean academic publications [3]. In the field of medical science, research has been mainly conducted through subjects accessible in South Korea due to the aforementioned limited access. The subjects of the studies were based on the official publications on North Korea by the South Korean government, sources available in interviews conducted with the North Korean refugees, or reports published by the organizations, such as World Health Organization (WHO), that have limited access to North Korea. The topics of the studies were mainly institutional contents such as health systems, health care systems, and medical education status [4-6]. Although there have been some studies on North Korean medical journals, there has been limited examination of the distribution of diseases, quality of medical care, and technology [3,7-10].

North Korea's important medical and public health problems are known to be infectious diseases, maternal health, nutritional problems, and health care systems. However, according to the Korea Foundation for International Healthcare [11], the non-infectious disease burden is also significant. WHO data points out that cardiovascular diseases were the major causes of death in North Korea. In addition, non-infectious diseases accounted for 65% of all deaths. According to a previous study analyzing the disease burden in North Korea, the burden of non-infectious diseases is also problematic [12]. According to the Korea Foundation for International Health Care [11], the present medical health situation in North Korea will be a serious problem if the North and South are unified. Therefore, it is necessary to know the prevalence of diseases in North Korea to grasp the actual condition of North Korea's health and medical situation.

According to Shin et al. [13] and the Korea Foundation for International Healthcare [11], there are 10 North Korean medical journals available in South Korea: *Goryeo Medicine* (North Korea traditional medicine), *Oral Medicine Ophthalmology Otorhinolaryngology*, *Basic Medicine*, *Internal Medicine*, *Pediatrics Obstetrics & Gynecology*, *Preventive Medicine*, *Chosun Pharmacy*, and *Chosun Medicine*. There are two government-owned publishing houses of journals. They have

been consecutively published since their respective first issuances. Given that the journals have been steadily published and there has been no significant change in the numbers of articles published, even during the economic recession of the country, the North Korean medical journals have been accumulating a valuable set of data on the medical concerns of, and results of the studies on, the local population. However, according to Kim and Lee [14], the North Korean government has been involved with the selection of researchers to contribute to the journals as well as their submissions. Therefore, North Korean medical journals have limited openness depending on the intentions of the government.

North Korea has not published epidemiological indicators either internally or externally. In addition, as mentioned earlier, South Korean researchers are not allowed to conduct direct studies on the North Korean people. However, North Korean medical journals, which are an accumulation of research results, are accessible from South Korea. Here, the importance and usefulness of the North Korean medical journals as subjects for objective understanding of the health care situation of North Korea have to be highlighted. Despite the fundamental limitations of research on North Korea, this study focuses on *Internal Medicine* [Naeggwa], a North Korean medical journal, which has the least political value among the other journals. The purpose of this study was to examine the contents of the articles published in *Internal Medicine*.

## Methods

### Ethics statement

This study is based on literature analysis; therefore, informed consent or approval by an institutional review board is not required.

### Material

The data source for this study was 2,092 articles published in the journal *Internal Medicine* from the first issue of 2006 to the third of 2015, obtained from the Information Center on North Korea (<https://unibook.unikorea.go.kr>). This accounts for 9% of the estimated 19,000 articles published in North Korean medical journals accessible in South Korea during the same period. Until February 2016, when the results of this study became available, a total of 9 North Korean medical journals had been available in South Korea, with *Internal Medicine* being the only one on the topic of internal medicine.

### Content and frequency analysis

For this study, two authors majoring in medicine and health sciences read the same articles thoroughly, extracted core and other information from each article, and exported their work

to spreadsheet file. The inputted data was confirmed by two authors as the final data for the study after cross-examinations. The core information includes three items: subspecialty of internal medicine, diseases, and the Korean Standard Classification of Diseases version 6 (KCD-6). Subspecialties were split into nine categories: infection, endocrinology, rheumatology, gastroenterology, cardiology, nephrology, allergy, hematology, and pulmonology. Articles not falling under these subspecialties are classified into the other fields. The articles related to the other fields cover 19 areas: family medicine, basic medicine, anesthesiology, urology, obstetrics and gynecology, pediatrics, neuroscience, neurosurgery, radiology, surgery, emergency medicine, otolaryngology, rehabilitation medicine, mental science, orthopedics, laboratory medicine, dentistry, dermatology, and “editorials, columns, and liberal arts.” The classifications of the articles in endocrinology, gastroenterology, cardiology, and pulmonology among the internal medicine categories were reviewed by clinicians currently working in South Korean university hospitals.

