



Achieving Sustainability and Environmental Justice in South Korea's Dental Sector: A Data-Driven Approach Informed by Public Opinion

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INTRODUCTION

Environmental Justice in Dentistry

- Equality in dental resource allocation: This is about ensuring fair access to dental care, which can mitigate oral health disparities
- Equality is critical as disparities in access can lead to worse health outcomes and higher environmental impact
- Equitable distribution of dental resources promotes environmental sustainability by reducing unnecessary travel for patients (thus lowering carbon emissions) and fostering local economies
- By ensuring resources are spread efficiently, we decrease waste and enhance the overall sustainability of the dental sector

Public Understanding and Influence

- Shapes policy development and discourse
- Indicates societal values and priorities in healthcare
- Reveals insight into potential public support for sustainable dental practices

Why is examining public understanding important?

- Understanding public perceptions can inform policymakers on where the public stands on the issue
- When the public is aware and understands the issues at hand, they are more likely to participate in discussions, contribute ideas, and support policy changes
- Public understanding of such issues can highlight areas of misconception or lack of knowledge

MATERIALS & METHODS

For the research, we gather public commentaries (replies) of news articles related with disparities of dental resources.

Data Collection

- Gathering articles and their replies related "Dental Regional Disparities" and "Dental Care Gap" using South Korean news portal (Naver News)
- Total 2,339 articles and 28,984 replies are gathered
- Remove redundancies and irrelevant articles: 2,025 articles and 22,355 replies are used in the analysis (Fig. 1)

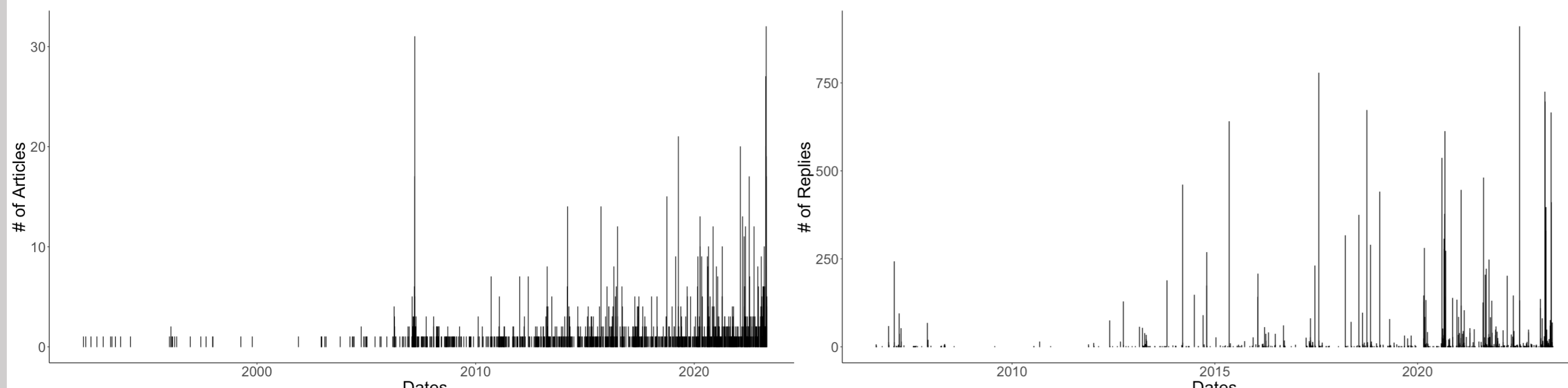


Fig. 1. Number of Articles and Replies Related with Disparities of Dental Resources

Methods

- Applying BERTopic¹ for topic modeling²
- For BERT³ model, *ko-sroberta-multitask*⁴ is used to clarify the themes of Korean replies

¹ A topic modeling approach that utilize the BERT language model to identify key themes or 'topics' in a collection of text data, allowing easy understanding of the main discussion points.

