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The Role of Risk Perception in Acceptance of Public Health Service : Focus on Water Fluoridation in Incheon City

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Abstract

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The scope of public health services is expanding in the complex modern society. Health-related information spread rampantly, especially the issues surrounding health safety and effectiveness. Water fluoridation is one example. Initiated in the United States (U.S.) in 1945, the Korean government also implemented this service and the controversy about its political, moral, ethical, and safety issues still remain elusive in many countries that have taken the measures including the U.S. and South Korea.

Many studies have conducted the analysis of health benefit/risk, cost-effectiveness, and awareness of water fluoridation, but much less have been focused on the in-depth investigation into sociological reasons behind the two opposing views. It is important to know how the public perceives water fluoridation and find the effective ways of proper public health communication. Therefore, this study is focused on the risk perception of water fluoridation and its effects on the public in deciding whether to accept

or reject the service.

The data were collected with an online cross-sectional questionnaire survey on 527 Korean citizens in October, 2015. The participants were residents in the city of Incheon who are 20 to 59 in age. The components of the survey include individual characteristics (knowledge, experience, and worldview), media, outrage factor, trust, risk perception, and the acceptance level of water fluoridation service. Correlation analysis and multiple regression analyses were performed to explore the factors influencing water fluoridation risk perception and the acceptance level of water fluoridation service. The mediating effect of water fluoridation risk perception was validated by hierarchical multiple regression analysis and sobel test.

The mean age of the study participants was 40 years, with the proportion of men (51%) and women (49%). The mean water fluoridation risk perception was 4.12 (out of 7 interval scale), 59% (ratio scale), with 0.69 standard deviation (SD). The mean acceptance level of water fluoridation was 4.12 (out of 7 interval scale), 59% (ratio scale), with 1.29 SD. Analysis showed that media, outrage factor, and trust were significantly predictive of water fluoridation risk perception and the service acceptance. Moreover, risk perception of water fluoridation partially mediated the service acceptance.

This is the first study in South Korea which attempted to determine the influencing factors of acceptance level of water fluoridation service and its risk perception through the analysis of a survey in the city where controversy exists. The findings suggest that considering the risk perception of the individuals is critical in the process of developing public health services and policies. Also planning health communication strategies are necessary to build an effective public health system.

Keywords: Water Fluoridation, Public Health Service, Risk Perception, Media, Trust, Outrage Factor, Policy Acceptance
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1. Introduction

1.1 Background

Importance of public health service

Putting fluoride in a community water (water fluoridation) has been around 70 years since it first initiated in the United States (Dan, 2015), and is one of the longest public health services that has been around. Many official health organizations, such as National Academy of Sciences, U.S. Public Health Service, World Health Organization (WHO), Centers for Disease Control and Prevention (CDC) approved the beneficial effect of putting fluoride in a community water, such as preventing tooth decay (CDC, 1999; WHO, 1957). However, groups such as Citizens for Safe Drinking Water, Health Action Network, Citizens for Health, who oppose the water fluoridation, believe that it is against their will, and uncomfortable for putting chemical in drinking water. There are many contentious issues that people continuously debate since it was initiated (Freeze & Lehr, 2009). In 1957, WHO formed the advisory committee for the fluoridation of public water supplies and admitted that it is the most ideal policy to prevent tooth decay (WHO, 1957). However later in 1969, controversies raised the issue and concluded that more extensive scientific evidences are needed in decision-making (WHO, 1969).

Water fluoridation debate and current status

Since its first implementation in 1945, public drinking water fluoridation and its attendant conflicts have been continued (Freeze & Lehr, 2009). The main agendas for the debate are completely opposite with the same issues; first example is that supporters insist that it is good for preventing health – especially tooth decay. Opponents argue that it causes many damages to the health, such as cancer, brain damage, hip fracture, skeletal ossification, and so on. Another example is that supporters insist that water fluoridation is such a great public health service for health equity, because everyone gets the equal opportunity to prevent tooth decay. Opponents argue that it is against their will and such a compulsory public health service. Especially with the same issues, depends on how they perceive the object (water fluoridation in this case), the acceptance level of public health policy could be different (Augenstein et al., 1991; Barrett & Rovin, 1980; Bayless & Tinanoff, 1985; Ericsson, 1970; Martin & Groth, 1991; Parnell, Whelton, & O'Mullane, 2009; Waldbott, Burgstahler, & McKinney, 1978; Wulf, 1988; Yeung, 2008). The issues of water fluoridation have become more vigorous, especially with the number of opponents increased rapidly (Freeze & Lehr, 2009).

There are alternative ways to intake fluoride: fluoride tablets, including fluoride in a table salt, and receiving topical (surface) applications of fluoride from dentists. However, water fluoridation which is putting fluoride in a

community water has been favored because it is cheaper and requires no individual initiative (Martin & Groth, 1991).

[Table 1] indicates the opinions of water fluoridation and its oppositions.

Table 1. Controversial topics of water fluoridation

Support		Opposition
- Health prevention for tooth decay	**Basic stance**	- Uncontrollable and compulsory public health service
- Cost-effective, especially in vulnerable group - Less pain in treatment for tooth decay and missing teeth	**Effectiveness /Efficiency**	- Doubt about statistical evidence in preventing tooth decay - People can intake fluoride in different ways - Health diet and maintaining clean teeth is more important
- No significant evidence of side effects - Fluoride already exists in natural	**Side effects**	- Skeletal ossification in over-dose fluoridation - Excessive intake in infant and children is critical - Might cause allergy, hip fracture and cancer - Less research have been conducted other than oral health
- Other countries/regions have already initiated - Approved by WHO, CDC	**Policy process**	- Rejecting individual rights - Many other countries have rejected expect a few English-speaking countries

The South Korean government has been paying attention to water fluoridation because more than half (54%) of citizens are using tap water (includes drinking), and this is closely related to people's health (Yang, 2013).

Similar to the U.S., the debate is still raging in South Korea, especially in particular cities. For example, in the city of Kimhae, an organization called "City of Kimhae civilian meeting for the love of water" gathered with a

member of legislative assembly to protest over delayed referendum (Cho, 2015a, 2015b; Kim, 2015) in November, 2015.

Another example is the city of Incheon, where has 2.9 million populations and its location is nearby the capital city of Korea, hosted a fluoridation plebiscite in 2014 because one of the candidates to run for the city mayor, used water fluoridation as an election pledge and it became an issue. According to the survey, 58.8% of citizens supported fluoridation, 37.5% rejected, and 3.7% deferred. Compared to the first plebiscite, which was held in 2011, the percentage of rejection increased by 8.9% where the people who supported remained the same. Even the percentage of supporters was higher, the city still has not implemented water fluoridation yet, due to the opponents' strong rejection (Bae, 2014; Lee, 2014). To make things worse in October 2015, the national airport in Incheon area found large amount of fluoride. Out of 3 places they tested near the airport area, 2 places were found 500-600mg/kg amount of fluoride (standard is 400mg/kg) (Kim, 2015). No one knew for sure how the city of Incheon would respond with the situation.

Despite the role of general public in determining implementation or cessation of water fluoridation is important, the reason why they support or oppose water fluoridation remained poorly understood (Armfield, 2010). Most of the studies were done through socioeconomic and sociodemographic correlations of stance, which are all important. However, it is important to develop further from the causation of water fluoridation support and opposition.

Significance of the problem

The continuous study of water fluoridation is important, because it is one of the longest public health services which has happened and still is a contentious issue. Besides, even experts are arguing with their strong opinions. For example, in 2012, Harvard school of public health published an article that water fluoridation is harmful for neurological development in children (Dwyer, 2012). However a year later, the dean at the Harvard school of medicine wrote a letter that they support water fluoridation due to the benefit of oral health and its cost-effectiveness (Flier, 2013).

The growing demand for broader-based participation in decision-making on health issues with increasing technical complexity is at stake (Cronholm & Sandell, 1981). Especially in the case of water fluoridation since WHO announced that initiating water fluoridation should take into the consensus of the people, whether they initiate water fluoridation or not is up to the community residents. This proves the point that knowing the resident's perception of water fluoridation is essential component in decision-making.

Studies of risk perception with the issue of water fluoridation controversy are very limited. There have been many researches and studies of health benefits/risks and cost-effectiveness of water fluoridation, but much less have been focused on the in-depth investigation into sociological reasons behind the two opposing views. Especially, standing with a neutral stance is even less. Also, the issue of this topic was popular in the 1990s and not many studies

have been conducted recently. A lot of things have changed as we staged into a modern society, therefore, more studies are required in a current context with sociological perspective in water fluoridation.

1.2 Study objective

The objective of this study is to figure out affecting factors of water fluoridation risk perception and its policy acceptance. Specific study objectives are shown as below:

First is to understand the comprehensive current status of water fluoridation in South Korea and the public's risk perception through the most recent online-survey data. The factors that influence the risk perception, such as individual characteristics, media, outrage factor, and trust are investigated.

Second is to analyze the affecting factors of policy acceptance of water fluoridation. Through literature review, the study finds main variables to affect the policy acceptance, and to figure out whether the variables are significantly effective.

Last objective is to validate the mediating effect of risk perception of water fluoridation towards its policy acceptance. Through the literature reviews and this online survey, the study examines how much it could contribute to the previous studies.

2. Literature Review

2.1 Issue Description and historical background

2.1.1 Water fluoridation controversy

In the United States, there have been numerous social science studies on the controversy of water fluoridation since 1960s. The early studies started with sociodemographic factors such as age, race, education, number of children, attitudes, income and so on. (Mausner & Mausner, 1955; Metz, 1966; Motz, 1971; Plaut, 1959). According to the studies, any educated, well-informed, and progressive people supported fluoridation, and people over 60 were found to be more likely to oppose fluoridation which correlated to the conservatism of political orientation. However, those studies of correlations between education, age, or other variables and attitudes to fluoridation did not provide an enough explanation for opposition (Martin, 1989).

Another major approach to the water fluoridation controversy studied through social psychology, typified by the alienation hypothesis (Gamson & Lindberg, 1961; Green, 1961; Linn, 1969; Simmel, 1961). This was the most widely used to explain the water fluoridation controversy, which meant a certain segment of the population was poorly integrated into society and felt powerless to affect groups. Therefore, they grabbed an opportunity to take an advantage of the chance to be perceived as powerful groups. In this case, the people who opposed water fluoridation was seen as the powerless, and insisted that a revolt of the powerless who have latched onto fluoridation as a

symbol of the impositions which they opposed (Martin, 1989). However, this hypothesis was criticized of its lack of evidence such as the limited size of survey, and lack of correlation with sociodemographic hypothesis; it did not explain why opinion surveys showed massive support for fluoridation while votes typically showed oppositions (Crain, Katz, Rosenthal, & Wilson, 1969; Sapolsky, 1968).

The following social approach was focused on community power structures rather than looking at individual opponents (Coleman, 1957; Crain et al., 1969; Frost, 1961; Petterson, 1969; Pinard, 1963). The studies found that blue-collar cites were amendable to fluoridation, which stated “the most educated communities have most trouble with fluoridation” (Crain et al., 1969). This emphasized that the form of government, especially local government, was important in implementing water fluoridation. When residents participated in local decision making, they were more likely to lead the referendum. This hypothesis was conflict with the alienation hypothesis, because middle-class communities with more opportunities to participate in local politics were more likely to reject fluoridation. Thus, Crain et al. (1969) suggested that citizen participation in policy making was not favorable to the “rational” outcome of fluoridation. However, just like other hypothesis, this one also had shortcoming as well; there were no indication of why individuals and communities supported or opposed fluoridation which avoided any consideration of the issue itself (Martin, 1989).

The confusion hypothesis was suggested to explain why public initially

supported water fluoridation then move to strongly opposed in the course of a referendum debate (Crain et al., 1969; Sapolsky, 1968, 1969). Sapolsky insisted that when experts confronted with conflicting claims, the voters/participants were not able to distinguish who are right or wrong, so that they simply voted that there was a divergence of opinion about safety benefits of fluoridation. Thus, they chose the "safe" course, which meant the opposition of water fluoridation. It seemed to explain why they chose one another, but it did not fully explain the dynamics of the development of controversy. The study of these social aspects of water fluoridation decreased since then. The solution of this controversial issue still remains elusive.

2.1.2 History of water fluoridation in South Korea

In 1981, the South Korean government initiated water fluoridation to economize on the cost of preventing dental caries of its nation, starting with the city of Jinhae and Cheongju. Until 1999, it expended to 27 fluoride facilities and 8% of the Korean citizens were able to take water fluoridation. However, some cities have refused to conduct the service, due to the controversial issues such as "scientific uncertainty" or local governments' "freedom of choice". As of 2013, 22 local governments have implemented water fluoridation, which indicated that only 6.4% of citizens were taking fluoride water. [Appendix 2] shows the current status of fluoridation in South Korea.

Following [Figure 1] explains the history of water fluoridation in South Korea.

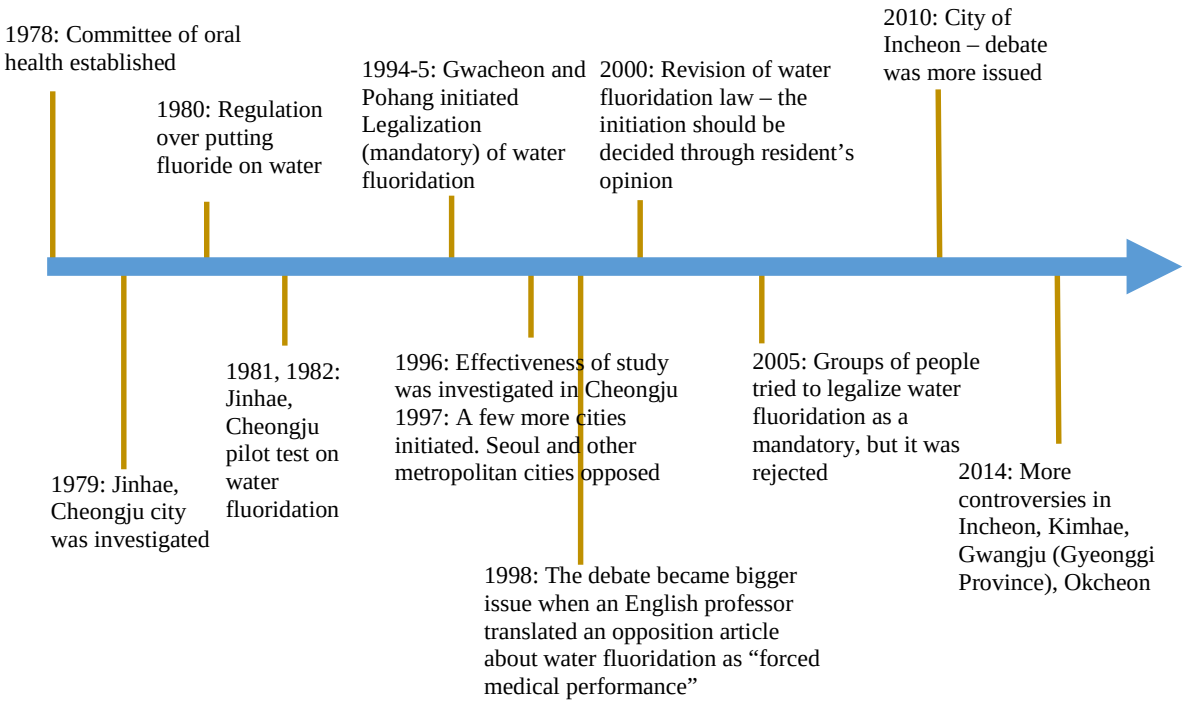


Figure 1. History of water fluoridation in South Korea

There were quite number of studies to find influencing factors to support or oppose water fluoridation in South Korea. According to one of the most prominent database in South Korea, Research Information Sharing Service (RISS), 40 articles were shown to be the studies related to water fluoridation. However, most of the studies were very limited to basic questionnaires, such as how much they heard of water fluoridation, awareness, and attitude towards the service. Of the many similar studies, Park (2002) and Seo (2004) studied deeply about water fluoridation from sociological perspective.

