

2016

Implementation Processes And Impacts Of School Store Policies In South Korea

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IMPLEMENTATION PROCESSES AND IMPACTS OF
SCHOOL STORE POLICIES IN SOUTH KOREA

by

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Submitted in Partial Fulfillment of the Requirements

For the Degree of Doctor of Philosophy in

Health Promotion, Education, and Behavior

The Norman J. Arnold School of Public Health

University of South Carolina

2016

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ACKNOWLEDGEMENTS

There are not enough words to express my thanks to all who have believed, supported, and encouraged me over the years. I would like first thank my advisor, Dr. Edward Frongillo, for his continuous encouragement and guidance during the PhD program. I could not have completed my program without his support. I am fortunate to have him as my mentor.

I wish to express my sincere thanks to my committee members Drs. Christine Blake, Jim Thrasher, and Mark Tompkins for their understanding, kindness, valuable feedback, and insights during the whole process. I am thankful to my MPH program advisor, Dr. Hyojee Joung, for allowing me to use her data for my dissertation. I also want to thank my interviewees and all people who helped me conduct interviews.

I would like to acknowledge and thank all people in Cancer Prevention and Control Program for their supports for my graduate assistantship and for giving me opportunities to broaden my research interests.

I would also like to thank my friends in South Carolina for being with me through both happy and hard times. Special thanks to my friends in Korea for their emotional supports regardless of the physical distance. Finally, I would like to extend my gratitude to my family for their endless love and unconditional supports.

ABSTRACT

With the concern of unhealthy school food environments, the South Korean government enacted two school nutrition policies to reduce unhealthy foods in school stores. The first policy banned on soft drinks sales in school stores enacted in 2007. The second policy restricted energy-dense nutrient-poor (EDNP) food sales in school stores enacted in 2009. This study aims to examine the changes in adolescents' food intake and foods sold in school stores due to the two policies and to understand the policy implementation processes.

The Korea National Health and Nutrition Examination Surveys were used to examine trends in adolescents' energy intake from school store foods during 1998-2012. Energy intake from instant noodles consistently decreased both at home and in school stores. Energy intake from soft drinks away from home or school rapidly increased beginning in 2008. All foods sold in school stores were observed before (2006) and after (2013) the implementation of policies. The mean number of soft drinks sold in a school store significantly decreased in 2013 (0.3 items) compared to in 2006 (1.9 items, $p=0.032$). However, soft drinks were available in 50% of school stores observed in 2013 and all school stores observed in 2013 sold EDNP foods. In the qualitative interviews with policy actors, despite of the policy noncompliance, all interviewees perceived that school stores complied with the policy. Perspectives and values towards the policy were different for each actor group. Poor monitoring, lack of awareness of the policy, profit-

seeking, and lack of interest in school stores were identified as reasons for incomplete implementation of the policy.

The two school store policies in South Korea appear to have had a modest impact on overall diet of adolescents and food availability in school stores. Comprehensive policies that target diverse eating places are needed to improve adolescents' overall diet. This study supports the needs for consideration of perspectives of various actors, especially for those who are affected by the policy, when implementing school nutrition policies. Understanding of various actors' involvement in policy processes can inform strategies to enhance implementation and thereby reach outcomes that align with the original policy intent.

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LIST OF ABBREVIATIONS

| | |
|---------------|---|
| CHC | Community Health Center |
| EDNP | Energy-Dense Nutrient-Poor |
| FVJ..... | Fruit and Vegetable Juice |
| KNHANES | Korea National Health and Nutrition Examination |
| LOWESS..... | LOcally WEighed Scatter plot Smoothing |
| MFDS..... | Ministry of Food and Drug Safety |
| MoE..... | Ministry of Education |
| SSB | Sugar-Sweetened Beverage |

CHAPTER 1

Introduction

Adolescents spend the majority of their waking time in school. School environments influence students' health behaviors, including food choices and dietary behaviors (Briefel, Crepinsek, Cabili, Wilson, & Gleason, 2009; Mensink, Schwinghammer, & Smeets, 2012; Wechsler, Devereaux, Davis, & Collins, 2000). Thus, schools have often served as places for health policies and programs to address adolescents' health issues (Jaime & Lock, 2009). Schools play an important role in their students' diets because students have one-third of their daily energy intake from schools through lunch and/or snacks in school stores (Briefel, Wilson, & Gleason, 2009). School meals are provided to students under the supervision of dietitians, whereas students choose snacks from school stores by themselves. Hence, foods and beverages available for sale (hereafter food availability) in school stores could directly affect students' diets. Food availability was found to be a key factor contributing to both healthy and unhealthy dietary behaviors of students during school hours (Briefel, Crepinsek, et al., 2009; Kubik, Lytle, Hannan, Perry, & Story, 2003; Larson & Story, 2010). Because most foods and beverages sold in school stores are often high in energy and low in nutrients, the limited healthy food options in school stores are criticized as one of the causes of childhood obesity and children's unhealthy diet (Clarke, Fletcher, Lancashire, Pallan, & Adab,

