FLUORIDE

Investigating the Influence of Lobbying Groups on Government and Political Actions Regarding Fluoride Regulation

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ABSTRACT

Objective: This study has explored lobbying strategies, including public relation efforts, lobbying intensity, political communication, moderated by media coverage, on government actions and public opinion towards fluoride regulation. It is based on the Resource Dependence Theory and the responses gathered from the residents living in high fluoride areas in China and Pakistan from 700 respondents.

Method: Structural equation modeling with SmartPLS 4.0 was used to analyze the proposed model. The public relation efforts ($\beta = 0.257$, $p < 0.001$), lobbying intensity ($\beta = 0.211$, $p < 0.001$), and political communication ($\beta = 0.103$, $p = 0.025$) have positive and significant impact on public opinion, which further mediates the effects on government actions on fluoride regulations ($\beta = 0.412$, $p < 0.001$).

Results: This study also elucidates the moderating effect on media coverage and results showed that media coverage ($\beta = 0.109$, $p = 0.012$) moderates the relationship between public relation efforts and public opinion.

Conclusions: This current research has established the importance of public opinion in supporting the actual government's decision and its implementation. Thus, this study is significant as it provides useful insights to policymakers and even lobby groups.

Key-words: Lobbying strategies, Public opinion, Government regulation, Fluoride policy, Resource Dependence Theory.

1. INTRODUCTION

In the world of public policy and health regulation, it all comes down to understanding why the government makes its choices about how best we can be protected. One regulatory debate that has sparked heated discussion, and profound implications for public health is the regulation of fluoride in public water systems [1]. The conflict over community water fluoridation is among the fiercest battles of public health, environmental sustainability and political policy. Fluoridation of public water supplies has been commonplace in many countries since the middle years of the last century, after studies have shown it to be effective at reducing dental caries [2]. Many countries add fluoride, a naturally occurring mineral, to the public water supply to help prevent tooth decay. The addition of fluoride to water supplies for health benefits has been controversial, and prevention programs in European countries have faced opposition focusing on minor or serious adverse effects, i.e., dental fluorosis; skeletal fluorosis; mental disorders [3] as shown in the Figure 1. Such concerns have fueled a polarized debate, with vocal advocates and opponents of fluoridation.
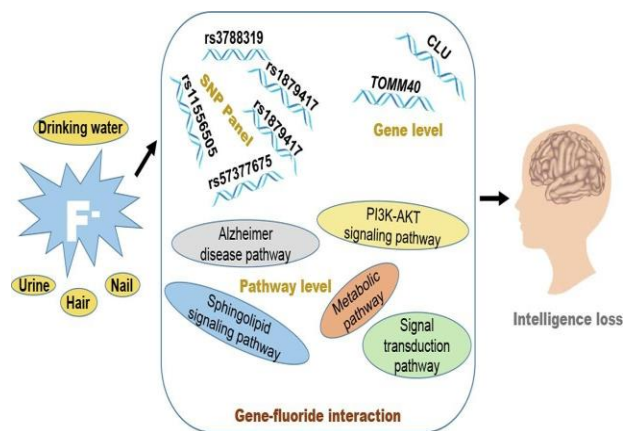

Figure 1: Potential health risks of fluoride. Source: [3]

In areas of great public health consequence, industry or other lobbying groups are instrumental in influencing policy and regulatory decisions which impact the healthfulness of diet [4]. Lobbying groups - such as industry associations, public health organizations and environmental advocacy groups - use a host of methods for gaining advantageous outcomes from policy decisions. The impact of lobbying from a variety of sectors - including PR and political communications concerning the regulation on fluoride in government practice is still an area that requires intense study [5]. Well-developed economy

countries have employed a variety of strategies to regulate fluoride, from the establishment of severe fluorosis standards/limits for maximum contaminant levels (MCLs), to extensive public education campaigns or provision of alternative drinking water supplies like bottled water. Mullen et al., 2017) For example, the U.S. has set standards of optimal fluoride concentrations in drinking water (U.S Public Health Service 2015), while European countries have different regulations reflecting alternative public health priorities and political landscapes [5]. Despite the strong scientific and public health rationale for these actions, research to date has not been comprehensive in examining added layers of complexity involving lobbying intensity (LI), political communication messages that promote self-governance over regulation, media coverage during legislative debate on REGS., or state-level general population opinion favoring additional gun control legislation.

The public relation activities about fluoride regulation involve preparing messages with the aim of informing or influencing and delivering them to the target audiences in order to build a favorable image. Lobbying effort is the direct amount of time and resources spent to influence policymakers in meetings, policy briefs or monetary contributions. This involves what is called political communication - the strategic interactions between a lobby group and government to steer governmental actions toward their objectives. Media coverage: is the fourth estate of democracy, as media covers issues and helps the public make informed decisions or viewpoints regarding information [6]. Knowledge of the nature of these lobbying efforts and their influence is essential to promote a more cohesive evidence-based government response. Public opinion is very important in the democratic process because it can and does affect elected officials as well as regulatory bodies. Hence an examination of the strategies used in lobbying, political communication and media coverage will provide insights into how public opinion is leveraged to give way for government decision on regulating fluoride.