After reading the articles, we extracted the disease name from the titles. When two or more disease names were extracted, each author selected the name that was considered most appropriate after re-reading the article, and the representative disease name selected through agreement between the authors. The disease names were somewhat different from those used in South Korea; therefore, they were replaced with medical terminology consistent with South Korea’s disease names through a similar-term reunification process. For example, the North Korean term “rheumatoid” was replaced with “rheumatism,” “metopodynia” with “headache,” and “pe-gijong” (i.e., emphysema) with “pyegijong.” However, if a term could not be replaced by a South Korean version, the words and terms used in North Korea were used. In the endocrine, digestive, circulatory, and respiratory categories, higher classification items including disease names were added to confirm the distribution, based on the requests and advice of the faculty members who participated in the classification process. The endocrinology category included thyroid disorders, thyroid nodule, osteoporosis, diabetes, and autoimmune thyroid disease and tumor. The gastroenterology category included liver, biliary tract, peritoneum, gastrointestinal tract, intestine, and pancreas disorders. The cardiology category included hyperlipidemia, hypertension, other circulatory system disorders, other forms of heart disease, cerebrovascular disease, arterial and capillary disease, chronic rheumatic heart disease, congenital malformations, deformations and chromosomal abnormalities, circulatory disease, pulmonary heart disease, diseases of pulmonary circulation, and ischemic heart disease. The pulmonology category covered chronic obstructive respiratory diseases, respiratory system infections, tumor, and

asthma. The KCD-6 major classification codes were intended to match the names of the major diseases covered by the authors or to find the appropriate codes and ascribe the highest-level code element. For example, if the disease name was facial nerve disorders, the code G51 (corresponding to the disease name) was searched for, and then the upper-class code G was given.

## Results

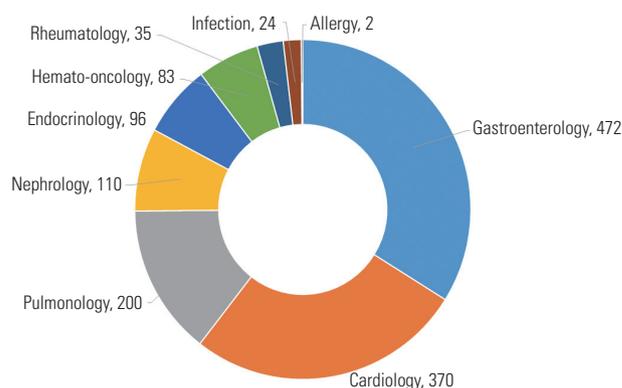
Out of 2,092 articles, 1,392 within nine subspecialties of internal medicine were identified, and 700 within the other areas. The nine sub-specialties of internal medicine ordered by frequency of occurrence are as follows: gastroenterology (472 cases, 33.9%), cardiology (370, 26.6%), pulmonology (200, 14.4%), nephrology (110, 7.9%), endocrinology (96, 6.9%), hematology and oncology (83, 6.0%), rheumatology (35, 2.5%), infection (24, 1.7%), and allergy (2, 0.1%) (Fig. 1).