Similar to the U.S., implementing water fluoridation in Korea was

positively initiated by Korean dentists and oral health experts, especially from the professors at Seoul National University School of Dentistry. With empirical studies of tooth decay with city comparison, it revealed that putting fluoride on public water was cost-effective and health beneficial – 59% in Jinhae and 56% in Cheongju proved tooth decay prevention effect (Kim, 1988). Such results were used as a tool to promote the use of water fluoridation. In 1995, it finally became legalized that facilitating water fluoridation is mandatory in each community.

For the 15 years since it was initiated in 1981, nothing seemed to have a problem with water fluoridation as a public health service for the benefit of health and cost-effectiveness. However, 3 years after it became legalized, in 1998, an article from the U.S. written by Griffiths was published in Korean magazine, *Mal*, translated by a Korean English professor (Griffiths, 1997). The article was about conspiracies in the States that Fluoridation was first advanced in the US at the end of the World War II. According to Griffiths, the U.S. government initiated water fluoridation so that the public would become familiar with the chemical component of “fluoride”, which revealed the readers about strong doubt and distrust towards the government. The Korean English professor, Jongcheol Kim, added the comment that it was a “compulsory health service” and emphasized that all the European countries were discontinuing water fluoridation. Both Park and Seo, who are sociologists, emphasized that the first person who spread the doubt of water fluoridation was not a scientist, which was not scientifically argued and

focused more to the individual rights freedom of choice (Park, 2000; Suh, 2004).

After the first argument was publicized, the issue of water fluoridation became a “hot issue” in the summer of 1998. Seoul withheld the plan of implementing water fluoridation, and a magazine called “Green Review”, criticized the safety and morality of putting fluoride on community water. Later on, the side of environmental engineers and medical scientists joined the opponent side and argued with technical analysis, just like in the U.S. Few dentists joined the opponent side and became propagandists. Opponents cited all the evidence of possible risks, such as genetic issues, causing cancer, bone fracture, and so on.

Park (2000) and Seo (2004) explained the causation of water fluoridation controversy in South Korea with the historical background of a pro-democracy movement. In 1980s, Korea was in the process of industry development under the authoritative Korean government. During the period, rebelling and protesting against the government was not acceptable (Gwangju Uprising in May 18, 1980 is an example). Korea was such in a hurry of developing economics, therefore environment issues were not an important issue. After Korea gained some economic success and freedom of speech, the issue of water fluoridation controversy upraised and became such a big issue.

However, compare to the U.S., the amount of social studies of this controversial issue is still very limited. The two studies were only explained the social phenomenon and background of how it started, but not within the

logical process of how it continued and in-depth studies based on sociological theories. There are still no social studies of how it continued and developed as of now.

[Table 2] shows the list of studies conducted in the cities where controversies were highly raised, Incheon and Kimhae. Direct comparisons cannot be made because different methods have been used. However, there is still value in examining these data. The results indicate that the rates of awareness, and sociodemographic factors of acceptance level are inconsistent.

Table 2. Previous studies on water fluoridation awareness and acceptance in Incheon and Kimhae

Region	Year, author	Survey target (n)	Awareness/ acceptance	Factors to increase acceptance level of water fluoridation
Incheon	2012, Kim, & Choi	700 residents	Awareness: 26.9%	- higher age, income, and education - oral health behavior, self-reported oral health, oral health interest
	2012, Kim et al.	700 residents	Acceptance: 58.7%	- experience/knowledge, healthier perceived oral health, oral health behavior
	2013, Jung et al.	751 mothers of elementary school students	Awareness: 31.0% Acceptance: 50.3% Opponent: 10.4%	- higher age, longer length of residence - recognition of water fluoridation program, recognition of sealant
Kimhae	2005, Kim et al.	4816 residents (3265 in 1998, 1551 in 2000)	Awareness in 1998: 21.9% Awareness in 2000: 48.4% Acceptance: 72.7→74.2% Opponent: 2.5→2.3%	- sex (higher in women) - awareness of water fluoridation, awareness of safety in water fluoridation
	2006, Kim, Moon, & Kim	1407 mothers of elementary school students	Awareness: 63.5% Acceptance: 74.7% Opponent: 3.8%	- no study of factors to accept implementation of water fluoridation - aware through mass media: 57.4% (highest among all)
	2010, Lee et al.	1479 parents of elementary school students	Awareness: 48.3% Acceptance: 90.2% Opponent: 2.7%	- younger age, sex (higher in women), length of stay (higher in <10yes than >11yrs), higher education, income - awareness of water fluoridation, awareness of implementing in Kimhae

2.2 Key variables

2.2.1 Independent variables

1) Individual characteristics

A few studies have conducted in South Korea that the more people knew about water fluoridation, the more they likely to accept the service (Kim, 2012; Kwag, 2013; Kim & Choi, 2012; Kwon, Lee, ; Lee, Oh, Song, Choi & Lee, 2009; Lee, Kang, & Lee, 2010). However, it was noticeable that the questionnaires were confused whether the participants were acknowledging the water fluoridation service, or asking actual knowledge of fluoride. The main questions they asked were if they ever heard about water fluoridation, purpose of the service, and true/false questions if the service was provided in all cities in South Korea. These were very limited knowledge, and more precise questionnaires should be developed.

Experience with water fluoridation of use of fluoride was correlated with knowledge, which showed that the more people used tap water (self-rated) and cared about their oral health, the more they likely to accept the water fluoridation service (Kim, 2012; Kim et al., 2012).

Knowing Korean culture is also important to understand the sociological perspective of water fluoridation history. Most studies were conducted in the western countries, which were rather much different worldview (cultural orientation). In promoting public health efforts are likely to be those that are sensitive to the culture context of health (e.g. Braithwaite & Lythcott, 1989;

US. Department of Health and Human Services, 1985).

Individualism-collectivism is probably the broadest and most commonly studied dimension of worldview variability (Gudykunst, Ting-Toomey, & Chua, 1988; Triandis & Gelfand, 1998). People who have individual mind tend to prefer independent relationships with others and to subordinate goals to their personal goals. They are associated with achievement, freedom, high levels of competition, and pleasure. Countries with individualistic culture are usually in western European cultures and Northern America. On the other hand, people with collectivistic mind are likely to have interdependent relationships to their in-group and subordinate their personal goals into their in-group goals. They are connected with interdependence, harmony, family security, social hierarchies, cooperation and low levels of competition. Countries with collectivistic culture are in Asia, Africa, Latin-America, and Southern European countries.

No studies have conducted according to the worldview in the study of water fluoridation controversy. There were only studies with sociodemographic factors in the U.S. that the white tend to have higher acceptance compare to other races (such as African-American and Latin American), but they mentioned that it was due to the education and income differences (Mausner & Mausner, 1955; Metz, 1966; Motz, 1971; Plaut, 1959).

2) Outrage factor

The study of risk and risk perception have received a considerable amount of empirical attention in literature (Af WÅhlberg, 2001). Traditionally, public perception of risk have been considered as a product of individuals to get the best possible outcome in decision making for proper health behavior (Becker, 1980, 1974; Fischhoff, 1993). However, there has been rapid growing study of risk perception as an interpretation involving emotions, feelings, and affect, with judgments about activities, technologies, or health interventions. This shows the study of risk perception has evolved not only on what people think about it but also on what they feel about it (Loewenstein et al., 2001; Slovic et al., 2004).

Of the many studies of risk perception, hazard and outrage factors of approach have been the most noteworthy definition of risk (Ju et al., 2015; Sandman, 1993). According to the Sandman's model of risk perception, the public view of risk is different from the expert's technological assessment of risk. Scientists and experts view the risk associated with a public-health issue as being similar to the hazard, which includes considerations of probability, magnitude, and uncertainty of possible harm. In contrast, public's perception of risk is conceptualized as being combined of both "hazard" and "outrage", with outrage factor includes voluntariness, control, responsiveness, dread, and various other components. Sandman insists that those outrage factors could be useful and more accurate to measure risk analysis (Armfield & Akers, 2010).

During the National Oral Health Conference in 1990, Sandman presented a lecture about risk perception of fluoridation using outrage factors (barbara, 1990). He proposed outrage factors that are related to water fluoridation, and emphasized ways to reduce public risk perception. [Table 3] shows outrage variables affecting the public's risk perception.

Table 3. Outrage factors of water fluoridation (Sandman, 1990)

Outrage factor (vs.)		Status of public outrage of water fluoridation
Voluntary	Coerced	-
Natural	Industrial/man-made	-
Familiar	Unfamiliar/exotic	+
Non-memorable	Memorable	+
Not dreaded	Dread	-
Diffuse	Static/focused	+
Knowable	Unknowable	-
Control by Individual	Control by society	-
Fair	Unfair	+
Morally Irrelevant	Morally Relevant	+- (even)
Trustworthy	Not trustworthy	-- (strong negative)
Open Sources	Secret sources	-- (strong negative)
Courtesy	Aarogance	-

Sandman's overall score for the 13 risk perception variables was negative (-7), which suggests the increased level of public outrage concerning fluoridation. This was measured in 1990, and a few things have changed since then. For example, Korean government used referendum to ask public's opinion whether the city is planning to initiate fluoridation in water. However, it is still same that public health community and experts must work to improve strategies for communicating risks by reducing the public's sense of outrage. Sandman emphasized more than enough that the worst way to address emerging fears is to become overly defensive and to state that the public

should not be concerned (barbara, 1990).

In Australia, there has been a study of risk perception of water fluoridation using outrage factor as a measurement to determine whether they are associated with water fluoridation support and opposition (Armfield & Akers, 2010). They used 20 assessed outrage factors, and 16 of them were significantly associated with water fluoridation stance in the predicted direction. Factors with the strongest association were unnatural, dreaded, unfair, untrustworthy, personal stake, unclear benefits, catastrophic potential, and effect on children. The greater outrage was related to increased water fluoridation opposition, which proves the point that outrage factors are important aspects to determine public's risk perception on water fluoridation. The efforts to mitigate the level of outrage, rather than denying possible hazards is necessary to gain public acceptance for the extension of water fluoridation.

3) Trust

Other than outrage factors which use individual feelings, there are also other elements which do not need much of efforts to convey information and still help to determine risk perception – it is trust (You, 2013).

Most people in a modern society do not acknowledge what is happening around them because the world is becoming more complicated. Likewise, in a defense of living in a complicated world without knowing everything is to trust society (Siegrist & Cvetkovich, 2000). Instead of trying to understand every step of process of risk perception, people tend to rely on each other in

society and determine the perception, which is a lot simpler. There are numbers of studies how trust could affect risk perception (Bassett, Bord & O'Connor, 1990; Chen & Li, 2007; Cvetkovich, 1999; Jenkins-Smith, Silva, 1996; &Kunreuther et al., 1990; Siegrist, 1999, 2000; Siegrist & Cvetkovich, 2000; Siegrist, Keller, & Kiers, 2005; Sjöberg & Drottz-Sjöberg, 1991; Slovic, 1993; Terpstra, 2011). For example, people who had high trust towards scientists and experts had lower risk perception over gene technology (Siegrist, 1999; Siegrist & Cvetkovich, 2000).

Trust not only affect risk perception, but also in policy acceptance. In the case of H1N1 in 2009, higher levels of trust towards government were positively related to an intention to accept vaccination (van der Weerd et al., 2011). Another study proved that trust of general public on nuclear power plants influenced negatively on stigma and influenced negatively on risk perception (Song & Kim, 2013).

In order to conduct successful risk and crisis communication, information provider should focus on building and maintaining trust by collaborating with municipal health services, providers, and the media.

4) Media

As mentioned above, outrage factors, trust could be an important factor to affect public's risk perception. Those are used as heuristics, which do not need deeper understanding of matters. It means that risk perception could form without any information, but rely on the level of feelings and trust. However, it is hard to imagine that the public never gets the information at all – they

cannot ignore the frequency of exposed information. These information is the matter of accessibility, and news media is one of the most important factor (You, 2013). There have been many studies about conveying news media on health-related information and it hugely impacts on risk perception (Adams, 1992; Finnegan & Viswanath, 2002; Freimuth & Nevel, 1981; Keown, 1989; Koné & Mullet, 1994; Singer & Endreny, 1987). Such media effects have been studied in many perspectives of health-related topics. For example, people who were more exposed to media and pay attention to food safety issues, tended to have higher level of risk perception (Fleming, Thorson, & Zhang, 2006; You, 2013). Also, consumers who depended heavily on media coverage for more information like Bovine Spongiform Encephalopathy (mad cow disease – BSE) were more likely to be affected by a disease leading to serious problems with higher risk perception (Lee, 2001).

News media could function as environment surveillance, which in the context that they are conveying precise information on possible risks (Lasswell, 1948; Shoemaker, 1996). When media function as surveillance and expose the possible health risk-related information, their risk perception could increase as well. Likewise, when media combines other factors to affect risk perception, which is different approach from outrage factor and trust, their possible relative size of effectiveness would become prominent (You, 2013).

According to a survey in South Korea, 82.2% of the people answered that they have heard of water fluoridation via media, includes TV, radio, and newspaper (Kang, 2005). Therefore, it is important to know and update about

media in water fluoridation, and how it affects the risk perception and its acceptance.

2.2.2 Mediator variable

1) Risk perception

The meaning of ‘risk’ (now called social understanding of risk) has changed from medieval times, which simply meant the terms of fate or fortune, to the present day, which has broadened to many different meanings including environmental risk, lifestyle risk, medical risks, interpersonal risks, economic risks, and criminal risks (Lupton, 1999). With the concept of risk, perception could mean many different ways, which means not only a simple sense of feeling, but includes the intelligent decisions such as beliefs or judgments (Angels & Angeles, 1992). Therefore, risk perception in modern society is multidimensional and multi-attributed concept (Slovic, 2000; You, 2009). Risk could be estimated by the degree of severity of the consequences and a probability of occurrence (Ortwin, 2006; Renn, 2005), which also can be understood as an ominous possibility for the future which does not reveal in current situation (Sofsky, 2005).

There are many different ways to approach the study of risk, such as sociology, psychology, anthropology, public policy, and so on (Cha, 2005, 2006). Of all these, risk could divide into two categories: technical notion of risk, and subjective notion of risk (Lupton, 1999; You, 2009). First, ‘technical notion of risk’ separates the meaning of risk and uncertainty. According to

Knight (1921), the essential concept of risk was based on probability. Probability was a type of calculations, so it could be predicted by logical methods. On the other hand, uncertainty was such an ambiguous concept due to its subjectivity, so it could not be predicted logically (Knight, 1921). Therefore, “technical notion of risk” included precise and predictable calculation of risk. Starr (1969) suggested risk-benefit analysis, which was similar to cost-benefit analysis in economics, and asked “How safe is safe enough” to find out social acceptance of risk level and its voluntary (Starr, 1969). Such model (revealed preference approach) had acknowledged by its meaning that risk could be quantified, however, it was criticized for quantifying individual risk perception which was truly its opinions (Mayo & Hollander, 1991).