The present study aims to explore these complex relationships amongst lobbying groups, and government intervention strengths in fluoride regulation. This research aims to address the research questions: What are the public opinion (PO) changes in fluoride regulation after different interest groups organized their own public relation effort (PRE)s? How does lobbying intensity (LI) affect government action related to the regulation of fluoride? What role,

if any, does political communication (PC) play in shaping public opinion and government action on fluoride regulation? To what extent might the influence of media coverage (MC) affect public opinion and government action regarding fluoride regulation?

This study seeks to address these questions by providing a nuanced understanding of how lobbying groups influence public opinion and regulatory decisions in the case of fluoride regulation. This research approaches this question by utilizing Resource Dependence Theory (RDT) in order to study the various ways that organizations rely on resources like information, stakeholder support and political connections to achieve their goals. The study will employ RDT for explaining how lobbying groups exert influence on public opinion and government policy solutions. The findings of this research may help not only in contributing knowledge to academia but also provide some very handy tools for shaping public health policy and governance, although this may alarm some.

2. THEORETICAL BACKGROUND

Over the past few decades, the power of interest groups and lobbying has played a massive role in determining public health policy. Lobbying efforts particularly affecting public health interventions including vaccination campaigns, tobacco control and environmental health regulations have been widely documented. Theories in public policy and health communication have long recognized the importance of strategic communication, resource dependence, and model rationality as mechanisms to determine how interested parties navigate these ensuing processes towards specific outcomes [7-9].

Resource Dependence Theory (RDT) provides a valuable model for understanding organizational behaviors in the contexts of resource acquisition and dependency [10]. It emphasizes that organizations must obtain important resources from their external environment to survive and reach the organizational goals. RDT has been used in public health policy to interrogate the influence of different health policies, from vaccination campaigns through to tobacco control measures. RDT suggests that organizations, including the aforementioned lobbying groups act strategically to deal with their dependence on critical resources like information, financial assistance and political leverage. RDT is commonly employed by

health advocacy groups as a theory of image to serve their tactical goals for raising money and political support with anti-smoking initiatives. For example, RDT has been applied to study strategic behavior of firms in the environmental health sector where obtaining regulatory support and public approval is vital [11].

In the context of fluoride regulation, the analysis of RDT has demonstrated the potential for lobbying groups to manipulate and use their resources in an information market. This study adopts RDT to examine a set of inter-construct relationships: the role that public relation efforts (PRE) play in shaping Public Opinion expressions about fluoride regulation; how lobbyists influence government actions towards regulating fluoride through lobbying intensity (LI); political communication's (PC) effects on both PO and governmental actions, as well as media coverage effects (MC).

The strategic management of resources forms one important aspect to RDT, explaining a great deal about organizational behavior and policy influence. The importance of strategic resource management has been well-highlighted when exploring research on policy. RDT also provides insights on how organizations can strategically combine resources using alliances, mergers and acquisitions in the field of corporate governance to circumvent external dependencies throughout research. In public health, RDTs have been used to identify how reliance on funding and regulatory support constrains health sector's ability to deliver appropriate intervention due of the need for adequate resources [12].

Lobbying (defined as effective means of controlling and influencing policy outcomes) is an attractive mechanism to ensure that fine-grained information can be disseminated strategically, supported by resources management. It can be politically difficult, especially when multiple interests with different perspectives are involved as is the case for fluoride regulation [13]. These strategies can be useful in mitigating the policy influence and enabling organizations to maneuver effectively in a complex policy environment, strategic lobbying as well communication efforts through it. Recent literature has focused on strategic information dissemination and lobbying strategies.

RDT thus suggests how non-profits will need to maneuver out of dual dependencies and survival mode-both internally with organizational needs, including managing donor expectations and funding

requirements but also externally by creating both strategic relationships as well diversified revenue for sustainability. RDT provides an analytical lens to help understand how organizations strategically respond (or fail to do so) in relation their external dependencies and thus the adaptation or viability of organizational forms across complex, dynamic environments. This serves to highlight the critical role that comprehensive advocacy and structured evaluation play in health reforms, which have profound implications for policy outcomes resulting from strategic lobbying efforts and resource distribution.

In order to increase the theoretical and practical merits of present research, RDT was utilized for assessing external factors as moderators. This theory has been employed to examine organizations and inter-organizational ties. The RDT theory suggests that firms have needs to acquire essential internal and external resources, resulting in a resource dependency which acts as the main factor determining how organizations behave and form their strategies [14]. It consists of three main tenets, resource acquisition, dependency resolution and strategic conduct. The initial pillar, according to the existing literature, is the acquiring of crucial resources needed for an organization's existence. This second pillar assists in the management of these dependencies and helps to reduce resource scarcity risks. This third pillar is the various strategic behaviors by which organizations attempt to shape their environment and limit dependence, like creating partnerships or engaging in lobbying efforts.