### Subject distribution of the fields other than internal medicine

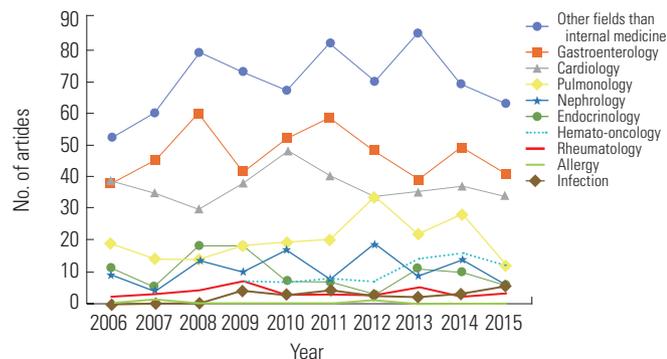
The number of articles related to the other fields was 700, ordered by frequency of occurrence are as follows: neurology (206 cases, 29.4%), basic medicine (188, 26.9%), dermatology (94, 13.4%), neurosurgery (40, 5.7%), psychiatry (34, 4.9%), urology (25, 3.6%), orthopedics (20, 2.9%), emergency medicine (9, 1.3%), and dentistry (1, 0.1%). The 43 remaining articles are the editorials and columns of the North Korean authorities that did not fall within the bounds of medical science.

### Publication trends by subspecialty

Over a decade (2006–2015), the trends in the publication of articles by subspecialty showed that there was no significant increase or decrease in the number of articles published (Fig.



**Fig. 1.** Sub-specialties of 1,392 articles in the field of internal medicine published in *Internal Medicine* [Naegwa] from 2006 to 2015.



**Fig. 2.** Publication trends by internal medicine sub-specialty among the 2,092 articles published in *Internal Medicine* [Naegwa] from 2006 to 2015.

**Table 1.** Major disease in the field of internal medicine that appeared in the North Korean internal medicine journal *Internal Medicine* [Naegwa] from 2006 to 2015

Sub-specialties	Disease name	Value (n=1,248)
Gastroenterology	Gastrointestinal diseases	131 (10.5)
	Liver diseases	88 (7.1)
	Biliary tract disease	57 (4.6)
	Intestine disease	46 (3.7)
	Tumor	46 (3.7)
Cardiology	Hypertension	79 (6.3)
	Ischemic heart disease	79 (6.3)
	Other forms of heart disease	68 (5.4)
	Disease of circulatory system	27 (2.2)
	Hyperlipidemia	24 (1.9)
	Tumor	1 (0.1)
Pulmonology	Respiratory infectious diseases	77 (6.2)
	Chronic obstructive pulmonary disease <sup>a)</sup>	29 (2.3)
	Asthma	22 (1.8)
	Carbon monoxide poisoning	18 (1.4)
	Tumor	18 (1.4)
Nephrology	Glomerular diseases	33 (2.6)
	Urolithiasis	11 (0.9)
	Acute renal failure	6 (0.5)
	Nephrotic syndrome	5 (0.4)
	Tumor	2 (0.2)
Endocrinology	Diabetes	43 (3.4)
	Autoimmune thyroid disease	17 (1.4)
	Thyroid disorders	4 (0.3)
	Tumor	2 (0.2)

Values are presented as number (%).

<sup>a)</sup>Including chronic bronchitis.

2). There were no changes in the issuing institution and issuing dates, and no increases in the frequency of issuance during the period. No significant changes in the number of articles in any particular subject area were observed. There were no remarkable changes in the occupancy of each subspecialty in terms of the number of articles. However, articles on infection had not been published at all before 2009, and two to five cases per year have been published since then. Articles on allergy were found in 2007 and 2012, one for each.

**Status by disease names**

Table 1 shows the status of the major diseases in the top five of the nine internal medicine subspecialties and the top five of the other fields. The diseases are ranked by subspecialty as follows: For gastroenterology, the order is gastroduodenal disease (131 cases, 10.5%), liver diseases (88, 7.1%), biliary diseases (57, 4.6%), and intestine diseases (46, 3.7%). For cardiology, the order is hypertension (79, 6.3%), ischemic heart disease (79, 6.3%), other forms of heart disease (68, 5.4%), circulatory diseases (27, 2.2%), and hyperlipidemia (24, 1.9%). For pulmonology, the order is respiratory infectious diseases (77,