2013; Story, Kaphingst, & French, 2006). For these reasons, the U.S. Institute of Medicine has recommended restrictions on unhealthy food and beverages sold outside of the school meal program (Stallings & Yaktine, 2007).

Efforts to improve school food environments have been made in many countries. One such effort is the enactment of policies that limit unhealthy food sales in schools. With the concern of increasing childhood obesity and unhealthy school food environments, South Korea has also enacted two national school nutrition policies to reduce unhealthy foods in school stores. The Korea Ministry of Education (MoE) required a ban on sales of soft drinks and recommended banning sales of instant noodles, fried foods, and fast foods in schools, including school stores, at the beginning of the school year in 2007 (hereafter 2007 policy). In 2009, the Special Act on Safety Management of Children's Dietary Life (hereafter the Special Act), a comprehensive nutrition policy targeted multiple nutritional problems of Korean children, was enacted. One component of the Special Act is a nutrient-based policy that restricts energy-dense nutrient-poor (EDNP) food sales in school stores (hereafter 2009 policy).

The two school store policies that restrict soft drinks and EDNP food sales in school stores have been implemented nationwide for the last nine and six years, respectively. Every school store is supposed to follow the school store policies, but several studies and media have reported that restricted foods are still available in some school stores (Ahn, 2009; S. C. Kim et al., 2010; S. Y. Lee, Lee, Kim, & Kim, 2012; B. Song, 2010). Nevertheless, there is a lack of studies that examine to what extent the school store policies have influenced adolescents' diets, and foods and beverages in school stores, and how the policies have been enforced and implemented. Thus, this study

aims to examine the changes in food intake of adolescents and foods available in school stores due to the school store policies and to understand implementation processes of the 2009 policy in South Korea.

This study consists of three manuscripts. The first manuscript of the dissertation examines trends of Korean adolescents' energy intake from selected school store foods by eating places during 1998-2012. This study aims to assess the extent to which adolescents' intake of the target foods of the school store policies shifted. The second manuscript assesses foods and beverages sold in school stores in South Korea in 2006 and 2013. The aim of the study is to assess how the two different national school store policies have changed school store food environments. The third manuscript reports qualitative research that aims to understand the implementation process of the 2009 policy through interviews with people who are directly or indirectly involved in the translation of the policy into specific rules and practices. The research questions of this study are: (1) How do policy actors describe policy implementation processes?, (2) Who are the policy actors and how do they act?, (3) Are the seven elements of social process (Clark, 2002) reflected differently across schools and policy actors?, and (4) What factors affect the extent of policy implementation among schools?

Chapter 2 describes a review of the scientific literature that provides current understanding of school food environments and efforts to improve school food environments both in South Korea and worldwide. Knowledge gaps are also stated. Chapter 3 presents methodology of the study. Chapter 4 presents the three manuscripts. Chapter 5 includes in overall discussion and conclusions, and implications for future research.

CHAPTER 2

Background and Significance

2.1 School Food Environments

Individual efforts to have healthy lifestyles can succeed within a supportive environment. Schools are important settings for shaping students' health behaviors including healthy diets (Story et al., 2006; Wojcicki & Heyman, 2006). Students have up to two meals as well as snacks at school during a school day and their peers and teachers serve as role-models for dietary behaviors (Story et al., 2006; Wojcicki & Heyman, 2006).

Food environments regarding food accessibility and food availability influence people's food purchase and consumption (Kant & Graubard, 2003; Martin et al., 2012; Wansink, 2004). Concerns about school food environments have been raised because of unhealthy foods, especially soft drinks and EDNP foods, sold in schools. Availability of unhealthy foods in school stores or vending machines in schools is associated with students' poor diet (Briefel, Crepinsek, et al., 2009). For example, students of schools with stores or snack bars had more energy intake from sugar-sweetened beverage (SSB) than those attending schools without stores or snack bars (Briefel, Crepinsek, et al., 2009). For students attending public schools in the U.S., schools are one of major sources of SSB intake. They consumed more SSB in schools than at home or in other places.