To this end, the research argues that strategic lobbying and resource management is a mechanism by which we can appreciate impact on public health policy, fluoridation mandate. This kind of policy changes and corporate behavior is facilitated by effective lobbying and resource management in public health. And so it is that the alcohol and gambling, ultra-processed food and tobacco industries— as many have written about—spend large amounts of money to buy short-term political power by commercial interests in health policy [15]. Critics had argued that the direct lobbying strategies of corporate food industry were used to thwart public health policies in Guatemala and Panama-in both countries, proposed policy was treated as ineffective. This demonstrates the importance of understanding lobbying in its larger socio-political context. Finally, continued pressure from advocacy organizations on public health policy including fluoride regulation again highlights the need for more comprehensive

models to assess legislation and regulations in general.

Research shows that lobbying has effects on public health policy and interest groups largely determine how regulation turns out. An example that is perhaps only too well known by now, lobbyists of industries resistant to environmental policy have been effective in stalling or diluting regulatory responses. Similarly, the power of the food and beverage industry in shaping obesity-related public health policies reveals how selectively funding lobbying efforts can determine what policy issues are introduced or sidelined [16]. There are many ways the opposing lobbying efforts on fluoride regulation interact with public opinion and influence government actions. A highly active viral campaign by the American Dental Association (ADA) has promoted fluoride as a public health program for nearly 70 years, even though water fluoridation delivers no known benefit in reducing tooth decay due to its topical action. In contrast, anti-fluoridation groups like the Fluoride Action Network (FAN) have employed some of these same strategies but to generate concerns about harm and the various ethical issues that come with water fluoridation. While previous studies have contributed to an understanding of lobbying impacts, they fall short in meaningfully analyzing campaigning disparities between public health contexts and groups. Public relations and political communication researchers have long sought to better understand the ways in which different types of lobbying efforts might interact with one another as well as public opinion, policy debates, and regulatory outcome. Existing literature has mostly reported on single case studies or policy areas and therefore limited generalizability of the findings.

This research seeks to address these gaps by studying the strategic deployment of resources and lobbying activity in attempts to shape fluoride regulation, thus offering an enhanced understanding of public health policy influences.

3. HYPOTHESIS DEVELOPMENT

This study seeks examines the interrelations between public relation efforts (PRE), lobbying intensity (LI), political communication (PC) and media coverage on shaping public opinion (PO) as well as stimulating government actions (GA,) in terms of fluoride regulation. Using Resource Dependence Theory (RDT) as a theoretical framework, this paper helps to

explain what strategic efforts and communication channels help influence regulatory outcomes. The four constructs extracted from the proposed model in this research, namely (1) public relation efforts, (2) lobbying intensity, (3) political communication and (4) media coverage were defined as endogenous variables to depict their impact on government decisions about regulating fluoride discharge79 against public opinions. In addition, the model postulated public opinion as a mediator through which exogenous variables effect changes in government behaviors. Inspired by revelations made by [17] this study argues that the influence of public relation activity is further moderated by media coverage on public opinion and about the influence of strategic communication as well as lobbying.

Public relation efforts involve the selective disclosure of information and framing issues in such a way as to influence perception. Powerful public relation campaigns can shape public perceptions by focusing on particular benefits or risks with respect to fluoride regulation. The food industry in India uses PR even among policymakers to promote alternative versions of health, as is the case with several other countries [18]. For example, via a study on political practices by the food industry in Guatemala and Panama. This is an indication that significant efforts from public relation can be taken to shape opinions of the general population in favor or against health policies.

H1: Public relation efforts (PRE) significantly influence public opinion (PO) regarding fluoride regulation.

Another important independent variable proven to have an influence on public opinion is the lobbying intensity, which has been seen as how much and how energetically lobby activities are being performed. More lobbying strength means more eyes to see and ultimately influence, the public sentiment. There is evidence that well-financed and sustained lobbying can inform the public discourse on health policy [19]. The relationship between lobbying intensity and political contributions from harmful industries to government officials in Australia reveals the world of influence that intense lobbying can exert on public health policy decisions [20]. Intense lobbying on the part of pro- and anti-fluoridation groups in debate over fluoride regulation similarly demonstrates that it is not which side makes better arguments, but rather how hard they lobby to make their argument.

H2: Lobbying intensity (LI) is significantly associated with public opinion (PO) concerning fluoride regulation.

Political communication is the use of media, speeches and other forms to influence public opinion. This will in turn increase the effectiveness of political communication and enjoyment value as well public relations campaigns. Research suggests that strategic political communication, of all forms, be it in the use media or direct representation to public opinion upends upon how issues are framed toward an experience deemed desirable by them [21]. An effective political communication in the area of fluoride regulation makes public relation attempts and lobbying more likely with success to change public opinion. Studies on political communication that influence public perceptions reveal the importance of oversight of both traditional and digital media, making regulation a necessity to ensure fair presentation in political debates through the press [22].

H3: Political communication (PC) significantly influences public opinion (PO) regarding fluoride regulation.