Second part of risk, “subjective notion of risk“, had developed by the end of 1960s (Mayo & Hollander, 1991). Psychologists viewed risk as a subjective probability, which involved individual experiences with feelings and emotions (Fischhoff, 1993; P. Slovic, Fischhoff, & Lichtenstein, 1982). Slovic et al. (1987) developed a method called “psychometric paradigm” by measuring unknown risk and dread risk, and is still a powerful research tool now. (Slovic, 1987). However, there were some critics about its ambiguous differences between risk inherent value and individual psychological characteristics (Sjöberg, 2000).

Figure 2. Risk perception using psychometric paradigm (Slovic, Fischhoff, & Lichtenstein, 1985)

Beyond the technical and subjective notion of risk, sociologists had studied risk perception from 1990s to overcome those two theory's limitations (Krimsky & Golding, 1992). Sociologists insisted there were no right or wrong risk perception, it was a matter of the socio-cultural differences (Zinn, 2004, 2006). The group of economy, society, politics, and cultural environments determined the individual risk perception. Such theory, so called "cultural theory" was categorized as fatalism, individualism, collectivism, and egalitarianism by group and grid (Douglas & Wildavsky, 1982). However, there were also limitations that such subjective forms were hard to quantifiable and conceptualize to theory (Rippl, 2002).

Since risk perception is such a subjective matter, people could be confused by inaccuracies in risk perception. Those inaccuracies in many risk managers believe about the perceptions, and risk managers could mean physicians, nurses, public health officials, legislators, regulators, and engineers. All of them could say what risks are created, what is communicated, and what role could laypeople have in determining their fate (Fischhoff, 1993). Especially if the layperson's understanding is overestimated, or underestimated, such misperceptions of risk perception may be continued over the long run, as well as in individual decisions. Such process of health decisions could determine people's degree of managing their own affairs in shaping their society. In the case of water fluoridation, previous research proved to provide accurate and factual information about water fluoridation could turn the public to being aware to the practice (Mueller, 1968).

There have not been many studies of risk perception about water fluoridation in the past. Issues of the studies were controversies, cost-benefit analysis, and health effects based on scientific evidence (Ayoob & Gupta, 2006; Carstairs & Elder, 2008; Easley, 1996; Mueller, 1968; Newbrun, 1996; Quiñonez & Locker, 2009; Wang et al., 2004). However, recently there has been a study of risk perception using cultural theory in Canada (Perrella & Kiss, 2015). According to the study, perception of fluoride as a risk were lower for the people who perceive fluoride's benefits and for the people whose cultural view was 'egalitarian'. The importance of cultural norm and perception was revealed when individuals in a community appear to risk up

against water fluoridation, with implications for other public health controversies.

2.2.3 Dependent variable

1) Policy acceptance

The concept of policy acceptance could be explained by two terms; compliance and noncompliance. According to Young in 1979, compliance is almost all type of behavior which correspond with rule and behavioral norm and noncompliance is against the will of specific behavior or norm that society requires (Young, 1979).

There are many studies about policy acceptances in South Korea. First, there were study about free taxi system (for foreigners) and its policy compliance (Han, 2002). The study suggested that there need to be a process where all stakeholders' opinions are gathered, and funding for the system has to be guaranteed which requires policy of resources. Also, a various strategies for PR system and active involvement of taxi drivers are necessary to support the program.

Policy compliance over waste reclaimed land construction was studied as well (Seo, 2002). According to the study, whether it was a feasible plan, validity of choosing the area, trust towards government, expert's knowledge, understanding of residents about choosing the land, compensation system, active involvement of the residents were the ways to improve policy compliance. Other study with same subject showed that Active involvement

of residents, logical process policy decision-making, establishment of compensation system, change of resident's consciousness were the main factors affecting policy compliance (Kim, 1996).

Other study of policy compliance was about water regulation (Kang, 1996). In this study, the main factor affects compliance were policy environment, content of the process, and institution who was responsible. Main factor to affect policy compliance over resource recovery facility were the change of resident's consciousness, effective involvement of residents, sustainable management, proper compensation system, proper operating system through information search system, well-established committee who will be responsible for the program (Nam, 1998). Similar studies with same results were shown in other study as well (Park, 2004).

In the case of the U.S. army base transfer, establishment of compensation system and its guarantee, effect of policy, trust towards stakeholders were the main factors to affect policy compliance (Kang, 2007).

[Table 4] shows the main factors to affect its compliances, which mentioned above.

Table 4. Factors affecting policy acceptance

Author (year)	Type of case	Affecting factors
Kim (1996)	Waste reclaimed land construction	Active involvement of residents, logical process policy decision-making, establishment of compensation system, change of resident's consciousness
Kang & Kim (1996)	Water regulation policy	Policy environment, content of the process, institution who can be responsible
Nam (1998)	Resource recovery facility	Active involvement of residents, establishment of compensation system, information search system
Seo (2002)	Waste reclaimed land construction	feasible plan, validity of choosing the area, trust towards government, expert's knowledge, understanding of residents about choosing the land, compensation system, active involvement of the residents
Han (2002)	Free taxi system for foreigners	Content of policy process, responsibility of the policy system
Paek et al. (2004)	Resource recovery facility	Content of policy process, responsibility of the policy system
Kang & Yoon (2007)	The U.S. Army base transfer	Establishment of compensation system and its guarantee, effect of policy, trust towards stakeholders

3. Methods

In addition to various literature reviews, the method of utilized variables of survey research and analysis to answer the four research questions are central to the risk perception of water fluoridation and its level of acceptance. The insights of the following research questions allow identifying the factors, which help understand the public perception of water fluoridation in the city of Incheon. The results would have a capacity to hold a significant impact on the public's level of support for public health services, adaptation policies, and on the successful ways to advocate appropriate public health services.

The reason to choose the city of Incheon was that, they recently pulled a referendum and it is the one of the biggest metropolitan cities which has higher chances to represent South Korea (other cities where currently undergo debates are Jinhae, Ockcheon, Kyounggi Gwangju, where relatively have smaller population). To avoid much confusion, this study was limited to one city.

Based on the collected data, this research would be able to explain the contentious issues of water fluoridation controversy from risk perception perspective, which previously has not been studied.

Following research questions are listed below:

1. Does social economic status, individual characteristics, media, outrage factor, and trust affect the acceptance of water fluoridation?

2. Does social economic status, individual characteristics, media, outrage

factor, and trust affect the risk perception of water fluoridation?

3. Does risk perception of water fluoridation affect the acceptance of water fluoridation?

4. Does risk perception mediate other variables (social economic status, individual characteristics, media, outrage factor, and trust) and the acceptance of water fluoridation?

3.1 Data collection

Analysis was based on a primary data with online survey administered October 16-23, 2016, by a professional panel company in South Korea. The survey gathered a sample of the people who are registered from the panel company in the city of Incheon, using convenience sampling. The total number of respondents for the study was 527, with a response rate of 36.4%. This allowed sampling the city which still has contentious issues, while asking establishing consistency and collecting standardized, quantifiable, and empirical comparative data.

The survey was confidential and voluntary; respondents had an option to refuse to precede the survey if they did not agree with the agreement. The questionnaire received ethics clearance through the Seoul National University Institutional Review Board (IRB No. E1508/001-006).

The Internet panels presented a cross-section of all age groups of over 18 years and above, gender, income groups, and the level of education. Relying on the Internet panel as sampling had several advantages of the survey

methods, compared to other ways such as telephone, mail, or personally administered surveys (Fowler, 2008). Email or web based surveys allowed broader coverage of area with relatively low costs. In addition, Internet panel allowed participants to choose which time to answer the questions, which could increase the response rates (Babbie, 2007).

Nevertheless, there were some downsides of using Internet survey method (O'Leary, 2004, Dillman et al., 2009, Fowler, 2009). The questions had to be designed as easy to understand, because the participants might not have the chance to clarify the questions. The whole language in the content should avoid complex terms, such as double negatives. Questions should be relevant and respondents must be willing to answer with credible results and conclusions.

3.2 Study design

The following [Figure 3] describes the study's research model for the research.

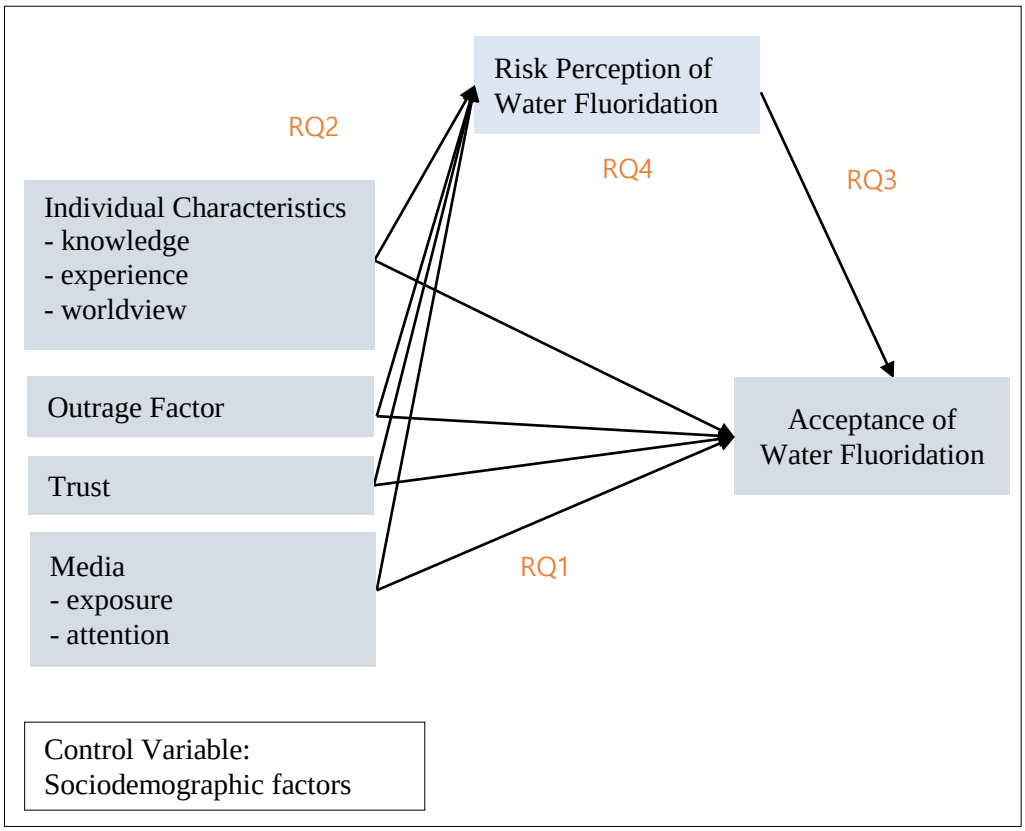


Figure 3. Research model of this thesis

Statistical Analysis

The content of this survey consisted of close-ended questions, which are usually fairly easy to code and to analyze statistically (Henerson et al., 1987). It mainly consisted of 'Likert-type scaling' which are balanced equally. The Likert-scales used in the survey instrument were most 7 point scales with the answers ranging from strongly disagree to strongly agree with neutral answer

in between.

There were a few debates using regression analysis in Likert-scale (Jamison, 2004; Brown, 2011). However, in the study of social sciences, it is known to be well-suited since Likert-type is treated as interval data and used for regression analysis (Johnson & Slovic, 1995; Leiserowitz, 2006; Sjoberg, 1998).

The data gathered from the survey was mostly analyzed through wide range of statistical methods. First, frequency distributions and descriptive statistics including means and standard deviation was analyzed for each variables. In order to find the associations between variables, correlation analysis was conducted. After that, multiple regression was conducted to find the significant relationship in the research model. Finally Baron and Kenny (1986), and Sobel test (1982) were conducted to see the mediating effect. SAS 9.4 program was used for the analysis.

3.3 Main variables

1) Individual characteristics

As one of the independent variables, this factor was consist of knowledge, experiences and worldview, which are the factors of how participants have known about fluoridation and knowledge, experience, and worldview. Knowledge consisted of six sentences with true and false questions answers are yes (1), no (2), and don't know (3) (Kim, 2012). More questions were added for the precise knowledge measurement. Experience included two questions: amount of using tap water and burden of dental fees. Amount of using tap water was seven point Likert-scale, 7 with the highest use. Burden of dental fees were consisted of two sub-questions. It asked whether they have felt burden or stress due to cavities, and if they had to pay high dental fee due to cavities. Answers were yes (1), and no (2) (Kim, 2012; Kim et al., 2012). Instead adding oral health status like previous studies, we asked their burdens of dental issues and fees. Worldview was consisted of individualism and collectivism, with each eight question, total of 16 questions. Answers were Likert-scale, 1 being highly disagree and 7 being highly agree (Triandis & Gelfand, 1998).

2) Outrage factor

Second independent variable included 16 various heuristic affect factors, which came to mind when the participant instantly remind of water fluoridation. Likewise, all of the questions were answered with 7 Likert-scale

from highly disagree (1) and highly agree (7) (Armfield & Akers, 2010).

3) Trust

Third independent variable consisted of the level of participant's trust towards government, local government, experts (related to water fluoridation in this study), and media (You, 2013; Siegrist, 2000; van der Weerd et al., 2011). The four questions were answered with 7 Likert-scale from highly distrust (1) and highly trust (7).

4) Media

Final independent variable asked about how often the participant hear the news about water fluoridation and their level of attention to the news. Both questions were answered with 7 Likert-scale from never heard or not interested at all (1) and frequently hear the news or very much interested (7). Two questions were chosen based on literature review (Finnegan & Viswanath, 2002; You, 2013).

5) Sociodemographic factors

Sex, age, length of stay in Incheon city, income, education, whether they have a children (including grandchildren), general health status, oral health status, and political orientation were asked as a control variable. Age and length of stay in Incheon were subjectively written. Income and education were consisted of 6 Likert-scale with 1 being the lowest and 6 being the highest. Having children or grandchildren were asked to check yes (1) or no (2). Both health status were asked to rate using 7 Likert-scale from not healthy at all (1) to very health (7).

6) Water fluoridation risk perception

This variable is used as a mediating factor. Risk perception were consist of overall risk perception from 1 being very harmful (risky) to 7 being very beneficial (Fischhoff, 1993; Slovic et al., 1982). There are many different ways to measure risk perception in the previous studies, but this study chose to use one representative question since this variable had to use as a mediating factor.

7) Acceptance of water fluoridation

Acceptance of water fluoridation is a dependent variable (Kang, 1996; Kang, 2007; Han, 2002; Kim, 1996; Nam, 1998; Park, 2004). This question is to be answered 7 Likert-scale from 1 not willing to accept to 7 highly likely to accept.