**Table 2.** Major diseases in the areas other than internal medicine that appeared in the North Korean internal medicine journal *Internal Medicine* [Naegwa] from 2006 to 2015

Areas	Disease name	Value (n=700)
Neurology	Cerebrovascular diseases	59 (8.4)
	Cerebral infarction	23 (3.3)
	Neurological diseases	18 (2.6)
	Lumbosacral neuritis or radicular syndrome	16 (2.3)
	Tumor	3 (0.4)
Dermatology	Herpes zoster	15 (2.1)
	Tinea pedis	10 (1.4)
	Psoriasis	9 (1.3)
Neurosurgery	Tumor	4 (0.6)
	Cerebrovascular diseases	13 (1.9)
	Subarachnoid hemorrhage	5 (0.7)
	Tumor	1 (0.1)
Psychiatry	Mental and behavioral disorders	9 (1.3)
	Schizophrenia	4 (0.3)
	Dissociative [conversion] disorders	4 (0.6)
	Nonorganic sleep disorders	3 (0.4)
Urology	Tumor	9 (1.3)
	Prostatitis	3 (0.4)
	Urinary tract infection	3 (0.4)

Values are presented as number (%).

6.2%), chronic obstructive pulmonary disease (29, 2.3%), asthma (22, 1.8%), and carbon monoxide (CO) poisoning (18, 1.4%). For nephrology, the order is glomerular diseases (33, 2.6%), urolithiasis (11, 0.9%), acute renal failure (6, 0.5%), and nephrotic syndrome (5, 0.4%). For endocrinology, the order is diabetes (43, 3.4%), autoimmune thyroid disease (17, 1.4%), and thyroid disorders (4, 0.3%). The main organs or tissues of the cancers in the top five of the nine internal medicine subspecialties are as follows. For the gastroenterology, 16 cases of gastric cancer, 16 cases of liver cancer and eight cases of rectal cancer were studied. There were two cases each on colorectal cancer and mucosa-associated lymphoid tissue lymphoma. One case of pericardial mesothelioma was found in the cardiology area. There were 18 cases of respiratory system tumors, 13 of which are about lung cancer, and one peripheral case and one asymptomatic case. There were two cases of renal tumors, renal cell carcinoma and renal pelvic tumors. For the endocrinology, there were two cases, both thyroid tumors.

For the other category, research subjects are as follows (Table 2). For neurology, the order was neurological diseases (59, 8.4%), cerebral infarction (23, 3.3%), nervous system diseases (18, 2.6%), and lumbosacral neuritis or radicular syndrome (16, 2.3%). For dermatology, the order was herpes zoster (15, 2.1%), tinea pedis (10, 1.4%), and psoriasis (9, 1.3%). For neurosurgery, the order was cerebrovascular diseases (13, 1.9%) and subarachnoid hemorrhage (5, 0.7%). For psychiatry, the order was mental and behavioral disorders (9, 1.3%), schizophrenia (4, 0.6%), dissociative [conversion] disorders (4, 0.6%), and nonorganic sleep disorders (3, 0.4%). For urology, the order was tumor (9, 1.3%), prostatitis (3, 0.4%) and urinary tract infection (3, 0.4%). Five of the nine tumor cases were bladder cancers and four were prostate cancers.

### KCD classification result

Table 3 shows the classification result using the KCD's classification codes. The codes were assigned to 1,743 out of the 2,092 articles; the 349 uncoded articles were the editorials or columns of the North Korean government, introduction of knowledge on general medical science, experimental research not targeting specific diseases, and research and evaluation of specific medical technologies, devices, and software. According to the results of the classification, the main subjects of study were diseases of the circulatory system (396, 22.7%), diseases of the digestive system (344, 19.7%), neoplasms (138, 7.9%), certain infectious or parasitic diseases (126, 7.2%), diseases of the respiratory system (121, 6.9%), endocrine, nutritional or metabolic diseases (111, 6.4%), diseases of the genitourinary system (108, 6.2%), diseases of the musculoskeletal system or connective tissue (84, 4.8%), diseases of the nervous system (77, 4.4%), mental, behavioral or neurodevelopmental