The media coverage informs public opinion not only what the content is but how it will be framed. This media coverage can make or break the effect of your public relations campaign on popular opinion. Research has shown that media exposure can change how the public perceives an issue through salience or by emphasizing certain parts of a story and de-emphasizing others [23]. The way the information is presented in media coverage of fluoride regulation can either support or undermine public relations work. The greater the coverage and general support from media, a given public re1ations campaign may be more effectual on its own in swaying opinion. A study on media and public health policy alleged that there is evidence to suggest good PR can leverage considerable influence over the minds of large segments of populations - provided that the coverage is well-executed [24]. This indicates that media coverage can moderate the effect of public relation activities on shaping public opinion.

H4: Media coverage (MC) significantly moderate the relation between public relation efforts (PRE) and public opinion (PO) regarding fluoride regulation.

Public opinion is a very important factor and plays an integral role in government decisions. It applies

strong pressure on policymakers to act when public opinion is strongly in favor or opposed to a particular policy [23]. There is ample research showing that policy decisions tend to follow public opinion: Elected officials are much more likely to enact policies the broader population supports [25]. In the case of fluoride regulation, public opinion is influenced by the publicity activities, lobbying intensification, political communications, and media coverage and plays a role in shaping government

behavior. This relationship is also clearly demonstrated by many public health interventions where policy has been driven by political will.

H5a-c: Public opinion (PO) significantly mediates among (a) Public relation efforts, (b) Lobbying intensity, (c) Political Communication and the government actions (GA) regarding fluoride regulation.
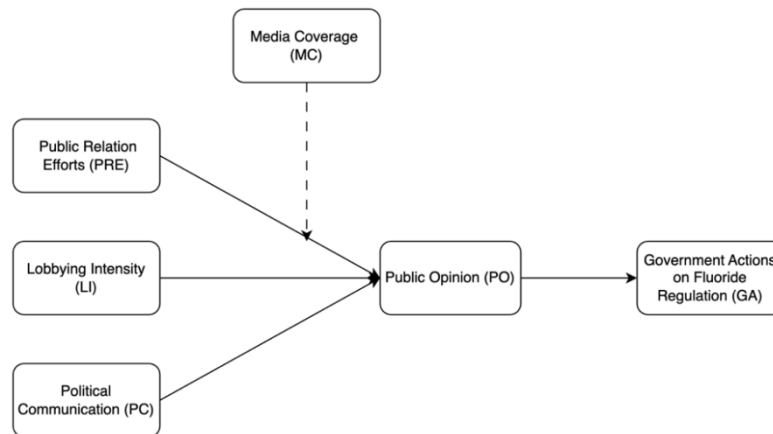

Figure 2: Proposed Model Framework

4. METHODOLOGY

The data for this study were collected online on an extensive survey to test the proposed research model. Due to the high fluoride level, this study was performed with residents in Shanxi Province in China and Sindh Province of Pakistan through direct communication. We selected these regions because they are particularly germane to the study of fluoride regulation and public health. This part describes what of the measurements, this sample and how data was collected.

4.1 Measurement

To ensure the content validity of these constructs, the authors adapted most of the items in this survey from

previous studies on which the scale was grounded. Table 1 summarizes the items adapted. Generally, the scale for public relation efforts, PRE, was adapted from Vento [26], while that for lobbying intensity, LI, was adapted from Saha [27]. Moreover, the scale for political communication, PC, was adjusted from Stewart and Coles [28]. Noting the media coverage, MC was adopted from [29]. Finally, the scales for public opinion, PO, and government actions on fluoride regulation were adjusted from [25] and [30] respectively. The survey adopted a seven-point Likert scale that provided responses as (1) Strongly disagree to (7) Strongly agree.

Table 1: Measures of construct.

Variable	Items	Source
Public Relation Efforts (PRE)	PRE1: The organization I work for is involved with public relations activities often used to shape the opinions of the general public.	[26]
	PRE2: We have advertising campaigns to try and shape public opinion about requiring fluoride regulation.	
	PRE3: We team up with politicians to push our anti-fluoridation agenda.	
Lobbying Intensity (LI)	LI1: Our organization spends significant resources on lobbying efforts related to fluoride.	[27]
	LI2: We frequently meet with policymakers to discuss fluoride regulation.	
	LI3: Our lobbying efforts have a significant impact on fluoride-related legislation.	
Political Communication (PC)	PC1: We use political communication strategies to influence policy decisions on fluoride.	[28]
	PC2: We maintain regular contact with government officials regarding fluoride policies.	
	PC3: Our political communication efforts help shape public policy on fluoride.	
Public Opinion (PO)	PO1: Public opinion on fluoride regulation is largely influenced by our campaigns.	[25]
	PO2: The public trusts our information on fluoride safety and benefits.	
	PO3: Our public relations efforts have positively shaped public opinion on fluoride.	
Government Actions on Fluoride Regulation	GA1: Government actions on fluoride regulation reflect our lobbying efforts.	[30]
	GA2: Policymakers often consider our input when making decisions about fluoride.	
	GA3: Our organization has successfully influenced government regulations on fluoride.	
Media Coverage (MC)	MC1: Media coverage of our efforts significantly impacts public perception of fluoride.	[29]
	MC2: Our organization works with media outlets to disseminate information on fluoride.	
	MC3: Media portrayal of fluoride issues aligns with our organizational stance.	