Table 5. Summary of main variables

Variable		Contents	Questionnaire type	Reference
Sociodemographic factors (control variable)		Sex	select	Jung, 2013; Kim, 2005; Kim, 2006; Kim, 2012; Lee, 2010;
		Age	type	
		Existence of children/grandchildren	select	
		Length of stay in Incheon	type	
		Education level	select	
		Income		
		Health Status (general health and oral health)		
		political orientation	7 point Likert-scale	
Individual characteristics	**Knowledge**	purpose of the service, Current status of Incheon, taste, WHO recommendations, Components of water, Comparison with other countries	7 point Likert-scale	Kim, 2012; Kim et al., 2012; ;Triandis & Gelfland, 1998
	Experience	Tap water use, burden on dental fee		
	Worldview	Individualism, collectivism		
Outrage factor		16 various heuristic affect factors		Armfield & Akers, 2010
Trust		government, local government, stakeholders, media		Siegrist, 2000; van der Weerd et al., 2011, You & Ju, 2013
Media		news exposure, news attention		Finnegan & Viswanath, 2002; You & Ju, 2013
Water fluoridation risk perception		overall risk perception		Fischhoff, 1993; Slovic et al., 1982
Acceptance of water fluoridation		acceptance level		Han, 2002; Kang, 2007; Kang, 1996; Kim, 1996; Nam, 1998; Park, 2004

4. Study Results

4.1 Basic statistical results

The frequency distributions and descriptive statistics are listed below [Table 6]. As a result of sociodemographic factors, the number of male are slight higher than female (50.85%, n=268). Their average age was 40.34, with the highest group of 40s (27.54, n=145). Their average length of stay was 24 months even with the highest stay was 5-6 years (23.72%, n=125). 62% of them did not have any children (n=329), and their subjective general health status and oral health were slightly above average (general health status was 4.39 and oral health was 4.11 out of 7). Half of the participants answered to be neutral in political orientation (50.09%, n=264), and there were about twice more participants who said to be liberal than conservative (liberal: 34.16%, n=180; conservative: 15.75%, n=83). More than half participants had college degree (68.50%, n=361), and at least they had high school degree. Their income average was 4.49 out of 7, which is slightly above average.

The participant's knowledge was very low (1.65 out of 7). However, most of them used tap water quite frequently (5.61 out of 7), and were feeling burden towards cavity and dental fee (those who answered yes to cavity burden was 67.71% and yes to high dental fee was 78.94%). Worldview was both above average, but collectivism (5.06 out of 7) was higher than individualism (2.88 out of 7). Those who answered that they have heard about water fluoridation answered that the media was slight less average (3.76 out

of 7). Outrage factor, which is an affect heuristic towards water fluoridation was 4.65 out of 7. The level of trust towards government (3.87), local government (3.89), experts (3.94), and media (3.74) were slightly lower than the average.

The overall risk perception of water fluoridation was 4.81 out of 7, which was the highest risk perception of all perception variables. Followings were health and ecosystem severity (4.51), health risk (4.28), likely to happen to me (4.10) and ecosystem (3.99). Their overall acceptance of water fluoridation was 4.12 which is around average.

Table 6. Basic statistical result

			N	%	Mean	SD
SF	sex	male	268	50.85		
		female	259	49.15		
	age	20-29	109	20.71		
		30-39	130	25.70	40.34	11.08
		40-49	145	27.54		
		50-59	143	26.05		
	stay	< 1 yr	82	15.56		
		1-2 yr	86	16.32		
		3-4 yr	50	9.49		
		5-6 yr	125	23.72	24.00	14.14
		7-8 yr	50	9.49		
		9-10 yr	118	22.39		
		>11 yr	16	3.04		
	children	yes	198	37.57		
		no	329	62.43		
	general health status	1-7 (interval)			4.39	1.21
	oral health status	1-7 (interval)			4.11	1.34
	political orientation (Conserv. → Liberal)	1-7 (interval)			4.24	1.04

	education	high school (graduate)	143	27.14		
		college	361	68.50		
		graduate school	23	4.36		
	income	1-6 (interval)			4.49	1.43
IC	knowledge experience	1-6 (interval)			1.65	1.15
	-tap water use *burden on dental fee*	1-7 (interval)			5.61	1.21
	-burden	yes	354	67.71		
		no	173	32.83		
	-high dental fee	yes	416	78.94		
		no	111	21.06		
	Worldview					
	individualism	1-7 (interval)			4.88	0.78
	collectivism	1-7 (interval)			5.06	0.79
Media	news exposure	1-7 (interval)			3.40	1.36
	news attention	1-7(interval)			4.11	1.27
Outrage factor	outrage factor	1-7(interval)			4.12	0.69
Trust	government	1-7 (interval)			3.87	1.46
	local government	1-7 (interval)			3.89	1.48
	experts	1-7 (interval)			3.94	1.38
	media	1-7 (interval)			3.74	1.39
Risk Perception	holistic risk perception	1-7 (interval)			4.81	1.55
Acceptance	water fluoridation acceptance	1-7 (interval)			4.12	1.29

SF: Sociodemographic Factors, IC: Individual Characteristics

4.2 Pearson Correlation analysis of the study population

Pearson correlation analysis was conducted in order to see the association of variables. Pearson was chosen since most of variables were continuous (Pearson, quote). As shown in [Table 7], it turned out that there are correlations between variables, especially with independent variables. There were positive correlations between media, and trust. Negative correlations were in between various variables, especially between risk perception and media, trust.

Acceptance of water fluoridation variable, which is a dependent variable, was correlated with many different independent variables and risk perception. Especially there were strong negative correlations with outrage factors and risk perception.

Table 7. Pearson Correlation analysis result

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1.000																			
2	-0.014 0.748	1.000																		
3	-0.015 0.738	**-0.302** **<0.0001**	1.000																	
4	-0.037 0.400	**0.178** **<0.0001**	0.005 0.917	1.000																
5	-0.036 0.410	-0.033 0.456	0.019 0.660	-0.056 0.203	1.000															
6	0.029 0.500	-0.075 0.085	-0.085 0.053	-0.006 0.886	0.038 0.38	1.000														
7	-0.111 0.011	-0.035 0.425	-0.116 0.008	-0.031 0.476	0.055 0.210	0.160 0.0002	1.000													
8	0.018 0.684	0.135 0.002	0.036 0.406	-0.135 0.018	0.0120 0.0.6	-0.012 0.783	**0.170** **<0.0001**	1.000												
9	-0.114 0.009	0.050 0.248	0.008 0.857	-0.057 0.195	0.159 0.0003	0.087 0.046	0.063 0.150	**0.170** **<0.0001**	1.000											
10	-0.131 0.003	0.132 0.002	0.014 0.745	-0.111 0.011	**0.222** **<0.0001**	0.034 0.439	0.056 0.199	0.063 0.150	**0.419** **<0.0001**	1.000										
11	**0.193** **<0.0001**	0.007 0.880	0.003 0.949	-0.048 0.274	0.0347 0.427	-0.032 0.458	-0.101 0.020	0.056 0.200	0.098 0.025	**0.192** **<0.0001**	1.000									
12	**0.175** **<0.0001**	-0.046 0.294	-0.121 0.006	-0.049 0.260	**-0.205** **<0.0001**	0.012 0.791	-0.089 0.041	-0.101 0.484	0.012 0.783	0.019 0.657	0.009 0.837	1.000								
13	-0.041 0.450	**0.244** **<0.0001**	0.075 0.172	-0.096 0.079	**0.248** **<0.0001**	0.066 0.224	-0.009 0.871	-0.049 0.263	0.080 0.143	0.124 0.023	0.005 0.932	-0.016 0.745	1.000							
14	0.168 0.0001	**-0.194** **<0.0001**	-0.040 0.356	-0.017 0.700	-0.081 0.063	-0.034 0.440	0.001 0.987	0.066 0.13	-0.084 0.056	-0.116 0.007	0.061 0.164	-0.012 0.783	**0.333** **<0.0001**	1.000						
15	-0.130 0.002	**0.274** **<0.0001**	0.089 0.042	-0.035 0.0426	0.136 0.002	-0.036 0.414	-0.022 0.609	-0.031 0.482	**0.234** **<0.0001**	**0.257** **<0.0001**	0.019 0.660	-0.012 0.778	**0.376** **<0.0001**	**-0.508** **<0.0001**	1.000					
16	-0.167 0.0001	**0.252** **<0.0001**	0.091 0.036	-0.012 0.788	0.108 0.013	-0.036 0.406	-0.023 0.606	-0.036 0.412	**0.224** **<0.0001**	**0.233** **<0.0001**	0.011 0.797	-0.015 0.723	**0.332** **<0.0001**	**-0.509** **<0.0001**	**0.875** **<0.0001**	1.000				
17	-0.103 0.018	0.159 0.0002	0.085 0.052	0.012 0.783	0.122 0.005	-0.040 0.364	-0.052 0.235	-0.031 0.482	**0.187** **<0,0001**	**0.217** **<0.0001**	0.0475 0.277	-0.012 0.769	**0.358** **<0.0001**	**-0.472** **<0.0001**	**0.884** **<0.0001**	**0.791** **<0.0001**	1.000			
18	-0.117 0.007	**0.211** **<0.0001**	0.089 0.040	0.014 0.757	0.130 0.003	-0.046 0.294	-0.024 0.577	-0.038 0.384	**0.185** **<0.0001**	**0.195** **<0.0001**	0.028 0.528	-0.009 0.828	**-0.227** **<0.0001**	**-0.512** **<0.0001**	**0.769** **<0.0001**	**0.796** **<0.0001**	**0.790** **<0.0001**	1.000		
19	0.135 0.002	-0.105 0.016	-0.008 0.857	0.037 0.399	-0.165 0.0001	-0.109 0.012	-0.051 0.245	-0.018 0.674	-0.107 0.014	-0.092 0.035	0.047 0.284	-0.032 0.468	-0.021 0.642	**0.454** **<0.0001**	**-0.336** **<0.0001**	**-0.368** **.<0.000**	**-0.407** **<0.0001**	**-0.466** **<0.0001**	1.000	
20	-0.156 0.0003	**0.195** **<0.0001**	0.085 0.053	0.017 0.705	0.103 0.019	0.0347 0.426	-0.047 0.283	0.009 0.845	0.168 0.0001	0.158 0.003	-0.013 0.770	-0.017 0.695	**0.407** **<0.0001**	**-0.697** **<0.0001**	**0.685** **<0.0001**	**0.668** **<0.0001**	**0.699** **<0.0001**	**-0.568** **<0.0001**	**-0.521** **<0.0001**	1.000

1. Sex 2. Age 3. Length of stay 4. Children 5. Health 6. Political orientation 7. Education 8. Income 9. Individualism 10. Collectivism 11. Amount of drinking tap water 12. Burden of dental fee 13. Media 14. Outrage factor 15. Trust1 16. Trust2 17. Trust3 18. Trust4 19. Risk perception 20. Acceptance

Bold: significant factors

4.3 Affecting factors of the study population

Affecting factor of policy acceptance

RQ 1. Does social economic status, individual characteristics, media, outrage factor, and trust affect the acceptance of water fluoridation?

Multiple regression analysis was used to explore the influencing factors of water fluoridation risk perception. [Table 8] showed that people who knows more about fluoride and water fluoridation (knowledge) likely to accept putting fluoride in water. Also, the more exposed to media and pay attention to what they are saying, the more likely to accept the water fluoridation. People who had high risk affect heuristic was significantly less likely to accept the policy. People who trust local government, fluoride-related experts, and media were significantly likely to accept the policy as well.

Table 8. Affecting factor of water fluoridation policy acceptance

		Acceptance of water fluoridation ***(Par Est., Std Err.)***
Sociodemographic factors	sex (male=0, female=1)	0.0047 (0.085)
	age	-0.0048 (0.0042)
	length of stay	0.00015 (0.003)
	children (yes=0, no=1)	0.027 (0.083)
	health status	-0.0079 (0.038)
	political orientation (conservative=0, liberal=1)	0.040 (0.029)
	education	-0.063 (0.078)
	income	0.036 (0.030)
Individual characteristics	knowledge	0.055 (0.036)
	experience	
	- *use of tap water*	-0.0073 (0.036)
	- *burden of dental fee*	-0.073 (0.11)
	worldview	
	- *individualism*	0.068 (0.061)
	- *collectivism*	-0.11 (0.062)*
Media	news exposure	0.012 (0.037)
	news attention	0.15 (0.040)***
Outrage factor	outrage factor	-0.71 (0.071)***
Trust	government	-0.068 (0.058)
	local government	0.22 (0.06)***
	experts	0.15 (0.058)***
	media	0.14 (0.056)**
R-SQ		0.68
F-Value		33.19
		<0.01***, <0.05**, <0.1*

Affecting factor of risk perception

RQ 2. Does social economic status, individual characteristics, media, outrage factor, and trust affect the risk perception of water fluoridation?

[Table 9] showed that the more they stayed in Inchoen city, the higher their risk perception towards water fluoridation. Also, people who have more conservative political orientation are likely to have high risk perception. People who has less income, not exposed to media, and less trust towards experts and media are likely to have higher risk perception. People who has

collectivism value and high outrage factor have higher risk perception towards water fluoridation as well.

Table 9. Affecting factor of water fluoridation risk perception

		Risk perception *(Par Est., Std Err.)*
Sociodemographic factors	sex (male=0, female=1)	0.17 (0.10)*
	age	0.00019 (0.005)
	length of stay	0.0046 (0.0035)
	children (yes=0, no=1)	0.058 (0.099)
	health status	-0.0031 (0.046)
	political orientation (conservative=0, liberal=1)	-0.010 (0.048)**
	education	-0.028 (0.093)
	income	-0.063 (0.035)*
Individual characteristics	knowledge	-0.071 (0.043)*
	experience	
	- *use of tap water*	0.038 (0.043)
	- *burden of dental fee*	0.03 (0.13)
	worldview	
	- *individualism*	-0.045 (0.073)
	- *collectivism*	0.15 (0.073)**
Media	news exposure	-0.28 (0.05)***
	news attention	-0.14 (0.048)***
Outrage factor	outrage factor	0.49 (0.085)***
Trust	government	0.13 (0.069)*
	local government	0.026 (0.072)
	experts	-0.13 (0.069)*
	media	-0.25 (0.067)***
R-SQ		0.47
F-Value		14.24
		<0.01***, <0.05**, <0.1*

RQ 3. Does risk perception of water fluoridation affect the acceptance of water fluoridation?

All variables of (reversed) risk perception was significantly resulted high acceptance of water fluoridation policy [Table 10]. The more risky they think the water fluoridation is, the more risk they think it would affect their health, and to themselves are not likely to accept the policy. Also, people who think it would be risk to ecosystem and severe to both health and ecosystem resulted less acceptance of the policy.

Table 10. Affecting factor of water fluoridation acceptance base on risk perception

		Acceptance of water fluoridation ***(Par Est., Std Err.)***
Sociodemographic factors	sex (male=0, female=1)	-0.21 (0.092)**
	age	0.016 (0.0044)***
	length of stay	0.0027 (0.0034)
	children (yes=0, no=1)	0.14 (0.096)
	health status	0.029 (0.040)*
	political orientation (conservative=0, liberal=1)	-0.00067 (0.045)
	education	-0.16 (0.089)*
	income	-0.047 (0.033)
Risk perception	overall risk	-0.64 (0.042)***
R-SQ		0.36
F-Value		32.40
		<0.01***, <0.05**, <0.1*

4.4 Mediating effect of risk perception

RQ 4. Does risk perception mediate other variables (social economic status, individual characteristics, media, outrage factor, and trust) and the acceptance of water fluoridation?

The mediating effects of water fluoridation risk perception was validated by hierarchical multiple regression analysis and sobel test:

1. Baron and Kenny Test (1986)

The fist mediating effect analysis was conducted through Baron and Kenny's equation (Baron & Kenny, 1986). The steps are shown in [Table 11].