Their in-school energy intake from SSB is estimated to range from 16-90 kcal per school day, which turns into 3,404-17,100 kcal per school year (Briefel, Crepinsek, et al., 2009).

Access to unhealthy foods in schools not only increases unhealthy food intake but also decreases healthy food intake. Middle-school students who gain access to school snack bars consume less fruit, milk, and regular-vegetables and more SSB and high-fat vegetables, compared to when they were in elementary school with access to only school meals (Cullen & Zakeri, 2004). In addition, students' daily intake of fruit servings decreases by 11% with each snack vending machine located in a school (Kubik et al., 2003). Unhealthy food consumption may also alter intake of other healthy foods, for example, when milk is replaced with soft drinks (Y.-J. Bae & Yeon, 2013; Taillie, Afeiche, Eldridge, & Popkin, 2015; Vatanparast, Lo, Henry, & Whiting, 2006).

To improve students' diet, several efforts have been taken worldwide. One such effort is development and implementation of school nutrition policies aiming at creating healthier school food environments.

2.2 School Nutrition Policies

School nutrition policies have historically been targeting the safety and nutritional quality of foods provided by school meal programs and outside of school meal programs such as school stores, snack bars, and vending machines. Foods and beverages available from outside of school meal programs are called competitive foods because students' consumption of those foods often compete with consumption of school meals (Fox, Meinen, Pesik, Landis, & Remington, 2005). Most competitive foods are high in energy and low in nutritional values in U.S. schools (D. M. Finkelstein, Hill, & Whitaker, 2008;

O'Toole, Anderson, Miller, & Guthrie, 2007; Story et al., 2006), as well as in schools in South Korea (M. Kim, 2013). In light of growing concerns about the contribution of unhealthy competitive foods to unhealthy school food environments, implementation of school nutrition policies that restrict unhealthy food sales and/or require healthy foods has recently increased.

School nutrition policies targeting competitive foods in the U.S. have been effective in improving school food environments and students' food intake (Chriqui, Pickel, & Story, 2014; Craddock et al., 2011; Kubik et al., 2013; Schwartz, Novak, & Fiore, 2009; Taber et al., 2011). U.S. students in states with a policy targeting SSB sales in schools purchase less SSB and consumed fewer servings of SSB than those in states without a restrictive policy (Jones, Gonzalez, & Frongillo, 2009; Taber et al., 2011). Students who attended Boston public high schools consumed less soda, other SSB, and total SSB, after a policy restricting SSB sales in Boston public high schools passed, while SSB consumption of nationwide samples in the same period did not change (Craddock et al., 2011). A recent systematic review of competitive food policies in the U.S. reported that competitive food policies are associated with positive changes in students' food consumption and food availability in schools (Chriqui et al., 2014).

Policies targeting competitive foods attempt to either limit specific food items or set a standard for nutrient content of the food. The first type of policy, the food-based policy, is mostly used to restrict sales of soft drinks or fried foods. The second type of policy, the nutrient-based policy, is used to limit foods with high energy, fat, sugar, or sodium. California's competitive food policy that has been implemented since 2007 includes food standards and beverage standards (Senate Bills 12 and 965) and showed a

good example of food- and nutrient-based policies. The food standards of California's competitive food policy specify amounts of energy, sugar, and energy from fat and saturated fat in the foods that can be sold in schools (nutrient-based policy). Beverage standards have a list of types of beverages that are allowed to be sold in schools (food-based policy). Previous research that compared food availability in schools before and after implementation of food- and nutrient-based policies reported that both types of policies contributed to the decrease in the unhealthy food availability in schools, but the reduction in unhealthy food availability varied across studies (Chriqui, Turner, Taber, & Chaloupka, 2013; Fernandes, 2013; Peart et al., 2012; Samuels et al., 2009; Woodward-Lopez et al., 2010). In some cases, nutrient-based policies resulted in the removal of only the least healthy foods, thus access to healthy foods are not increased (Samuels et al., 2009; Woodward-Lopez et al., 2010). In general, schools sell less restricted foods under food-based policies than foods restricted under nutrient-based policies; however, none of the policies achieved 100% removal of the restricted foods (Peart et al., 2012; Samuels et al., 2009; Woodward-Lopez et al., 2010). Food-based policies are more straightforward while policy implementers often have difficulty in understanding complex nutrient criteria of nutrient-based policies (Chriqui et al., 2014; Chriqui et al., 2013; Woodward-Lopez et al., 2010). Less is known, however, about which type of policy most improves school food environments and adolescents' diets.