4.2 Sample and Data Collection

We used the online survey method and provided questionnaires in both English and local languages (Chinese and Sindhi). A pilot study was first conducted, in which 20 participants from Shanxi Province in China and Sindh Province in Pakistan were invited to participate in the survey. The participants were local residents, and their answers to the questionnaire included feedback, which was used to refine the measurement items. The modified questionnaire was distributed in March to May 2024 over a period of two months. We communicated with local community leaders and public health officials and requested them to distribute the link for the online survey to residents in their areas. Participants were assured of the confidentiality of their information and were requested to volunteer in the study by completing a questionnaire that explored their opinions on fluoride regulation. To increase the response rate, the researchers conducted a second round of follow-up with community leaders.

The link to the questionnaire was distributed to 1,000 residents, of whom 750 returned the questionnaires. A total of 50 responses were discarded due to incomplete information, resulting in a final sample consisting of 700 valid responses. We checked for non-response bias by comparing the responses from the questionnaires completed earlier with those completed later. The

results did not show any significant difference between the two groups. Hence, we conclude that our sample is not influenced by non-response bias.

Table 2 summarizes the demographics of the respondents in the final sample. The age of most respondents ranged from 25 to 50 years. Male and female respondents comprised 48% and 52% of the sample, respectively. Respondents who have lived in areas with high fluoride levels for more than 10 years comprised 60% of the sample. The vast majority of the surveyed population had at least a secondary education level (70%) and was aware of local public health policies (65%).

Table 2: Demographics of respondents.

Category	Percentage
Age (25-50 years)	75%
Male	48%
Female	52%
Lived in high-fluoride areas >10 years	60%
Secondary education or higher	70%
Aware of local public health policies	65%

5. DATA ANALYSIS

To assess our measurement and structural model, we applied the structural equation modeling using the SmartPLS version 4.0. SmartPLS is a highly operational method that combines the principal components analysis to establish CFA and regression to estimate both the measurement and structural model. It has also been very beneficial in dealing with formative measures and moderating relationships. According to [31], SmartPLS is not only capable of developing a formative model for the latent constructs but also does not make specific assumptions about the distribution of data and can manage complex models very well. Therefore, we used SmartPLS 4.0 software to run CFA and structural model testing in our study.

5.1 Measurement Model

We performed exploratory factor analysis using Smart PLS version 4 to test whether the measures' indicators can show factor loadings higher than 0.4. Results are shown in Table 3. EFA is typically used to check the accuracy of item-factor matching and prepare for factor relationship analysis. The EFA results indicate that the indices for the overall fit of the proposed model are valid because the resulting values fall within the desired cut-off for loading values. All values are above the recommended level, indicating a lack of cross-loading issues.

Convergent validity was assessed by testing the value of the factor loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE). The CFA results show that all item loadings are above 0.7. Next, we assessed the reliability and validity of the data using Cronbach's alpha, CR, and AVE. Cronbach's alpha is considered acceptable if it is 0.70 or higher, the variables in this study range between 0.723 and 0.892, which are considered satisfactory. The values for CR and AVE should be 0.70 and 0.5, respectively, or higher [32]. In this study, CR values range between 0.823 and 0.925, and those for AVE range between 0.608 and 0.755. Both results are above the recommended values, thereby indicating valid measures.

Table 3: Construct reliability and validity

Constructs	Items	Loadings	Cronbach Alpha	CR	AVE
Government Actions	GA1	0.806	0.831	0.885	0.657
	GA2	0.864			
	GA3	0.792			
	GA4	0.779			
Lobbying Intensity	LI1	0.872	0.892	0.925	0.755
	LI2	0.902			
	LI3	0.854			
	LI4	0.848			
Media Coverage	MC1	0.851	0.844	0.895	0.682
	MC2	0.852			
	MC3	0.837			
	MC4	0.758			
Political Communication	PC1	0.826	0.751	0.823	0.608
	PC2	0.804			
	PC3	0.705			
Public Opinion	PO1	0.695	0.723	0.83	0.621
	PO2	0.845			
	PO3	0.817			
Public relation Efforts	PRE1	0.690	0.728	0.847	0.651
	PRE2	0.846			
	PRE3	0.873			

The discriminant validity of the measurement model is assessed by comparing the square root of AVE for each construct with the inter-construct correlations (Fornell & Larcker, 1981). The results indicate that the square root of AVE for each construct is larger than those for all related inter-construct correlations, thus establishing the discriminant validity of all scales as shown in the table 4. For example, the square root of AVE for Government Actions on Fluoride Regulations (GA) is 0.811, which is higher than its correlations with Lobbying Intensity (LI) at 0.507, Media Coverage (MC) at 0.680, Political Communication (PC) at 0.006, Public Opinion (PO) at 0.412, and Public Relation Efforts (PRE) at 0.690. Similar patterns are observed for the other constructs, confirming that each construct shares more variance with its own indicators than with those of other constructs.