First step is to confirm that the independent variable is a significant predictor of the mediator. Second is to confirm that the independent variable is a significant predictor of the dependent variable. Last step is to confirm that the mediator is a significant predictor of the dependent variable, while controlling for the independent variable. This step demonstrates when the mediator and the independent variable are used simultaneously to predict the dependent variable, the previously significant path between the independent and dependent variable is greatly reduced, if not, it is not significant.

Table 11. Baron & Kenny (1986) mediating effect definition

Regression equation	Condition
① $X2 = \alpha1 + \beta1X1$	In regression ①, Independent variables have to significantly affect the mediating variable. β1 has to be significant.
② $Y = \alpha2 + \beta2X1$	In regression ②, Independent variables have to significantly affect the dependent variable. B2 has to be significant.
③ $Y = \alpha3 + \beta3X1 + \beta4X2$	In regression ③, mediating variable has to significantly affect the dependent variable. B4 has to be significant.

As a first step of verifying mediating effect, we checked if the independent variables (including control variables) are significant predictor of the mediating variable, which is risk perception. As a result, the whole model's *p*-value was less than 0.05, which confirmed that the independent variable is a significant predictor of the mediator.

Next step, same analysis was used but the dependent variable was the level of water fluoridation acceptance. The whole model's *p*-value was less than 0.05 as well, but the value of R-sq (as well as adj. R-sq) and F-value was significantly higher than the first model, which proves that model fitness is higher. Lastly, next analysis was to check if the mediator is a significant predictor of the dependent variable, while controlling for the independent variable. Likewise, the *p*-value for the model was less than 0.05, which was very significant. Also the value of R-sq (as well as adj. R-sq) and F-value was the highest. Especially in this case, risk perception, which was the mediating factor, was significantly high and proved the mediating effect.

Not all independent variables were significant, which explains that the

model is partial mediation.

Table 12. Baron & Kenny mediating effect analysis

		model1 (IV+M)	model2 (IV+DV)	model3 (IV+DV+M)
Control variable	sex (male=0, female=1)	0.17*	0.0047	0.052
Sociodemographic factors	age	0.00019	-0.0048	-0.0047
	length of stay	0.0046	0.00015	0.0014
	children (yes=0, no=1)	0.058	0.027	0.043
	health status	-0.0031	-0.0079	-0.016
	political orientation (conservative=0, liberal=1)	-0.010**	0.040	0.016
	education	-0.028	-0.063	-0.071
	income	-0.063*	0.036	0.023
Individual characteristics	knowledge	-0.071*	0.055	0.035
	experience			
	- *use of tap water*	0.038	-0.0073	-0.0012
	- *burden of dental fee*	0.03	-0.073	-0.071
	worldview			
	- *individualism*	-0.045	0.068	0.056
	- *collectivism*	0.15**	-0.11*	-0.066
Media	news exposure	-0.28***	0.012	-0.031
	news attention	-0.14***	0.15***	0.11***
Outrage factor	outrage factor	0.49***	-0.71***	-0.57***
Trust	government	0.13*	-0.068	-0.031
	local government	0.026	0.22***	0.23***
	experts	-0.13*	0.15***	0.14**
	media	-0.25***	0.14**	0.07
Risk perception	Overall risk			-0.27***
R-SQ		0.47	0.68	0.71
F-Value		14.24***	33.19***	37.03***

IV: Independent variable, M: Mediator variable DV: Dependent variable

<0.01***, <0.05**, <0.1*

2. Sobel Test (1982)

Since Baron and Kenny's test is indirect way of checking mediation effect, we additionally used Sobel test to prove the effect (Preacher & Leonardelli, 2001; Sobel, 1982). We used media, outrage factor, and trust as factors since those were the main factors and significant predictor for the model. As a result, three factors, media, outrage factor, and trust were all significantly effective as a mediation effect.

Table 13. Sobel test mediating effect analysis

	IV→M		**M→DV**		**Sobel test**		**Effect**
	coefficient	SE	coefficient	SE	Z	*P*-value	
Media	-0.48	0.048	0.142	0.051	-2.683	0.0073	Yes
OF*	0.54	0.085	-0.60	0.069	-5.111	0.0000032	Yes
Trust	-0.16	0.049	0.40	0.038	-3.142	0.0017	yes

OF*: Outrage Factor

5. Discussion and Conclusion

The purpose of this study was initiated with questioning uncertain issues of science and the role of public health. There are information about health benefits, while the potential of health risks exist at the same time. Child vaccinations, GMOs, HPV vaccines, and climate changes are such cases. When people confront with uncertain matter of health related topics, they tend to be confused and avoid the matter, and become indifferent while the subject of the matter is still vital for public health services. More importantly, this matters for the field of public health because the target is based on population, and the dilemma exists whether we should pursue or cease the public health services. It is a nation's duty and responsibility to promote health equally to all populations.

As there are many unproved or contentious stories, the research question of this study was interested in is then, how people come to decisions about health-related issues. The answer was through asking people's risk perception of the matter, and the way that what determines people to accept the level of public health services.

In order to further analyze the hypothesis, this study chose to focus on the public health policy of water fluoridation. This issue was of particularly interesting, and applicable to this study, as it has a long history with historical controversy. By looking at various components of its determinants, it was possible to tease out some of those threads and how we could alleviate the

controversy, through individual characteristics, outrage factors, trust, media, and risk perception.

5.1 Risk perception and acceptance of water fluoridation

This study was to find affecting factors of water fluoridation's risk perception and whether the perception affect the acceptance of putting fluoride on water. As a result, we could find that people who had higher trust towards local government, experts, and media, more exposed to mass media, had higher knowledge of fluoridation tend to accept the water fluoridation policy. Noticeable finding was that the trust towards local government was more significantly effective than the government. This supported the idea that local officials were more trusted than federal officials (Wray, Rivers, Jupka, & Clements, 2006). Also, people who had higher outrage factor had significantly low policy acceptance.

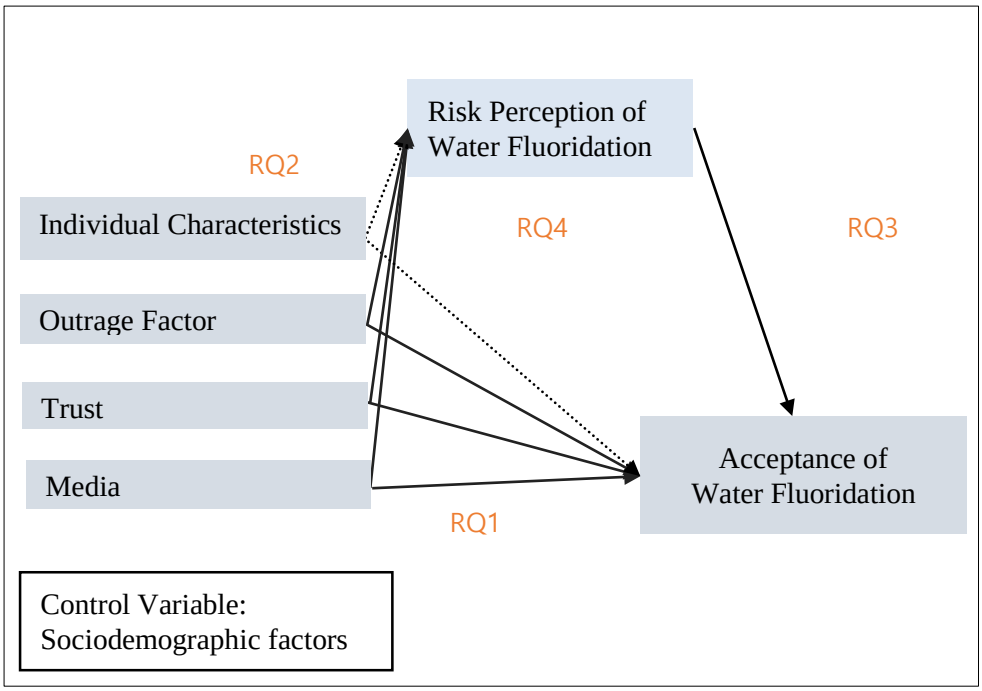
To take a look at the side of risk perception, people who had higher outrage factors, less exposed to media, and less trust towards fluoride experts and media tend to have higher risk perception of water fluoridation (Armfield & Akers, 2010; Finnegan & Viswanath, 2002; Siegrist, 2000; van der Weerd et al., 2011; You, 2013). People who had higher trust towards the government tend to have a higher risk perception. We could conclude that this is because the Korean government is run by a conservative political party – and more liberal people tend to have lower risk perception and higher acceptability of putting fluoride into water. Also, people have higher collectivism, and who

have lived in the city of Incheon longer, tend to have a higher risk perception.

It was also significant that the lower participant's risk perception, the higher their acceptance of water fluoridation policy (Fischhoff, 1993; Kang, 2007; Han, 2002; Kang, 1996; Kim, 1996; Nam, 1998; Park, 2004; Slovic et al., 1982). Finally it was obvious that the risk perception mediated media, trust, and outrage factor for the acceptance of water fluoridation policy.

It is not significantly approved, but we were able to find that people who had liberal political orientation tend to have lower risk perception and higher acceptance of water fluoridation policy. Contrary to this, people who had higher collectivism tend to have higher risk perception and lower level of water fluoridation policy acceptation.

The revised version of research model after the result analysis is listed below:



Bole line: significant
Dotted line: not significant

Figure 4. Revised research model of this study based on the result

5.2 Implications

Since the first water fluoridation initiated in Korea in 1981, it continuously has been an issue whether to continue, cease or newly implement the service. The debate is likely to continue its resurgence. There have been numerous studies about the public's awareness and knowledge of water fluoridation service (Lee, 2009; Lee, 2013; Kang, 2009; Kim, 2009; Oh, 2010). However, none of the studies have investigated people's perception of fluoride and how they affect the policy acceptance. They mentioned perception, but only explored whether people know the service or not, which is an awareness. When it comes to the contentious issues, it is important to know the public's perception of how they think of the issue itself. As the study proved, risk perception was an important factor in predicting public's policy acceptance.

From the study, we verified that media, outrage factor, and trust were the significant predictor of risk perception and policy acceptance. From a public health perspective, it is important to know the strategies of how we can approach better understanding of public. Implications through this study are shown as follow; first, it was important to know the public's affect heuristic, in the case of outrage factor, of how they instantly feel about water fluoridation and what cues them to form such perceptions. Knowing how people perceive water fluoridation would be helpful in planning communication strategies when designing messages.

Media was another important factor as well. When people are more

exposed to the media and willing to look for the water fluoridation information, the more they are likely to accept the perception positively, and higher policy acceptance. Thus, it could be used as a strategy how we can approach the community with conveying an efficient information. In the case of exposed information with possible health risks, the first thing people want to know is whether the risk is relevant to them. According to Lundgren and McMakin, the kind of information people want to know when they hear of possible risk matter is that they want a detailed description of risk. People want to go beyond technical descriptions to familiar analogies with possible consequences. They also want to hear the acceptable risk levels once they are exposed to the risk (Lundgren & McMakin, 2013). No matter how the supporters insists that there are no harm to fluoride, the opponents argue over health risks for excessive intake. It is very important that both sides need to accept the other side's opinion and debate logically with an open-mind.

Lastly, trust towards stakeholders, especially the local government was very important in policy acceptance, if the health service's decision depends on the community's opinion. This might be the solution to ease the controversies with uncertain scientific evidences, like water fluoridation. Trust and confidence are being shown as increasingly important in the case of how people perceive risks and how they respond to risk management strategies (Lundgren & McMakin, 2013).

It is a well-known fact that trust is an important factor in decision-making and communications, but also very hard to practically gain the support from

the public in a short time. Trust is built over time and is the result of ongoing actions, listening, and communication skills. Several factors to affect trust are caring, empathy, dedication and commitment, competence and expertise, honesty and openness, fiduciary responsibility, confidentiality, and equity (Slovic, 1999; Thomas, 1998). Also when conveying messages to public, source of the speaker who is a keyperson, matters to the listeners (Peters, Covello, & McCallum, 1997).

Active public engagement can foster trust as well. Involving members of the public in agenda-setting, decision-making, and policy formulation activities of organizations or institutions is responsible for policy development. Especially in risk communication, this activity could enhance the issue more socially and morally acceptable (Mah, Hills, & Tao, 2014; Renn & Schweizer, 2009; Rowe & Frewer, 2000).

Those factors mentioned above would help to structure the future direction of the communication as a public health agenda. For example, in the case of British Petroleum (BP) oil spill in the Gulf of Mexico in 2012, CEO Tony Hayward undermined trust and ended up leaving the company (Kanter, 2010). After that, BP had to suffer many critics and still trying to recover from the negative image. In 2002, Beijing was criticized for its lack in initial cover-up of Severe Acute Respiratory Syndrome (SARS) cases and since then and as a lesson from it, they instituted a 24-hour online monitoring system to gather information for preventing future outbreaks (Knobler, Lemon, Mack, Sivitz, & Oberholtzer, 2004).

Even when government accidently released false information, the first thing they should acknowledge is that the public has a right to know the correct information. In 2002, the U.S. CDC mistakenly said that anthrax spores could not escape a sealed envelope to the threaten postal workers, with the limited information available at the time, later corrected and admitted the error, which ended up adding to the agency's trust for handling future incidents (Rougier et al., 2013). When a government covers the facts and hide statistics, the organization will lead to increase its anxiety. The case of mad cow disease in Britain supports the evidence (The Washington Post, 2003).

It is obvious that the future of public health will be more controversial and debatable, with numerous indicators of health threats are evolving, and there has to be a stronger regulation if necessary. For example, the birth-control pill, abortion, and HPV vaccine, children vaccinations have been criticized by people's putative or excessive health risks (Melnick, 2011; Reed-Kane, 2003). Those controversies cannot be fully explained by studying one case. However, but studying on step at a time with each case, we could possibly understand why the controversies exist, and find a way to ease the contentious issues for the future of public health. Accounting to the multi-dimensional nature of public opinion, including the perception of risks and benefits, affect heuristics is important to identify to tease out some of those threads and how we could alleviate the controversy.

5.3 Limitations

The present study has several limitations, such as a cross-sectional design, self-reporting, and small sample size. The target of the survey is limited to one city, which cannot represent the case of South Korea. Different cities might have their own motives to raise the controversy, therefore this study was conducted in one of the big metropolitan cities. Plus, given the small sample size, one should be cautious in interpreting the present findings. Also, asking the public's risk perception of water fluoridation and the policy acceptance does not interpret that they fully understand the situation. The components of questionnaires were instant thoughts (outrage factors) and before the survey began, we briefly explained about water fluoridation. Moreover, this issue was popular back in the 1990s and now slowly fading away by many other public health agendas. Therefore, it is hard to define that the level of acceptance is based on the precise perception. Lastly, water fluoridation is only one of the many cases of public health services, thus this case cannot represent many controversial issues because each cases are different and have their own characteristics.

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Appendix

1. Survey questionnaire

본 설문 내용은 통계법 제33조에 의거하여 비밀이 보장되며, 통계목적 외에는 사용되지 않습니다.

수돗물 불소농도조정 사업 시행에 대한 시민인식 조사

안녕하십니까?
본 설문은 서울대학교 보건대학원 주관 하에 수돗물 불소농도조정 사업에 대한 국민들의 인식을 알아보기 위한 것입니다.