Knowing policy influences and the conditions under which they are most effective could help in developing and implementing more effective policies in the future. The two types of policies are known to be associated with the decrease in availability of and students' in-school consumption of the restricted foods (Chriqui et al., 2014; Cradock

et al., 2011; Fernandes, 2013; Jones et al., 2009; Peart et al., 2012; Samuels et al., 2009; Taber et al., 2011; Woodward-Lopez et al., 2010), but these policies have limited impacts on students' overall diets (Chriqui et al., 2014; Jones et al., 2009; Taber, Chriqui, Powell, & Chaloupka, 2012). Students may compensate for restrictions in schools by consuming more of the restricted foods when they are not in school or by bringing foods from home or outside of school (Cullen, Watson, & Zakeri, 2008; E. Finkelstein, French, Variyam, & Haines, 2004; Vecchiarelli, Takayanagi, & Neumann, 2006). Some studies reported no compensatory intake at home among students while the intake of restricted foods in schools decreased (Schwartz et al., 2009). Still, less is known about where the compensatory behavior occurs and how it affects overall diets. Thus, the need to understand the influence of school nutrition policies on students' consumption in school and out of school has been brought to the fore (Chriqui et al., 2014; Cullen et al., 2008).

2.3 Policy Process

Many people and interest groups, from the government level to the individual level, are involved in the policy process. The participants of the policy process are called policy actors. Legislators and government agencies whose roles are specified in the policy are considered official actors; individual citizens, interest groups including industry, political parties, media, and research organizations are considered unofficial actors. "Unofficial" does not mean that their participation in the policy process is not expected; it means that their roles are not specified in the policy (Birkland, 2005). Both official and unofficial actors are involved in the policy process; but each actor's role and influences are not always the same during the whole policy process.

Agenda setting is a stage in which some societal problems are raised to elicit political attention from decision makers. Legislators, politicians, advocacy groups, media, and researchers have power in the agenda setting stage (Kingdon, 2002). Official actors, including legislators and politicians, are directly involved in the policy formulation and legislation processes. They may have less impact on policy implementation compared to the huge amount of power they exert in policy agenda setting and enactment (Kingdon, 2002). On the other hand, public officials may have a greater impact on policy enforcement and implementation processes although their involvement in policy agenda setting is limited (Kingdon, 2002). Public officials are usually in charge of ensuring compliance with the policies. They enforce policies aiming at preventing non-compliance of the policy and eliminate the benefits of policy non-compliance, often using monetary fines and incentives (Organization for Economic Co-operation and Development, 2009). Public officials, especially in the local level governments, are expected to be in a better position to get feedback about the policy from the front-line policy implementers and citizens, and are also expected to monitor specific indicators more regularly than policy makers (politicians), researchers involved in the policy making, and public officials in higher-level governments. Public officials receive feedback about poor implementation that does not meet the original policy intention, unmet policy goals, cost-related problems, new problems, and unanticipated consequences of the policy (Kingdon, 2002). Actors who are affected by policies, such as school store owners in the case of the school store policy, are often not included in the decision-making process, which turns into a misunderstanding of the policy intent, distrust of the government, or unsupportive responses to the policy (Roberts, Pobocik, Deek, Besgrove, & Prostime, 2009). Policies

are less likely to be implemented in expected ways when actors, whose cooperation is essential for policy implementation, do not involve themselves (either intentionally or unintentionally) in the decision making process (Cram, 1997).

Policy implementation is difficult. Many explicit and implicit factors and policy actors whose involvement differs in each stage of policy processes affect and are affected by policy implementation. Pressman and Wildavsky (1984) explained this complex situation as: “The longer the chain of causality, the more numerous the reciprocal relationships among the links and the more complex implementation becomes” (p. xxiv).

Recognizing policy actors is an important step in policy processes since they can hinder or enhance policy implementation (Clark, 2002; Clarke et al., 2013). The perspectives and attitudes of policy makers and implementers affect how the policy is being implemented (Vine & Elliott, 2014). In addition, difficulties in satisfying different perspectives among policy actors and conflicts in responsibility among policy actor groups, such as expecting other actors to support or oppose the policy implementation, may hinder implementation processes (Clarke et al., 2013; Green & Aarons, 2011).