Table 4: Fornell-Larcker criterion

	Gov't Actions on Fluoride Regulations (GA)	Lobbying Intensity (LI)	Media Coverage (MC)	Political Communication (PC)	Public Opinion (PO)	Public Relation Efforts (PRE)
Gov't Actions on Fluoride Regulations (GA)	0.811					
Lobbying Intensity (LI)	0.507	0.869				
Media Coverage (MC)	0.680	0.365	0.826			
Political Communication (PC)	0.006	0.100	-0.058	0.780		
Public Opinion (PO)	0.412	0.405	0.302	0.154	0.788	
Public Relation Efforts (PRE)	0.690	0.489	0.577	-0.083	0.414	0.807

Meanwhile, the scores for variance inflation factor (VIF) were examined to assess the possible concerns of multicollinearity among the constructs. The resulting VIF scores range from 1.28 to 1.59, which are below the recommended threshold value of 10 [31]. Thus, multicollinearity is not an issue in this study.

Next, the structural model is tested using the data collected for the validated measures. Overall fit indices for the proposed model were calculated using SmartPLS 4. The resulting values are within the commonly accepted range. RMSEA is 0.057, which is lower than the suggested value of 0.10. CMIN/DF is 2.770, which is also within the accepted range. Moreover, IFI is 0.926, TLI is 0.914, and CFI is 0.926; these values are all above the suggested estimates of 0.90 (J. F. Hair et al., 2010). Thus, the results show a valid model fit.

In addition, given that all questions in the survey were answered by the same individual, the extent of common method bias was evaluated using Harman's one-factor test [33]. The threat of common method bias in the test is considered high if a single factor accounts for more than 50% of the variance [34]. The results show that none of the factors significantly dominate the explanation of the variance, in which the most influential factor accounts for 36.9% of the variance. Other evidence of common method bias includes exceptionally high correlations (r > 0.90) among variables. The inter-construct correlation matrix shows that the unusually high correlation in the sample is non-existent. Thus, common method bias is not a serious concern in this study.

Table 5: Heterotrait-monotrait ratio (HTMT) - Matrix

	Gov't Actions on Fluoride Regulations (GA)	Lobbying Intensity (LI)	Media Coverage (MC)	Political Communication (PC)	Public Opinion (PO)	Public Relation Efforts (PRE)
Gov't Actions on Fluoride Regulations (GA)						
Lobbying Intensity (LI)	0.562					
Media Coverage (MC)	0.833	0.421				
Political Communication (PC)	0.148	0.115	0.111			
Public Opinion (PO)	0.511	0.516	0.387	0.217		
Public Relation Efforts (PRE)	0.895	0.594	0.738	0.163	0.577	

5.2 Structural Model

The structural model was tested with the data collected for the validated measures. The overall fit indices for the proposed model are acceptable because the results are within the commonly accepted values. Chi-square/df is 1.832, RMSEA is 0.032, NFI is 0.931, IFI is 0.9420, TLI is 0.941, and CFI is 0.941. Considering that the results show acceptable model fit, we proceed to calculate the path coefficient.

The results show that the calculated path coefficients are significant. The results indicate that Public Relation Efforts (PRE) have a significant positive association with Public Opinion (PO) (H1:β = 0.257, p < 0.001). Lobbying Intensity (LI) has a significant positive association with Public Opinion (PO) (B2: β = 0.211, p < 0.000) and Political Communication (PC) has significant positive association with Public Opinion (H3: β = 0.103 p < 0.025). Thus, H1, H2 and H3 are supported. Moreover, media richness (MC) has significant positive moderating effect on public relation efforts (PRE) (H4: β = 0.109 p < 0.012). Furthermore, the results indicate that Public opinion (PO) significantly mediates among (a) Public relation efforts, (b) Lobbying intensity, (c) Political Communication and the government actions (GA) regarding fluoride regulation (H5a-c: β = 0.412 p < 0.000). Thus, we conclude that the hypothesized model is acceptable (Fig. 2).