**Table 3.** Number of articles classified according to KCD-6, published in *Internal Medicine* [Naegwa] from 2006 to 2015

Diseases according to KCD-6	Value
Diseases of the circulatory system	396 (22.7)
Diseases of the digestive system	344 (19.7)
Neoplasm	138 (7.9)
Certain infectious or parasitic diseases	126 (7.2)
Diseases of the respiratory system	121 (6.9)
Endocrine, nutritional or metabolic diseases	111 (6.4)
Diseases of the genitourinary system	108 (6.2)
Diseases of the musculoskeletal system or connective tissue	84 (4.8)
Diseases of the nervous system	77 (4.4)
Mental, behavioural or neurodevelopmental disorders	49 (2.8)
Diseases of the skin	49 (2.8)
Diseases of the blood or blood-forming organs	38 (2.2)
Symptoms, signs or clinical findings, not elsewhere classified	33 (1.9)
Injury, poisoning or certain other consequences of external causes	30 (1.7)
External causes of morbidity or mortality	21 (1.2)
Developmental anomalies	11 (0.6)
Codes for special purposes	4 (0.2)
Diseases of the visual system	2 (0.1)
Diseases of the ear or mastoid process	1 (0.1)
Total	1,743 (100)

Values are presented as number of articles (%).

KCD-6, Korean Standard Classification of Diseases version 6.

disorders (49, 2.8%), diseases of the skin (49, 2.8%), and diseases of the blood or blood-forming organs (38, 2.2%).

### Discussion

Through this study, we were able to determine which diseases are mainly covered in *Internal Medicine*, a medical journal in North Korea, and what kinds of diseases have been studied in the field of medicine. The main results revealed in this study can be used to estimate the current state of medical diseases in North Korea. The topics of gastroenterology, cardiology, and pulmonology were the highest. The number of articles in these three subspecialties, 1,042, accounted for 74.9% of the total 1,392 in the field of internal medicine. According to the KCD-6 classifications, the combined 861 cases of circulatory diseases, digestive diseases, and respiratory diseases were the most common. The neoplasms (138, 7.9%) were classified separately; however, the results of the KCD-6 classification are

not significantly different from the distribution results by subspecialty, considering that neoplasms are included as a disease name. It can be assumed that digestive diseases, circulatory diseases, and respiratory diseases cause a relatively high disease burden in North Korea, as confirmed by the WHO data [11]. Out of gastrointestinal cancers, the numbers of liver cancer and stomach cancer cases were high, at 16 each, whereas there were only two colorectal cancer cases. That is probably because North Koreans' eating habits are not the same as the western meat-based diets [15,16].

Cerebrovascular diseases, heart diseases, liver diseases, hypertension, and diabetes, are relatively common diseases in North Korea and it is estimated that the related disease burden is heavy (Table 1). These diseases require continuous medication and lifestyle correction for the management of diseases, which is difficult taking into consideration the economic and health situation of North Korea after a series of hardships [17,18].

It is difficult to determine the degree of a disease on the basis of the high frequency of studies on the specific disease in *Internal Medicine*. However, it is possible to estimate to some extent by supplementing several grounds, including the overall socio-economic situation of North Korea. For example, regarding the respiratory system, CO poisoning was the fourth most common subject (Table 1). It is not reasonable to judge that CO poisoning is widespread in North Korea, causing social loss, based on the above results. However, although it is difficult to judge the degree of the disease, it can be deduced that the socioeconomic situation of North Korea provides an environment in which North Korean medical researchers can continue to be interested in CO poisoning, and it can be assumed that the environmental impact is reflected in the number of articles dealing with the disease. This is because the socioeconomic situation of North Korea serves as a basis for assuming that North Koreans are more easily exposed to CO poisoning. According to Kim et al. [19], in North Korea the demand for fuel briquettes is very high because of the relatively cold winter, continuous need for heating, the chronic economic difficulties and power shortages. In this aspect, it can be expected that North Koreans, including medical researchers, are more exposed to CO poisoning.