본 연구의 목적은 수돗물 불소농도조정 사업에 대한 국민들의 인식을 조사함으로써 이에 관련된 여러 가지 의견들을 수렴하고 바람직한 정책 결정에 기여하는 데 있습니다. 귀하는 대한민국의 국민으로서, 귀하의 국가적 보건정책 중 하나인 수돗물 불소농도조정 사업에 대한 의견이 중요하기 때문에 이 연구에 참여하기를 권유 받았습니다. 설문은 총 15-20분이 소요될 예정입니다.

설문 조사는 귀하의 동의 하에 익명으로 실시되며, 조사문항에 따라 응답을 거부할 수 있고 언제든지 철회할 수 있습니다. 조사를 통해 얻은 정보는 연구 자료로만 활용되며, 절대로 개인을 식별할 수 있는 정보가 발표되거나 공개되지 않을 것이오니 최대한 솔직하게 답해주십시오.

응답해주신 고귀한 자료는 향후 바람직한 정책 결정을 위한 기초 자료로서 유용하게 활용될 것입니다.
바쁘신 가운데 설문에 응해주시어 진심으로 감사 드립니다. 항상 건강하십시오.

2015 년 10 월

서울대학교 보건대학원
책임연구자: 천 진 희
(연락처: 02-880-2767, jenny.jinhee.chun@gmail.com)

귀하는 본 설문지 참여에 동의하십니까? 예___ 아니오___
*"예" 란에 동의한 분에 한하여 온라인 설문을 실시함.

SQ1) 귀하의 성별은 무엇입니까? 남( ) 여( )

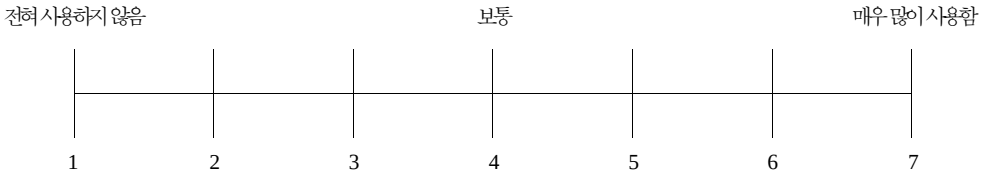
SQ2) 귀하의 나이는 어떻게 되십니까? 만( ) 세

SQ3) 귀하는 인천에서 얼마 동안 거주하셨습니까? ( )년( )개월

SQ4) 귀하께는 만 18세 이하의 자녀 혹은 손녀가 있습니까? 네( ) 아니오( )

SQ5) 귀하께서 평소에 주로 마시는 물은 어떤 종류입니까?
1. 끓이지 않는 수돗물
2. 끓인 수돗물
3. 정수기 물
4. 사먹는 생수
5. 약수터나 우물물
6. 기타: 직접입력( )

SQ6) 귀하께서 평소 수돗물을 얼마나 많이 사용하십니까, 혹은 사용하지 않으십니까?(식수, 음식의 국물, 세척 시 사용되는 경우 모두 포함)



문1) 귀하께서는 수돗물 불소 사업에 대하여 들어본 적이 있으십니까, 혹은 없으십니까?
1. 들어본 적 있다 2. 들어본 적 없다

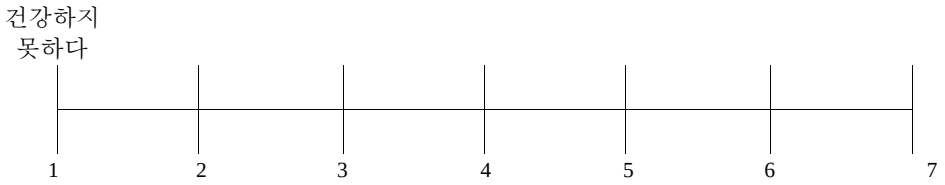
들어본 적이 없는 경우 다음의 설명 후 설문이 진행됩니다
수돗물 불소농도조정사업 (이하 수돗물 불소 사업) 은 보건복지부에서 주관하는 건강증진 사업 중 하나로, 자연상태 수돗물 내 불소 이온 농도를 저수조에서 0.8ppm(물 1리터당 0.8mg 에 해당하는 양)으로 조정하여 공급합니다. 보건복지부와 구강전문가들은 수돗물 불소농도조정사업이 충치예방에 효과적이고, 안전성이 과학적으로 증명되었으며 비용도 저렴하여 이미 많은 나라들에서 오랫동안 실시해오고 있다는 이유로 추진하고 있습니다. 하지만 일부 단체에서는 불소의 안전성(예: 불소로 인한 각종 암 및 골연화증)에 의문을 제기하고 있으며, 모든 주민이 일괄적으로 불소를 섭취하도록 하는 것은 옳지 않다고 반대하고 있습니다.

***들어본 적이 없다고 응답하신 분들은 문30-34 부분을 제외한 나머지 문항 수행.**
문2-3) 다음은 수돗물 불소사업에 대한 귀하의 동의 정도입니다. 다음의 문장을 읽고 동의여부에 대해 답하여 주십시오.

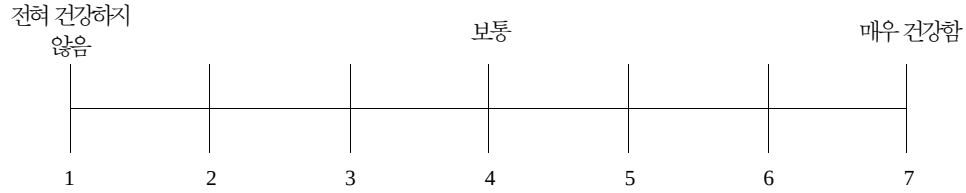
문2) 수돗물에 불소농도를 조정하는 것은 충치(치아우식증) 예방에 효과적이다.
동의한다 ( ) 동의하지 않는다 ( )

문3) 수돗물에 불소농도를 조정하면 충치예방으로 인한 진료비가 줄기 때문에 경제적으로 이득을 볼 수 있다.
동의한다 ( ) 동의하지 않는다 ( )

문4-7) 다음은 귀하의 주관적 건강 상태 및 치아 관련 경험에 대한 질문입니다. 읽고 답하여 주십시오.
문4) 현재 귀하의 건강상태는 어떻다고 생각하십니까?
전혀 보통 매우 건강하다



문5) 귀하 또는 귀하의 가족의 차이는 건강한 편입니까?



문6) 귀하 또는 귀하의 가족 분 중에 충치로 인하여 정신적 스트레스나 금전적 부담을 느낀 적이 있습니까?
예( ) 아니오( )

문7) 귀하 또는 귀하의 가족은 충치 치료를 위해 많은 진료비를 지불해야 했던 적이 있으십니까? 예 ( ) 아니오 ( )

문8-13) 다음은 불소와 수돗물 불소 사업 관련 지식에 대한 질문입니다. 읽고 답하여 주십시오.

내용	예	아니오	모르겠다
문8) 수돗물 불소 사업의 목적은 수돗물 소독을 하기 위함이다	1	2	3
문9) 현재 인천에서는 수돗물 불소 사업을 시행하고 있다	1	2	3
문10) 세계보건기구(WHO)는 불소를 '인간에게 발암성이 있을지도 모르는 물질로 분류하고 있다	1	2	3
문11) 수돗물 불소 사업은 가난한 나라에서 주로 시행한다			
문12) 자연상태 수돗물에는 다양한 물질(불소, 알루미늄, 망간 등)이 있다	1	2	3
문13) 시중에 판매되고 있는 생수에는 불소가 포함되어있지 않다.	1	2	3

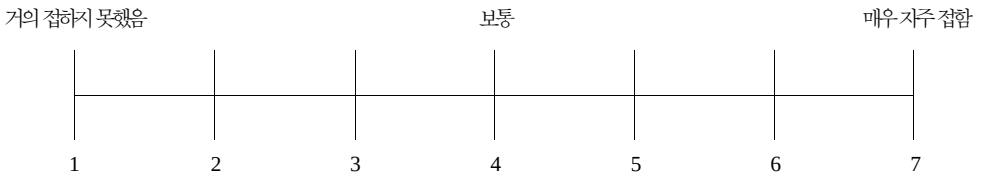
문14-29) 다음은 귀하의 성향에 대한 질문입니다. 읽고 답하여 주십시오..

내용	그렇지 않다 ←---→ 그렇다						
	1	2	3	4	5	6	7
문14) 나는 다른 사람에게 의존하느니 차라리 나에게 의존하는 편이다	1	2	3	4	5	6	7
문15) 나는 대부분 나에게 의존하는 편이며, 다른 사람에게는 의존하는 편이 아니다	1	2	3	4	5	6	7
문16) 나는 다른 사람의 시선에 신경 쓰지 않고 주로 내가 원하고 좋아하는 일을 한다	1	2	3	4	5	6	7
문17) 다른 사람이 가지고 있지 않는 나만의 정체성을 가지고 있다는 것은 나에게 매우 중요하다	1	2	3	4	5	6	7
문18) 나는 다른 사람의 일을 해주기 보다는 나의 일을 하는 것이 중요하다	1	2	3	4	5	6	7
문19) 나는 어떤 일을 하는데 있어서 이기는 것을 중요하게 생각한다	1	2	3	4	5	6	7
문20) 경쟁은 자연의 법칙이다	1	2	3	4	5	6	7
문21) 다른 사람이 나보다 일을 잘한다면, 나는 긴장이 되고 자극이 된다	1	2	3	4	5	6	7
문22) 동료가 상을 받으면 나는 자랑스럽다	1	2	3	4	5	6	7

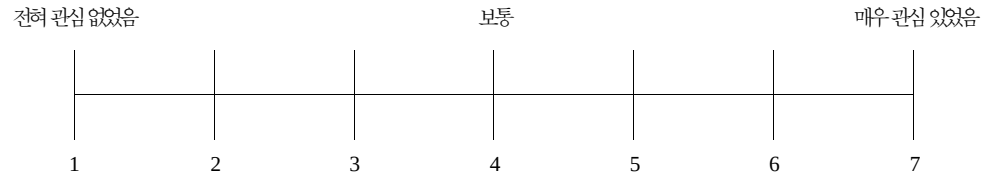
문23) 동료가 잘되는 것이 나에게는 중요하다	1	2	3	4	5	6	7
문24) 다른 사람과 시간을 보내는 것은 나의 기쁨이다	1	2	3	4	5	6	7
문25) 나는 다른 사람과 협력할 때 기분이 좋다	1	2	3	4	5	6	7
문26) 부모님과 아이들은 되도록이면 함께 시간을 보내야 한다	1	2	3	4	5	6	7
문27) 나의 가족을 돌보는 것은 내가 희생하는 한이 있더라도 내가 해야 할 일이다	1	2	3	4	5	6	7
문28) 가족 구성원들과 함께 있는 것은 희생이 따르더라도 꼭 지켜야 하는 것이다	1	2	3	4	5	6	7
문29) 나의 커뮤니티에서 정해진 결정을 존중하고 이를 지키는 것은 중요하다	1	2	3	4	5	6	7

문30-34) 다음은 수돗물 불소 사업에 대한 귀하의 미디어 이용에 대한 질문입니다. 읽고 답하여 주십시오. 앞서 수돗물 불소 사업에 대해 들어본 적이 없다고 답하신 분께서는 응답하지 않으셔도 됩니다.

문30) 귀하께서는 최근 2년간 수돗물 불소 사업에 대한 소식을 얼마나 자주 접하셨습니까?



문31) 귀하께서는 소식을 접하실 때 얼마나 관심을 가지셨습니까, 혹은 가지지 않으셨습니까?



문32) 귀하께서는 주로 어떤 경로를 통해서 수돗물 불소 사업 소식을 접하셨습니까?

1. 중앙방송 (KBS, MBC, SBS,JTBC 등)
2. 인천지역방송 (경인방송 등)
3. 중앙일간지(중앙일보, 한겨레, 동아일보 등)
4. 인천지역일간지 (인천일보, 경인일보, 부평신문 등)
5. 중앙 인터넷 뉴스 (데일리안, 오마이뉴스 등)
6. 지역 인터넷 뉴스 (인천in 등)
7. 카페, 블로그
8. 페이스북, 트위터 등의 SNS
9. 기타 (직접 기입:_____)

→3,4번 택한 경우

문32-1) 어떤 신문을 주로 접하셨으며, 정기구독을 하십니까? ( ), 예( ) 아니오( )

문33) 귀하는 평소에 수돗물 불소 사업에 대해 스스로 정보를 찾아본 적이 있습니까?
예( ) 아니오( )

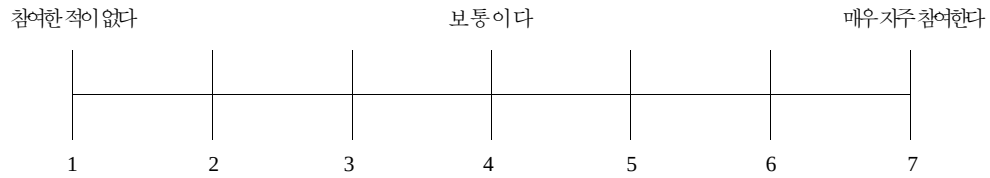
문34) 귀하가 주로 접해 듣는 수돗물 불소 사업 관련 정보에는 어떤 내용이 담겨져 있습니까?
문34-1) 수돗물 불소 사업 시행을 결정하는 과정은 강압적( ) 민주적( )

문34-2) 수돗물 불소 사업은 국민 건강에 위험함 ( ) 유익함( )

문35-42) 다음은 귀하께서 살고 계신 인천광역시에 대한 관심도를 묻는 질문입니다. 읽고 답하여 주십시오.

	그렇지 그렇다	않다←	보통	→매우			
	1	2	3	4	5	6	7
문35) 이 지역의 많은 것을 이야기 할 수 있다	1	2	3	4	5	6	7
문36) 이 지역은 나에게 매우 특별한 곳이다	1	2	3	4	5	6	7
문37) 이 지역에 사는 것을 자랑스럽게 생각한다	1	2	3	4	5	6	7
문38) 이 지역은 내가 일하기에 적합한 곳이다	1	2	3	4	5	6	7
문39) 내 생활은 주로 이 지역에서 이루어진다	1	2	3	4	5	6	7
문40) 내가 이 지역을 떠난다면 섭섭할 것이다	1	2	3	4	5	6	7
문41) 이 지역에 친척들이 많이 살고 있다	1	2	3	4	5	6	7
문42) 지역사회의 공적인 일에 적극적으로 참여한다	1	2	3	4	5	6	7

문43) 지난 12개월 동안 귀하나 귀하 가족구성원께서는 지역사회를 위한 공동생활에 얼마나 자주 참여하셨습니까, 혹은 참여하지 않으셨습니까?

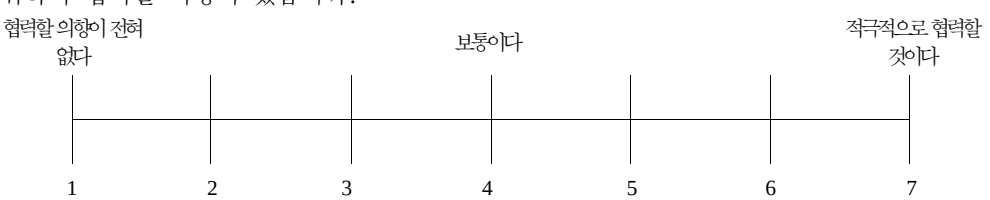


→ 2, 3, 4, 5, 6, 7번 택한 경우

문43-1) 그렇다면 귀하의 참여 형태는 어떠하였습니까?