Fig. 1. Results of model test.
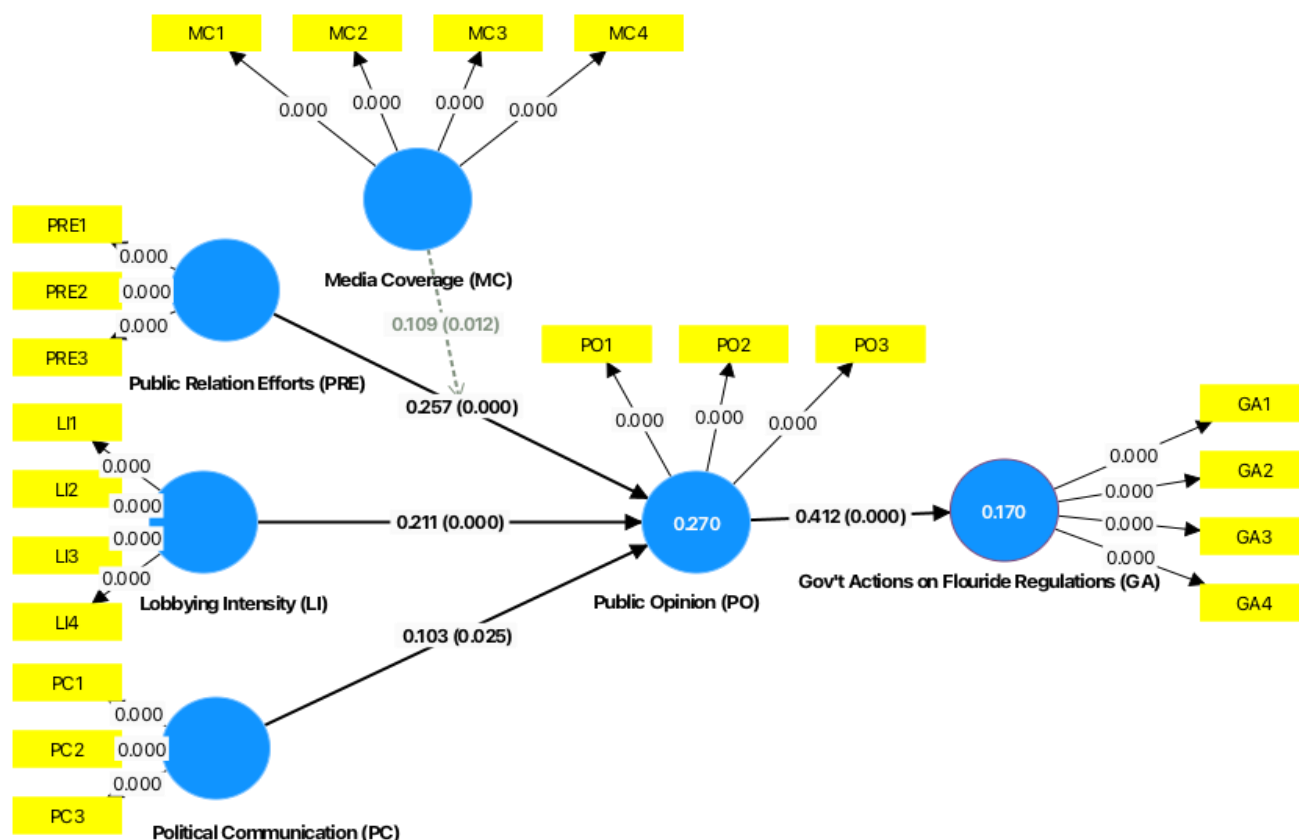
6. DISCUSSION AND CONCLUSIONS

Based on the Resource Dependence Theory (RDT), this study investigated how various lobbying strategies, including public relation efforts (PRE), lobbying intensity (LI), political communication (PC), and media coverage (MC), influence government actions (GA) and public opinion (PO) regarding fluoride regulation. Taken together, these findings illustrate the interplay between strategic communication and resource management in the formation of public health policy.

According to the results of our analysis, public relation efforts are positively associated with public opinion (H1: β = 0.257, p < 0.000). It means that the strategic information and issues framing by organizations play a crucial role in forming public perception. It is also in line with research concerning PR and health policy public opinion [35]. At the same time, lobbying intensity has a positive relation to public opinion as well (H2: β = 0.211, p < 0.000). It implies that high lobbying

expenses and regular lobbying activity tend to make public opinion more positive. Intense lobbying is regarded as coverage by visibility heuristic, as it is a visible indicator of pressure on politicians. High lobbying is associated with a positive public opinion and vice versa. The role of the indicator of the visibility heuristic is confirmed in our study, finding: Political communication also has a positive influence on public opinion H3: β = 0.103, p = 0.025. it means that the effective political communication strategies, including media management and direct interaction with political parties, make a significant impact on public relation efforts and lobbying intensity. The findings of this research are aligned with the previous research that highlights the critical role of political communication in shaping public policy and its results [36].

Interaction between media coverage and public relation efforts on public opinion was found to be significant (H4: β = 0.109, p=0.012) In turn, supportive media coverage facilitates the dissemination of information, increasing its prominence and credibility by contributing to public relations campaigns. Stewart and

Coles [29] found that media coverage can be influential in framing what the public thinks about an issue by bringing one facet of it-instead of another-to light.

H5b and c: The relationships between public relation efforts, lobbying intensity, political communication on the one hand and government actions regarding fluoride regulation (for H5a-c in a multiplicative model of media effects: H5a-c (β = 0.412; p < 0.000) are significantly mediated by public opinion as well. Arrigo and Acheson [37] use the gun issue as a successful example of this point precisely because public polls consistently show that policy making does not align with popular support for liberalized law, which arguably pro-gun groups have lobbied hard to encourage [37, 38]. The influence of lobbying on public opinion has been argued to put pressure on policymakers as a reflection of democracy where majoritarian interference significantly impacts regulatory decisions[39].

Our findings support the model, showing that strategic PR effort investments mediate lobbying activity, and which combined influence political communication intensity over media coverage to drive public opinion about whether government should regulate fluoride. The study highlights the means through which lobbying strategies and resource management influence public health policy development, with important practical implications for politicians and advocacy organizations. Future work could examine these dynamics across additional regulatory contexts to promote the generalizability of our results.