2.4 Implementation Processes of School Nutrition Policies

Like other public policies, there are various actors in school nutrition policies including school staff (e.g., teachers, principals, school nurses, health educators, food service directors, and school board/governors), students and their families, health professionals, private sector (e.g., food industry), and non-governmental organizations (Clarke et al., 2013; Pan Canadian Joint Consortium for School Health, 2010). They affect and/or are affected by school nutrition policies, but not all of them are actively

involved in the policy process (Clarke et al., 2013; Roberts et al., 2009). Front-line actors, who are implementing school store policies such as food service personnel, are often left out of the decision-making process for development and implementation of the policy (Roberts et al., 2009).

While most actors agreed that school nutrition policies are good for students' health (Monterrosa et al., 2015; Vine & Elliott, 2014). Some actor groups, such as food industry, however, expected that school nutrition policies will not be effective due to students' unhealthy diet out of schools and wanted to have policies that focus more on family-level, nutrition education, or physical activity (Monterrosa et al., 2015; Roberts et al., 2009; Vine & Elliott, 2014). Concerns of revenue loss; students' food preference; a lack of communication, support, and coordination; complexity of policies; limited resources; and competing priorities have been identified as barriers in school nutrition policy implementation (Agron, Berends, Ellis, & Gonzalez, 2010; Clarke et al., 2013; Davee et al., 2005; Greves & Rivara, 2006; Mâsse, Naiman, & Naylor, 2013; McKenna, 2003; Roberts et al., 2009; Schwartz et al., 2012). Private food service providers or schools make profits through food sales in schools. If they expect that school nutrition policies affect their revenue, they would be less likely to comply with the policy (Mâsse et al., 2013; McKenna, 2003; Roberts et al., 2009). In addition, if students do not like the new items the policies require or items that have to be removed are students' preferred foods, food service providers would resist the policies. Limited involvement in the policy process for some policy actors, such as school food service personnel, students, and parents, causes a lack of communication which leads to unawareness of or misunderstanding the details of the policies, unsupportive attitudes toward the policies,

and even unintentional noncompliance with the policies (Haroun, Harper, Wood, & Nelson, 2011; McKenna, 2003; Roberts et al., 2009). School staff and school food service personnel often do not have or know about resources to interpret or to implement the policies. Thus it causes difficulties in compliance with the policies, e.g., having difficulties finding foods that meet policy requirements (Samuels et al., 2009; Schwartz et al., 2012). Having resources (e.g., booklet, websites providing policy information or supports from dietitians), organized communication to increase policy awareness among policy actors, and support from school administrator, school board, parents, and politicians are identified as facilitators of school nutrition policy implementation (Agron et al., 2010; Davee et al., 2005; Dodson et al., 2009; Mâsse et al., 2013).

Previous studies reported actors' roles and thoughts on school nutrition policies from school administrators, food service personnel, public officials in governmental institutions, students, and parents. Yet there are only a few studies that investigated the views of multiple different types of actors on school nutrition policies together (McKenna, 2003; Monterrosa et al., 2015; Roberts et al., 2009; Vine & Elliott, 2014).

2.5 School Food Environments and Related Policies in South Korea

For Korean students, major food sources in schools are from school meal services (mainly for lunch) and school stores. As of 2014, 99.8% of Korean students participate in the school lunch program (Korea Ministry of Education, 2015), and a total 52% of middle and high schools in Seoul, South Korea have school stores (110 middle schools, 35%; 248 high schools, 65%) (M. Kim, 2013). School stores are small stores in schools that sell foods and beverages to students during school hours. Usually, only one store is

located in a school and they mostly offer snacks rather than meal substitutes. Chips, cookies, and bread are high-selling products in school stores (Chang et al., 2007; Y. J. Kim, 2010). Most of school stores are operated by private retailers, not schools. Thus, school stores are often not controlled by the schools while school meal service is managed by school dietitians.

The presence of school stores is related to snack intake of Korean students. Korean students attending schools with school stores are more likely to eat more snacks, to spend more money for snack purchases compared to other students attending schools without a school store (Do, 2012). More than 80% of students among those attending schools with school stores use them at least once a week (Y.-J. Kim, 2012; Yun, 2014). Given that school stores offer unhealthy snacks to students, concerns regarding unhealthy school store foods that may cause childhood obesity have been growing. To address unhealthy school store food environments, two national policies have been enacted.