1. 정부나 인천시의 강압으로 인해 수동적으로 참여하였다
2. 설문조사 여론조사와 같은 조사 형태로 참여하였다
3. 정부나 인천시 행정기관의 요청으로 주민들의 견해를 물었을 때 참여하였다
4. 정부나 인천시에서 물질적인 인센티브를 제공(식량, 주택, 교육지원금 등)하는 대가로 참여하였다
5. 정부나 인천시의 프로젝트에서 단체를 조직하여 시민들의 이해와 목표를 달성하는 데 참여하였다
6. 정부나 인천시의 주도가 아닌 시민들이 적극적으로 참여하여 공동분석, 기획개발, 대안설정 등을 하는 데 참여하였다
7. 정부나 인천시의 개입이 없이 NGO들의 주도적인 운영 하에 참여하였다

문44) 지역사회 내에 수돗물 내 불소 관련 문제가 있다고 하면, 이 문제를 해결하기 위하여 협력할 의향이 있습니까?



문45-60) 다음은 수돗물에 불소농도가 조정되는 것에 대한 귀하의 생각을 묻는 질문입니다. 읽고 답하여 주십시오.

내용	그렇지 않다←-→그렇다 1 2 3 4 5 6 7						
문45) 귀하께서는 불소농도가 조정된 수돗물을 공급하는 것이 강요된 사업이라고 보십니까?	1	2	3	4	5	6	7
문46) 귀하께서는 수돗물에 불소농도를 조절하는 것이 당연하다고 보십니까?	1	2	3	4	5	6	7
문47) 귀하께서는 수돗물 불소농조 조정에 위험이 있다고 알려질 경우, 귀하 스스로 통제 가능할 것이라고 보십니까?	1	2	3	4	5	6	7
문48) 귀하께서는 정부가 수돗물에 불소농도를 조정하는 것에 대해 일반 사람들이 가지고 있는 우려를 충분히 고려하고 있다고 생각하십니까?	1	2	3	4	5	6	7
문49) 귀하께서는 불소농도가 조절된 수돗물을 마신 후 건강이 나빠진다면 건강한 상태로 다시 되돌아 갈 수 있다고 생각하십니까?	1	2	3	4	5	6	7
문50) 귀하께서는 수돗물에 불소농도를 조정함으로써 얻을 수 있는 편익이 불명확하고 의문스럽다고 생각하십니까?	1	2	3	4	5	6	7
문51) 귀하께서는 수돗물 불소 사업이 개인의 인권을 침해한다고 생각하십니까?	1	2	3	4	5	6	7
문52) 귀하께서는 수돗물에 불소농도를 조정함으로써 생길 수 있는 건강 부작용에 대하여 두려움을 느끼십니까?	1	2	3	4	5	6	7
문53) 귀하께서는 수돗물 불소 사업 관련 전문가/운동가들 사이에 의견이 일치하지 않는다고 생각하십니까?	1	2	3	4	5	6	7
문54) 귀하께서는 수돗물 불소 사업으로 인한 이득과 손해가 시민들에게 공평하게 돌아갈 것이라고 생각하십니까?	1	2	3	4	5	6	7
문55) 귀하께서는 정부에서 제공하는 수돗물 불소 사업 관련 정보를 신뢰하고 계십니까?	1	2	3	4	5	6	7
문56) 귀하께서는 정부가 수돗물 불소 사업과 관련된 정보를 모두 공개하고 있다고 생각하십니까?	1	2	3	4	5	6	7
문57) 수돗물 불소 사업을 시행하면 귀하와 귀하의 가족의 건강이 위험할 것이라고 보십니까?	1	2	3	4	5	6	7
문58) 귀하께서는 수돗물에 불소농도를 조정하면 잠재적으로나마 심각한 결과를 초래할 것이라고 생각하십니까?	1	2	3	4	5	6	7
문59) 귀하께서는 수돗물 불소 사업은 특히 아이들에게 위험을 안겨다 줄 것이라고 생각하십니까?	1	2	3	4	5	6	7
문60) 귀하께서는 수돗물 불소 사업과 관련하여 발생했었던 사건/사고와 관련하여 들어보신 적이 있으십니까? (많이 들을수록 높은 점수 부여)	1	2	3	4	5	6	7

문61-76) 다음은 귀하의 수돗물 불소 사업에 대한 인식을 묻는 질문입니다. 읽고 답하여 주십시오.

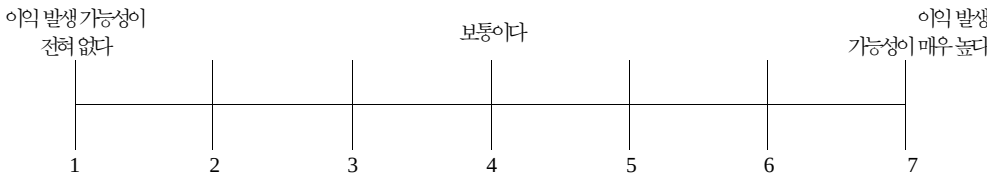
문61) 귀하께서 생각하시기에 불소는 이로운 물질입니까, 해로운 물질입니까?

문62) 불소농도가 조정된 수돗물은, **어디에** 가장 큰 좋은 혹은 안 좋은 영향을 줄 것이라 생각하십니까?

1. 인체

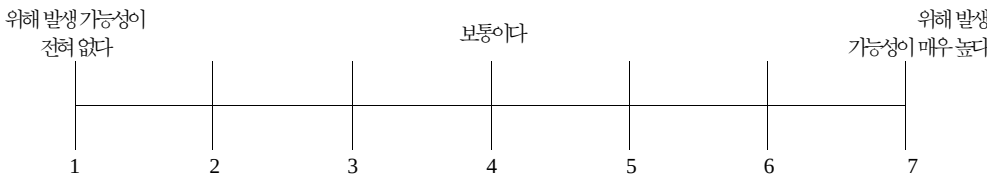
2. 자연환경/생태계
3. 지역 사회의 발전
4. 의료비 절감
5. 기타 (직접 기재:)

문63) 미래에 수돗물 불소 사업으로 인한 **건강에** 대한 이익이 발생할 가능성은 어느 정도라고 생각하십니까?



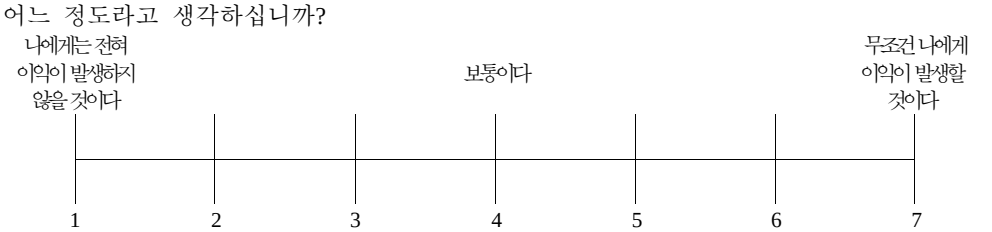
문63-1) 건강에 대한 이익이 발생할 가능성을 **수치**로 표현한다면 어느 정도 입니까? 0에서 100사이 숫자로 표시하여 주십시오. ( )%

문64) 미래에 수돗물 불소 사업으로 인한 **건강에** 위험이 발생할 가능성은 어느 정도라고 생각하십니까?

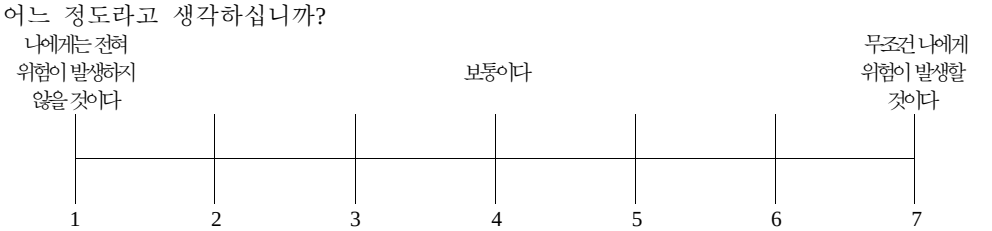


문64-1) 건강에 위험이 발생할 가능성을 **수치**로 표현한다면 어느 정도 입니까? 0에서 100사이 숫자로 표시하여 주십시오. ( )%

문65) 수돗물 불소 사업으로 인해 **나에게** 일어날 건강에 대해 이익이 발생할 가능성은 어느 정도라고 생각하십니까?



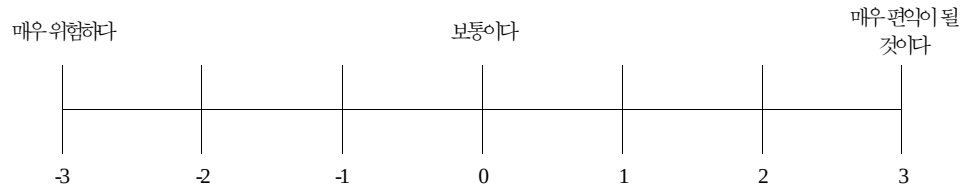
문66) 수돗물 불소 사업으로 인해 **나에게** 일어날 건강에 대한 위험이 발생할 가능성은 어느 정도라고 생각하십니까?



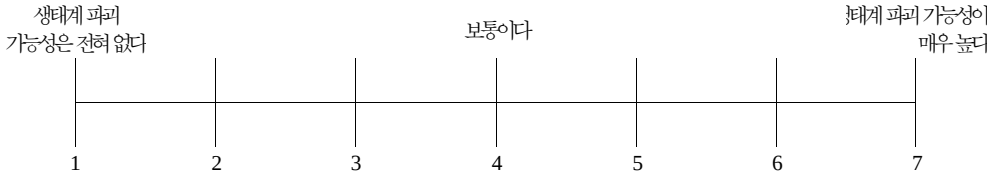
문67) 미래에 수돗물 불소 사업으로 인한 **건강에** 불이익이 발생했을 시 이는 얼마나 심각할 것이라고 생각하십니까?

1 2 3 4 5 6 7

문68) 불소농도가 조정된 수돗물은 **인체에** 얼마나 위험하다고 생각하십니까, 혹은 편익이 될 것이라고 생각하십니까?

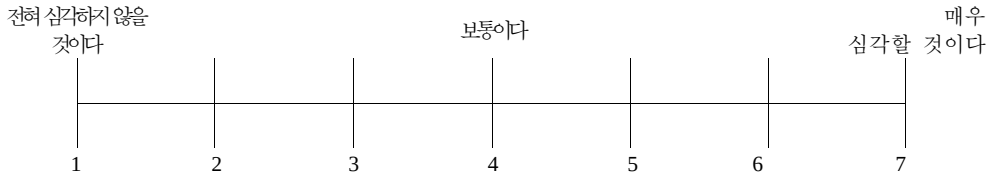


문69) 미래에 수돗물 불소 사업으로 인한 **생태계 파괴** 가능성은 어느 정도라고 생각하십니까?

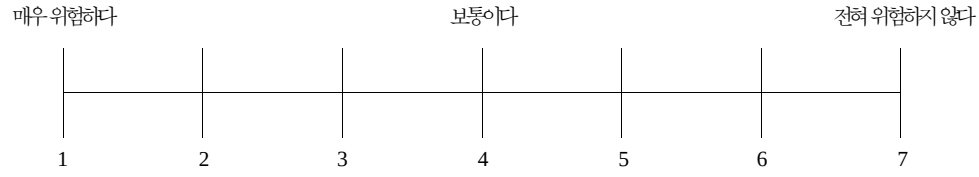


문70) 생태계 파괴 가능성을 **수치**로 표현한다면 어느 정도 입니까? 0에서 100사이 숫자로 표시하여 주십시오. ( )%

문71) 미래에 수돗물 불소 사업으로 인한 **생태계에 위험이 발생했을 시** 얼마나 심각할 것이라고 생각하십니까?

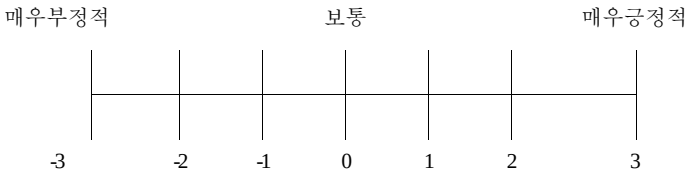


문72) 불소농도가 조정된 수돗물은 **생태계에** 얼마나 위험하다고 생각하십니까, 혹은 위험하지 않다고 생각하십니까?

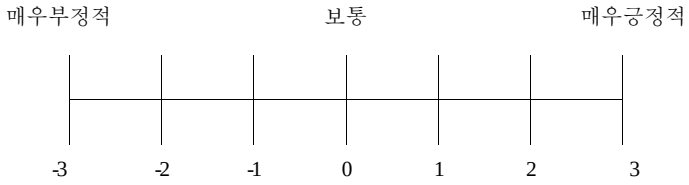


문73) 수돗물 불소 사업을 생각할 때 생각나는 이미지를 3가지로 표현해 주십시오.
1순위 ( ) 2순위 ( ) 3순위 ( )

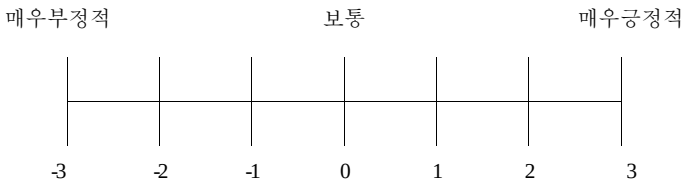
문74) 위 질문에 대한 각 단어들에 대한 긍정적/부정적 감정정도를 표시해 주십시오
1순위 ( )



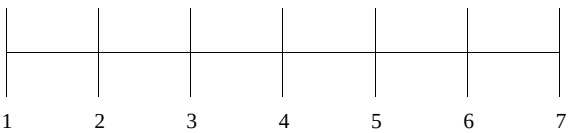
2순위 ( )



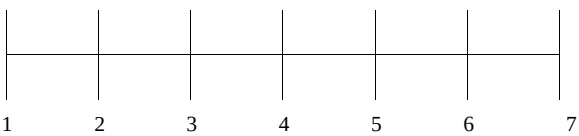
3순위 ( )



문75) 귀하께서는 전반적으로 수돗물 불소 사업에 대한 **긍정적인 감정**이 어느 정도 입니까? 아래에 표시하여 주십시오. 숫자가 높을수록 긍정적임을 뜻합니다.



문76) 귀하께서는 전반적으로 수돗물 불소 사업에 대한 **부정적인 감정**이 어느 정도 입니까? 아래에 표시하여 주십시오. 숫자가 높을수록 부정적임을 뜻합니다.



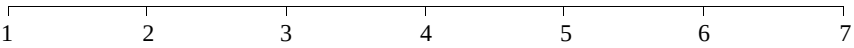
문77-80) 다음은 귀하의 평소 신뢰 수준을 묻는 문항입니다. 읽고 답하여 주십시오.

	그렇지 않다←-→그렇다						
문77) 나는 정부가 국민 건강증진의 목적에 부합되는 공중보건사업을 시행할 것이라고 신뢰하고 있다	1	2	3	4	5	6	7
문78) 나는 인천 광역시가 국민 건강증진의 목적에 부합되는 공중보건사업을 시행할 것이라고 신뢰하고 있다	1	2	3	4	5	6	7
문79) 나는 공중보건사업과 관련된 전문가들이 정확한 과학적 정보를 지니고 있다고 신뢰하고 있다	1	2	3	4	5	6	7
문80)나는 공중보건사업에 대해 미디어 매체에서 전달하는 정보를 신뢰한다	1	2	3	4	5	6	7

문81-83) 다음은 수돗물 불소 사업에 대한 귀하의 수용여부를 묻는 질문입니다. 읽고 답하여 주십시오.