² A type of machine learning technique that sifts through large amounts of text data to identify recurring themes or 'topics'

³ An advanced AI technique that understands the context of words in text data to provide more accurate language processing, which is published in 2018 by Google and change the research modality of language models

⁴ <https://huggingface.co/jhgan/ko-sroberta-multitask>

RESULTS & DISCUSSION

Result: General Themes of Replies to "Dental Disparities" Articles

- 19 themes* are selected to make a cohesive result for all replies (Fig. 2)
- 4 main groups are identified: (a) Number of doctors and facilities, (b) public health policies, (c) political agendas, and (d) COVID-19 related issues (Table 1)

* BERTopic algorithm make an outlier group, giving (k-1) result

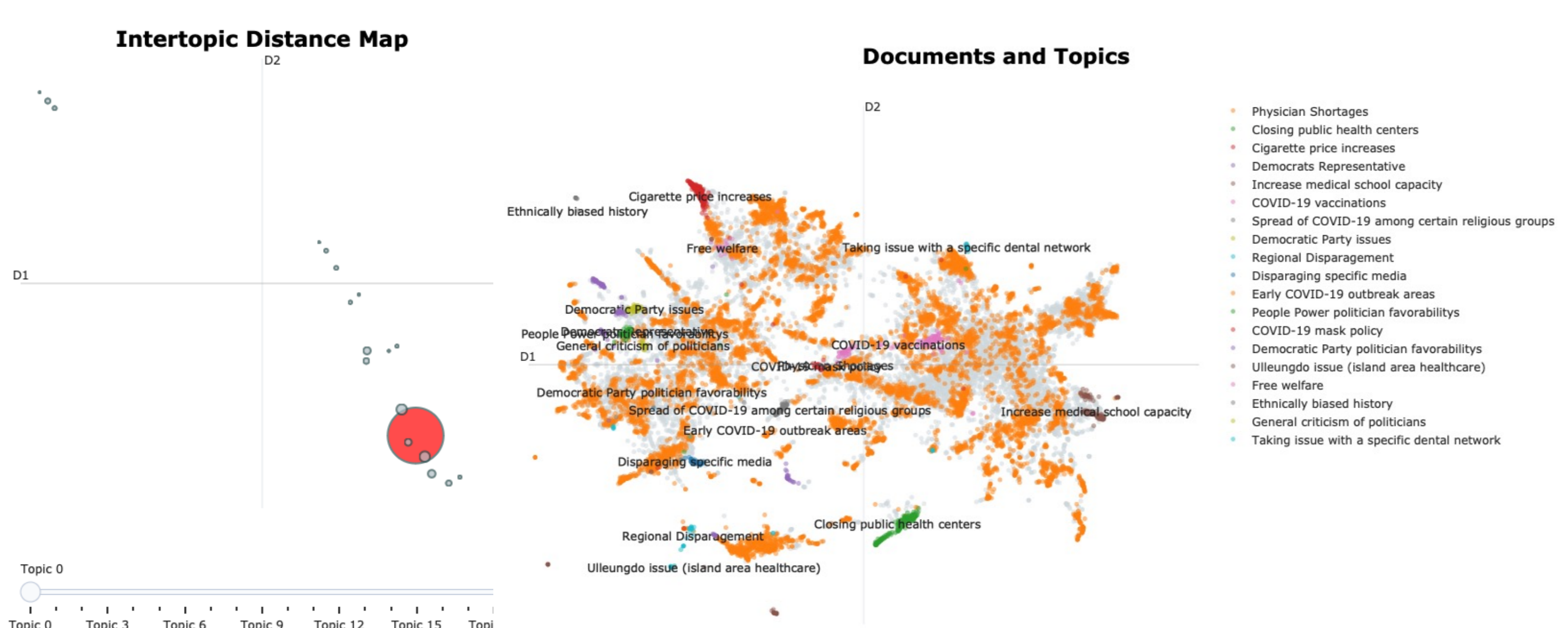


Fig. 2. Topic Visualization of All Replies of the News Articles

Label (English labels set by authors)	Words (Korean)				
Physician Shortages	의사	으로	..	에서	의료
Closing Public Health Centers	진주	###	의료	경남	병원
Cigarette Price Increases	담배	올리	인상	세금	건강
Democrats Representative	###	공약	지사	시도	추천
Increase Medical School Capacity	정원	의대	늘리	늘려야	확대
COVID-19 Vaccinations	한 의사	접종	백신	의학	화이자
Spread of COVID-19 Among Certain Religious Groups	교회	신천지	목사	교인	종교
Democratic Party Issues	민주당	더불어	후보	법안	ㅋㅋ
Regional Disparagement	전라도	경상도	라도	남원	경상
Disparaging Specific Media	KBS	방송	공영	어용	언론
Early COVID-19 Outbreak Areas	대구	시장	공감	경북	세요
People Power Politician Favorabilities	###	도로	화이팅	누리	승리
COVID-19 Mask Policy	마스크	세요	지금	출서	마다
Democratic Party Politician Favorabilities	부산	###	후보	시장	출마
Ulleungdo Issue (Island Healthcare Accessibility)	울릉도	울릉도	이하	기자	??
Free Welfare	무상	지금	공짜	복지	구제
Ethnically Biased History	신라	기록	홍노	민족	다는
General Criticism of Politicians	선거철	선거	ㅎㅎㅎ	지방	ㅎㅎ
Taking Issue Of A Specific Dental Network	유디	치과	과잉	진료	광고