*Internal Medicine* is a journal that deals with a specific subject area, but it has the characteristic that it covers the whole field of medicine. It also includes surgical subjects such as subarachnoid hemorrhage, as well as dermatological and psychiatric ones. This can be considered from two perspectives. First, when the results were of collaborative research conducted by a number of subspecialties such as interdisciplinary research, the author chose to submit the article to *Internal Medicine*. Second, because there were no academic journals dedi-

cated to topics such as neurology, journals such as *Internal Medicine* or their editors accepted articles in other fields. It is difficult to explicate why *Internal Medicine* reflects various medical topics only by these perspectives. However, it is likely that a hypothesis can be presented based on information such as the possibility of collaborative research by specialized fields, restricted number of medical journals in North Korea, and control of the North Korean government. This hypothesis can be verified through qualitative research including interviews with or questionnaires completed by North Korean refugees who had contributed to the North Korean medical journals.

*Internal Medicine* is believed to function as a space for independent academic exchange and sharing as a medical journal. Inside *Internal Medicine*, there is no instructions to authors such as submission guidelines, style and forms, or editorial policy. However, articles on the subjects of internal medicine have been continuously published through *Internal Medicine* (Fig. 2). In addition, there are few quantitative changes in the publication cycle and the articles covered. It is presumed that the information related to the contribution is communicated to the researchers through the North Korean authorities or that the North Korean medical researchers are aware of it in advance. In addition, there are no foreigners among the researchers who contributed to *Internal Medicine*. This suggests that *Internal Medicine* restricts the contributions to North Korean medical researchers living in North Korea. It is unique to North Korea to share research results in limited areas among a limited set of researchers. North Korea has few international exchanges, and academia is no exception. In the absence of exchange with the world, *Internal Medicine* seems to have continued its function by continuously publishing the articles of North Korean researchers.

The most important point in classifying the diseases covered by the articles in *Internal Medicine* was to apply an objective classification system and to make it sufficiently reproducible by other researchers in future. For the classification codes, KCD-6 was applied, which was made considering the characteristics of South Korea and meets the international standards. We also considered using International Statistical Classification of Diseases and Related Health Problems 10th revision (ICD-10), but decided that it was appropriate to use the KCD-6 to understand the structure of the code and reduce the amount of time it takes to identify the content on the diseases that corresponds to individual codes, given that the South and North use a single language. Moreover, we thought that KCD-6 was not significantly different from ICD-10, and since we would check only the differences if it were necessary to change to ICD-10, it would be appropriate for a limited research period. During the study, KCD-6 was revised to the next version, KCD-7, but at the time of revision, this paper

was already in the result analysis phase, which made us unable to reflect the revision. This should be redressed when similar studies are conducted in the future. It is better to consider using a recent version of ICD rather than KCD when conducting comparative reviews with international studies.

Studies on North Korea, including this article are accompanied by a qualitative approach in interpreting the results, and therefore much effort is required. This is because we have difficulty in maintaining objectivity for research subjects due to preconceptions, as well as lack of prior knowledge and objective information about them [20].

In conclusion, it was possible to understand the topics of North Korean internal medicine journal *Internal Medicine* by searching all articles published from 2006 to 2015. Major topics were gastroenterology, cardiology, pulmonology, nephrology, and endocrinology. The results of this study are expected to be exploited to estimate the disease distribution and disease burden in North Korea.

### Conflict of Interest

No potential conflict of interest relevant to this article was reported.

### Data Availability

Please contact corresponding author, Dr. Yo Han Lee to access the raw data of article.

### Supplementary Material

Supplementary file is available from the Harvard Dataverse at: <https://doi.org/10.7910/DVN/5OATIR>.

**Suppl. 1.** Files generated for analysis of data.

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