문81) 귀하의 수돗물 불소 사업에 대한 수용의사 정도는 어느 정도 입니까?

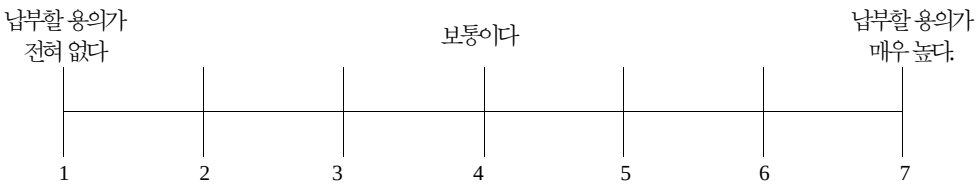
수용의사가 전혀 없다 — 보통이다 — 수용의사가 매우 높다



문82) 수돗물 불소 사업이 시행 또는 중단될 때 결정여부는 어떻게 이루어 지는 것이 합리적이다고 생각합니까?

1. 정부가 결정
2. 인천시가 결정
3. 지방의회가결정
4. 여론조사로 결정
5. 주민투표로 결정
6. 모름
7. 기타 ( )

문83) 수돗물 불소 사업이 시행된다면 예산이 투입되어야 하는데, 이를 위해 세금이 인상될 수 있습니다. 귀하는 세금을 납부할 용의가 있으신지요?

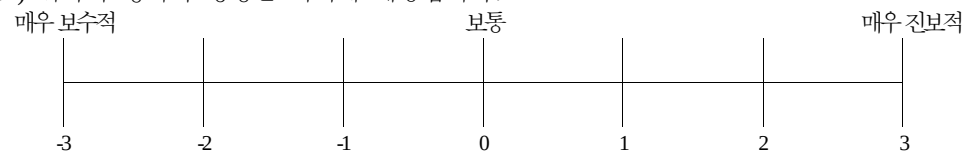


→ 4-7번을 택한 경우

문83-1) 귀하는 수돗물 불소 사업이 실행되는 데 세금을 얼마나 더 지불할 의사가 있으십니까? 1년에 ( )원

문84-87) 다음은 귀하의 일반적인 사항을 묻는 문항입니다. 읽고 답하여 주십시오.

문84) 귀하의 정치적 성향은 어디에 해당됩니까?



문85) 귀하의 학력은 다음 중 어디에 해당됩니까?

□1 무학 □2 초졸 □3 중졸 □4 고졸 □5 대졸 □6 대학원졸

문86) 귀하의 월평균 가계소득은 얼마 입니까? (본인 수입 포함)

□1 100만원 미만 □2 100~199만원 □3 200~299만원
□4 300~399만원 □5 400~499만원 □6 500만원 이상

문87) 귀하는 현재 어떤 일을 하고 계십니까?

□1 학생 □2 자영업 □3 전문직
□4 회사원 □5 주부 □6 시간제 고용직
□7 공무원 □8 자유직 □9 무직 □10 기타

이상 설문을 마치겠습니다. 감사합니다.

문의사항이 있을 시에는 책임 연구자 천진희 (02-880-2767, jinhee_chun@snu.ac.kr) 에게 연락주십시오.

2. Places implementing water fluoridation in South Korea

수돗물불소농도조정사업 시행 현황

(2013년 12월 기준)

시.도	시.군.구		정수장명	시작년도	음용인구수	관할지역 내 불소수돗물 공급지역
울산*	남구, 동구, 북구, 울주군		회야1	1998	590,212	신정1동, 신정2동, 신정3동, 신정4동, 신정5동, 달, 삼산, 야음, 장생포, 대현, 수암, 선암),전하1동, 전하2동, 일산동, 남목1동, 남목2동, 남목3동, 화정동, 방어동, 양정동, 염포동, 효문동, 송정동, 온산읍, 온양읍, 청량면, 서생면
			회야2	1998		
경기	광주시		광주1	1998	272,364	송정동, 광남동, 경안동, 오포읍, 초월읍, 도척면, 곤지암읍, 중부면, 퇴촌면, 남종면
			광주2	2000		
	안산시	상록수	반월	1999	713,666	수암동, 장상동, 장하동, 호수동, 초지동, 부곡동, 일동, 이동, 사동, 사사동, 성포동, 본오동, 건건동, 팔동1동, 팔곡2동, 월피동 일부지역(안산천을 기준으로 성포동쪽 지역)
		단원구	안산	1999		사동, 와동, 고잔동, 상록구 일부
			연성	1999		원곡본동, 원곡1동, 원곡2동, 선부1동, 선부2동, 선부3동, 초지동, 대부동

	안성시		안성	1999	32,085	안성1동, 안성2동
강원	강릉시		연곡	2000	26,387	연곡면, 주문진읍
	영월군		영월	1996	22,065	영월읍
충북	옥천군		옥천	1998	43,739	옥천읍, 동이면, 이원면, 군서면, 군북면
충남	서산시		수석	2002	109,185	서산시 동지역, 인지면, 음암면
전남	여수시*		학용	1999	118,000	쌍봉동, 여천동, 주삼동, 소라면, 삼일동, 율촌면, 화양면 일부
	해남군*		해남	1999	25,175	해남읍
경남	거제시		구천	2008	67,000	장승포동, 마전동, 능포동, 상문동, 아주동, 동부면, 거제면, 이룸면, 남부면 일부
	김해시		삼계	1999	510,886	동상동, 회현동, 부원동, 내외동, 북부동, 칠산서부동, 활천동, 삼안동, 불암동, 장유1동, 장유2동, 장유3동, 생림면
			명동	2008		진영읍, 주촌면, 한림면
	진주시		진주1	1998	324,367	평거, 판문, 신안, 이현, 내동
			진주2	1998		수곡, 대평, 명석, 정촌, 중앙, 상봉서, 상봉동, 봉안, 봉수, 성지, 옥봉, 가호, 강남, 칠암, 망경, 상대1, 상평, 하대1, 하대2, 상대2, 초장, 미천, 대곡, 집현, 금산, 문산
	창원시	진해구	석동	1981	373,458	중앙동, 태평동, 충무동, 여좌동, 태백동, 경화동, 병암동, 석동, 이동, 자은동, 덕산동, 풍호동, 웅천동, 웅동 1동

		의창구(창원)	대산	2008		의창동, 소계동, 중동, 도계동, 명곡동, 대방동, 성주동, 안민동, 남양동, 가음정동
	창녕군		상월	1999	2,750	고암면
	남해군		아산	1999	13,000	남해읍(아산리, 봉전리, 유림1동, 유림2동, 북전1리, 신기리, 선소리, 동산리, 곡내리, 진천리)
	합천군		합천	1999	12,767	합천읍(창동, 교동, 정대동, 서산리, 신소양리, 중흥동), 대양면(이천리, 정양리, 대목리, 이계리, 남암리, 덕정리, 신거리, 양산리)
합계	실시 지역	지자체	22곳		3,257,106	
		정수장	24곳			

* 잠정중단 지역 : 울산(‘14년 1월~), 여수(‘13년 9월~),
해남(‘14년 2월~), 경기도 광주(‘14년 7월~)

3. Worldview

1) Four dimensions of collectivism and individualism (Triandis & Gelfand, 1998)

Vertical Collectivism	Seeing the self as a part of a collective and being willing to accept hierarchy and inequality within that collective
Vertical Individualism	Seeing the self as fully autonomous, but recognizing that inequality will exist among individuals and that accepting this inequality
Horizontal Collectivism	Seeing the self as part of a collective but perceiving all the members of that collective as equal
Horizontal Individualism	Seeing the self as fully autonomous, and believing that equality between individuals is the ideal

2) Survey questionnaire of worldview (Triandis & Gelfand, 1998)

Horizontal individualism
1. I'd rather depend on myself than others.
2. I rely on myself most of the time; I rarely rely on others.
3. I often do "my own thing."
4. My personal identity, independent of others, is very important to me.
Vertical individualism
1. It is important that I do my job better than others.
2. Winning is everything.
3. Competition is the law of nature.
4. When another person does better than I do, I get tense and aroused.
Horizontal collectivism
1. If a coworker gets a prize, I would feel proud.
2. The well-being of my coworkers is important to me.
3. To me, pleasure is spending time with others.
4. I feel good when I cooperate with others.
Vertical collectivism
1. Parents and children must stay together as much as possible.
2. It is my duty to take care of my family, even when 1 have to sacrifice what I want.
3. Family members should stick together, no matter what sacrifices are required.
4. It is important to me that I respect the decisions made by my groups.

4. Outrage factors

Survey questionnaire of outrage factors (Armfield & Akers, 2010)

Outrage Factor	Wording	Responses
Imposed	"To what extent do you see the drinking of fluoridate water as either voluntary or imposeduponpeople(involuntary)?"	"Very much voluntary" to "Very much imposed"
Unnatural	"To what extent do you see the addition of fluoride to the water supplies as a relatively natural process?"	"Very natural" to "Very artificial"
Unfamiliar risks	"How familiar are you with any possible health risks you believe to be associated with water fluoridation?"	"Very unfamiliar" to "Very familiar"
Memorable	"How much media attention do you remember being paid to water fluoridation in the last couple of years?"	"A great deal of attention" to "No attention"
Diffuse benefits	"Over what period of time do you think possible major adverse health effects of water fluoridation may become known?"	"Long term" to "No major adverse health effects"
Dreaded	"How fearful or anxious are you regarding any possible health risks from water fluoridation?"	"Very fearful or anxious" to "Not at all fearful or anxious"
Disagreement	"What level of agreement do you think experts have over the benefits and risks of water fluoridation?"	"Considerable agreement" to "Considerable disagreement"
Unfair	"Do you see the benefits and/or risks of water fluoridation as affecting people equally? That is, how fair or unfair do you regard the risks and benefits?"	"Very fair" to "Very unfair"
Uncontrollable	"In terms of any perceived risk you associate with drinking fluoridated water, to what extent do you regard these risks as personally controllable?"	"Very controllable" to "Very uncontrollable"
Untrustworthy	"How trustworthy do you think government information is on the benefits and risks of water fluoridation?"	"Very trustworthy" to "Not at all trustworthy"
Secretive	"To what extent do you believe the government may be withholding information relating to water fluoridation?"	"Withholding considerable information" to "Not withholding any information"
Arrogance	"What do you think is the government's attitude in relation to the public's concerns over water fluoridation?"	"Very courteous and caring" to "Very arrogant and defensive"
Personal stake	"To what extent would you regard yourself, or your family, to be at risk as a result of the addition of fluoride to public supplies?"	"At high risk" to "At no risk"
Irreversible	"Do you believe that any potential adverse health effects associated with water fluoridation can be undone or are reversible?"	"Not at all reversible" to "Entirely reversible/no health risks"
Unknowable	"How well do you understand any risks that you associate with water fluoridation?"	"Entirely understand" to "Do not understand at all"
Unclear benefits	"To what extent do you regard water fluoridation as having unclear, questionable or vague personal or economical benefits?"	"Very clear benefits" to "Very unclear benefits"
Moral relevance	"To what extent do you see water fluoridation as a moral issue (e.g. relating to personal rights or freedoms)?"	"Very morally relevant" to "Very morally irrelevant"
Catastrophic potential	"Do you regard water fluoridation as having catastrophic potential i.e. the capability of causing many deaths or much illness?	"No danger whatsoever" to "Potentially catastrophic"
Effects on children	"Do you believe that children, in particular, will be put at risk from water fluoridation?"	"At considerable risk" to "At no risk"
Accident history	"Are you aware of any major accidents or frequent minor accidents being associated with water fluoridaton?"	"Aware of at least on major accident" to "Not aware of any accidents"

Abstract (Korean)

공중보건사업의 수용과 위험인식 : 인천지역 수돗물 불소농도조정사업의 인식도 조사 사례연구

천진희
보건학과 보건정책관리전공
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현대사회가 점차 복잡해지면서 공중보건의 영역과 역할 또한 증대되고 있다. 특히 건강과 관련된 정보들이 다양한 매체에 의해 여러 사람들과 공유되면서 이로 인해 보건서비스의 안정성과 효과성이 끊임없는 논쟁으로 이어지고 있다. 그 예로서 수돗물 불소화 농도조정사업(이하 수돗물 불소사업)을 들 수 있다. 수돗물 불소사업은 최초로 미국에서 1945년에, 그리고 한국에서는 1981년에 실시되었다. 그리고 이 사업에 대한 논란은 지금까지도 지속되고 있다.

수돗물 불소사업에 대한 편익/불이익, 비용효과, 인지도에 대해서는 다수 연구되었지만, 전체적인 논쟁에 대한 사회학적인 입장에서 바라본 연구는 부족한 실정이다. 때문에 효과적이고 성공적인 보건사업을 위해 수돗물 불소사업에 대한 시민들의 인식 및 관련 요인을 파악할 필요가 있다. 이에 본 연구는 한국 시민들, 특히 논란이 되었던 인천 지역의 시민들을 대상으로 수돗물 불소사업 위험인식의 영향요인을 탐색하고, 시민들의 인식이 사업의 수용여부에 미치는 효과를 검증하였다.

본 연구를 수행하기 위해 2015년 10월 인천광역시를 대상으로 527명의 시민들에게 온라인 설문을 실시하였다. 설문 문항에는 개인의 특성, 미디어, 감정촉발요인, 신뢰를 포함하였다. 수돗물 불소사업 수용여부 및 위험 인식의 영향요인을 확인하고자 상관분석과

다중회귀분석을 수행하였고, 수돗물 불소사업 위험 인식의 매개효과 검증은 위계적 다중회귀분석과 소벨 테스트를 통해 이루어졌다.

연구대상자의 평균 연령은 40세로 남성 51%, 여성 49%의 비율을 나타냈다. 대상자들의 수돗물 불소사업 위험인식과 사업 수용여부 정도는 4.1 (7점 척도), 59%(비율형)였다. 상관분석과 다중회귀분석결과 미디어에 노출되고 사업과 관련된 이해당사자들의 신뢰가 높을수록, 그리고 감정촉발이 낮을수록 수돗물 불소사업의 위험인식은 낮고 사업의 수용여부는 높아지는 것으로 확인되었다. 또한 수돗물 불소사업의 위험인식은 사업의 수용여부에 부분적으로 매개하는 것으로 나타났다.

따라서 본 연구는 수돗물 불소사업에 대하여 국민의 이해를 높이고, 효과적이고 성공적인 공중보건 정책 및 커뮤니케이션 방법을 모색할 때는 시민들의 이해당사자들에 대한 신뢰, 감정촉발과 더불어 미디어를 이용한 전략이 위험인식을 통해 반드시 고려되어야한다는 점을 시사해 준다. 아울러 본 연구는 수돗물 불소사업의 수용여부를 위험인식의 관점으로 재조명했다는 점에서 최초의 연구이다. 또한 과학적 증거에 대해 논란이 되고 있는 보건사업에 대한 사례연구로서 가능성 있는 대안을 모색했다는 데에도 의의가 있다.

주요어: 수돗물 불소농도조정사업, 위험인식, 공중보건사업, 미디어, 감정촉발, 신뢰

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