6.1 Theoretical Implications

This research makes important theoretical contributions by examining the intricate interdependencies among lobbying plans and government actions in relation to fluoride regulation. This study adds to the public health literature by emphasizing how lobbying activity matters for regulatory policy decisions. Using Resource Dependence Theory (RDT), this research explains how organizations use strategic communications and resource mobilization to influence public opinion, organize economically vulnerable citizens for political action that can shape government policy. This study is one of the first to extend RDT comprehensively into fluoride regulation, positing a unique theoretical explanation on the deference regarding lobbying activities and supine public health policies. Second, this research provides a nuanced understanding of the effects that lobbying and public relations intensity have on public opinion as well as government action. Thirdly, this study is among the few to acknowledge and proven how various aspects (i. e., public relation efforts, lobbying intensity political communication and media coverage) combine in regulatory influence rather than being individually considered. This method extends the theoretical framework beyond a traditional

concentration on individual lobbying strategies to capture the multi-faceted nature of policy influence. Fourthly, it contributes to media influence in public policy by showing that the effect of public relation efforts on public opinion is mediated through media coverage. Thus, this result highlights the role of media as a crucial intermediary able to enhance or occupy SC efforts. This research complements and expands on the agenda-setting theory by demonstrating how media outlets can influence public debates and policy outcomes. Lastly, the study also sheds light on how public opinion can mediate the relationship between lobbying strategies and governmental behavior. The mediating effect suggests the democratic nature of this process, wherein public opinion shapes policy outcomes. This study therefore contributes to the literature by showing how public opinion can serve as an intermediary mechanism that allows lobbying efforts undertaken at the behest of relevant stakeholders and patients, or some deliberately informal combination thereof, to influence governmental activity. By linking elements from these three fields in a systematic way our analysis brings us closer toward presenting a generalizable theory for understanding certain types of policy influences operating within contexts related directly (or indirectly) to public health topics.

6.2 Practical Implications

This study has several notable practical implications. Few studies are available which have brought to light such a clear and over-all conclusion, so this research provides numerous noteworthy practical facts for policymakers, regulators, public health agencies and fluoride lobbyists. First, the results demonstrate substantial effects of public relation efforts (PRE) on public opinion (PO). Stakeholders and public health advocates who demand removal of fluoride regulations are encouraged to consider investing in aggressive PR campaigns until most of the nation truly fears those idyllic, freedom-loving dentists. This means working with media campaigns and public figures to spread correct cogent messages. In this way, they can make sure the general public is informed about health policies and that the reasoning behind them is based on evidence. Secondly, this study highlights the role of lobbying intensity (LI) in molding public opinion and government behaviors. Therefore, fluoride lobbying organizations must set aside sufficient resources for this purpose and conduct regular meetings with key lawmakers along with creating detailed policy briefs. These efforts are essential for ensuring that the voices of both proponents and opponents of fluoride regulation are heard, leading to balanced and well- considered policy decisions. Third, we highlight the political communication (PC) dimension as a key element affecting public opinion and regulatory outcomes. Lobbying efforts can be maximized through efficient political communication strategies, such as by

maintaining a continuing relation with government officials and using different media. Policymakers should be willing to hear from various stakeholders in order to understand multiple perspectives and deliver well- informed public interest decisions. With respect to public relation efforts and the interaction with media coverage (MC) in shaping public opinion, Fourth this model uncovers how MC plays its critical moderated role between public relations efforts and public opinion. Media outlets must endeavor to give a full and fair account of fluoride-related stories in order that the public is properly informed.

Additionally, this would be an opportunity for advocacy groups and public health officials to work with the media in order to help get their message out on a state or local level. Finally, the mediating role of public opinion in the relationship between lobbying effort and government behavior underscores that attention to popular attitudes is important for an understanding policymaking. Officials ought to be conducting public if they are interested in aligning regulatory decisions with the community's views and worries listening to tours, consultations and local surveys. Also, public health campaigns should be designed to inform the general population of the benefits and risks involved with fluoride so that they are in a position to make an informed choice rather than remain misinformed.

6.3 Limitations and Future Directions

The study has the following limitations. First, our study examines only fluoride regulation and the role of lobbying in that context, so its generalizability beyond this issue is not clear. Second, the data is cross-sectional and therefore no causal inference over time can be made. We suggest that future work might consider a longitudinal design to disentangle the causal interplay between lobbying and opinion formation over time. Third, survey data were self-reported potentially causing common methods bias. However, future research should extend the validity of these findings by collecting data from multiple sources to mitigate any common method bias.

In addition to addressing these limitations, future studies should also further expand the subject of this study to regulatory problems other than fluoride. To illuminate these mechanisms, future research can investigate the impact of lobbying efforts on policy decisions (especially in vaccination or tobacco control and environmental regulations). Additionally, it would provide much needed context on the contemporary media environment by investigating how various forms of news influence attitudes and policy outcomes through new mediums like social media or digital platforms.

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