Table 1. 19 Themes of Replies and Categorization* * Names of Politicians are masked with # (Green: # of Doctors, Yellow: Public Policies, Blue: COVID-19, White: Political Issues)

Result: Time-Dependent Themes Change of Replies

- Replies are separated by 3 timeframes (Table 2)
 - 1992-2013: Separation of dispensary from medical practice (2000), first Doctors Strike
 - 2014-2019: After second Doctors Strike over telemedicine issues (2014)
 - 2020-2023: COVID-19 and third Doctors Strike over medical school expansion (2021)
- Themes are categorized by 4 domains (Doctors, Public Health, Politics, Regional/COVID-19)

	1992-2013	2014-2019	2020-2023
# of Doctors	Nurses vs. Nurses' Aide Physician Salary Privatization of Medicine Sufficiency of Numbers of Doctors Claim Doctor Blaming Blaming the Doctor Strike	Division of Physician and Dentist Taking Issue with a Specific Dental Network	Physician Shortage Nurses' Working Condition Refusal of Medical License Board Examination
Public Health	Shortage of Local Health Centers Problems of Medical Military Service Obligation Separation of Drug Dispensary Medical Law Complaints of Medical System from Physician Side	Increasing Retirement Age Closing Public Health Center: Support Closing Public Health Center: Criticism National Pension System Issue Medical (Military) Service Obligation: Support Medical Military Service Obligation: Blaming	Cigarette Price Increase Dental Care Costs Ulleungdo Issue (Island Healthcare Accessibility)
Politics	Democratic Government Criticism Gender Equity Issue	Blaming Journalist Supporting a Certain Politician Labor Issue Judiciary Penalties Regional Issue (Politics) Biased Statistics Blaming a Certain Politician Gender Conflict	Blaming Journalist Disparaging News Media Blaming the Government Blaming Democratic Party Regional Issue (Politics) Partisanship Education Policies Mentioning Specific Politician
Reg/COVID	Regional Features Regional Gap in the Capital Poverty	Public Land Ownership Regional Gap in the Capital	COVID-19 Vaccinations Regional Gaps Blaming Religion Blaming Certain Religious Group

Table 2. Time-Dependent Themes of Replies and Categorization* (Green: # of Doctors, Yellow: Public Policies, Blue: COVID-19, White: Political Issues)

Summaries

- For replies, 4 main groups are identified
- These domains are related to environmental justice issues
 - Equitable distribution of medical/dental professionals reduces travel-related emissions
 - Public health policies can encourage sustainable practices
 - Political will is crucial for implementing environmental measures
 - Regional disparities underline the need for resilient dental care system

DISCUSSIONS & CONCLUSION

Challenges and Considerations

- The connection between the four main domains and environmental justice is not deep, necessitating their expansion toward financial benefits, professional development opportunities, and infrastructures
- Given the significance of news articles in influencing the public sphere, we need to consider the expressed distrust towards journalists, acknowledging potential biases due to our sole reliance on newspaper articles, and aiming to mitigate this distrust

Equitable Distribution of Dental Resources

- The need for policy reform to ensure equitable distribution of dental resources, considering public concerns about number of professionals and facilities
- The redistribution of resources would allow universal access to quality dental care, striking a balance between public and private funding
- Needs of incentives and strategies to address political challenges in increasing the number of dentists in rural settings

Sustainability and Environmental Justice in Dentistry

- Fair allocation of resources and reduces environmental impact of dental practices align with principles of medical justice theory and dental ethics
- Emphasis on the environmental impact of dental practices, suggesting that balanced resource utilization and reduced environmental strain contribute to a sustainable and environmentally just dental care system
- Bridging these key domains and justice theory can provide a comprehensive framework for stakeholders to promote sustainability and environmental justice