In March 2006, the Korea National Youth Commission recommended banning soft drink sales in schools and youth training facilities (Korea National Youth Commission, 2006). Following this, in February 2007, the MoE announced the 2007 food-based policy that banned sales of soft drinks and recommended schools not sell instant noodles, fried foods, and fast foods. The 2007 policy began to be implemented in March 2007, the onset of the 2007 school year (Table 2.1). After the MoE's recommendation of banning instant noodle sales in schools, most regional offices of education banned instant noodle sales in school stores.

In February 2007, the Korean Ministry of Food and Drug Safety (MFDS) announced a comprehensive plan for the safety management of children's foods. This

Table 2.1 Two nutrition policies focusing on school food environments^a in South Korea

| Policy | Policy contents |
|---|--|
| Ban on soft drink sales (Ministry of Education) | |
| March 2006 | Korea National Youth Commission <i>recommended</i> banning soft drink sales in schools and youth training facilities |
| February 2007 | Announcement of the ban on soft drink sales in schools |
| March 2007 | Implementation of the ban on soft drink sales in schools |
| The Special Act (Ministry of Food and Drug Safety) | |
| March 2008 | Enactment of the Special Act |
| March 2009 | Enforcement of the Special Act |
| | Begin banning energy-dense nutrient-poor (EDNP) foods sales in exemplary stores located in Children's Food Safety and Protection Zones |
| May 2010 | First announcement of the list of EDNP products |

^a Policies regarding school meal services were not considered in this study.

^b After the Ministry of Education's recommendation of ban on instant noodle sales in schools, most regional offices of education banned instant noodle sales in school stores.

^c All school stores are required to register to be exemplary business places.

plan included legislation of the Special Act (an umbrella policy of the 2009 policy) that aimed at “promoting children’s health by prescribing matters necessary for supplying safe and nutritionally balanced foods in order to help children acquire proper dietary habits” (the Special Act, article 1). The Special Act was enacted in March 2008 and was implemented beginning in March 2009 (S. C. Kim et al., 2010) (Table 2.1). As a part of the Special Act, the 2009 nutrient-based policy restricted EDNP food sales in Children's Food Safety and Protection Zones and in schools. Areas within 200 meters in a straight line from schools are designated as Children's Food Safety and Protection Zones (the Special Act, articles 5 and 6). Among stores located in Children's Food Safety and Protection Zones, those that cook and/or sell children’s favorite foods can voluntarily pledge to not sell EDNP foods. All stores located in schools are mandated not to sell EDNP foods. The 2009 policy set a nutrient standard for energy, protein, saturated fat, sugar, and/or sodium to define EDNP foods and beverages (Table 2.2), forbade their sale in schools and allowed voluntary compliance for stores in Children's Food Safety and Protection Zones after March 2009 (the beginning of the 2009 school year). The 2009 policy intended to improve children’s health through a decrease in EDNP food sales in schools and in Children's Food Safety and Protection Zones. Figure 2.1 presents the causal model of the 2009 policy. The MFDS reported that as of 2012, among 42,765 stores that cook and/or sell children’s favorite foods in Children’s Food Safety and Protection Zones and in schools (including school stores), only 1,904 stores (4.2%) volunteered not to sell EDNP foods. In addition, most of the voluntary stores were school stores (Korea Ministry of Food and Drug Safety, 2013). Thus, the 2009 policy may only affect foods in school stores.

Table 2.2 Criteria of the energy-dense nutrient-poor (EDNP) foods

| |
|--|
| <p>A. Criteria for snacks among children's favorite foods^a</p> <ol style="list-style-type: none">(1) Foods containing over 250kcal and less than 2g of protein per serving,(2) Foods containing over 4g of saturated fat and less than 2g or protein per serving,(3) Foods containing over 17g of sugar and less than 2g of protein per serving(4) Foods containing over 500kcal or over 8g of saturated fat or over 34g of sugar per serving among foods that do not meet criteria of 1~3. <p>※ For foods which the serving size is less than 30g, the criteria is applied to 30g of the foods instead of the actual serving size.</p> <p>B. Criteria for meal substitutes among children's favorite foods</p> <ol style="list-style-type: none">(1) Foods containing over 500kcal and less than 9g of protein per serving,(2) Foods containing over 500kcal and over 600mg of sodium per serving. For deep-fried noodles and noodles among noodles (only applied to noodles in containers), over 1,000mg of sodium is applied to as a criteria of EDNP.(3) Foods containing over 4g of saturated fat and less than 9g of protein per serving,(4) Foods containing over 4g of saturated fat and over 600mg of sodium per serving. For deep-fried noodles and noodles among noodles (only applied to noodles in containers), over 1,000mg of sodium is applied to as a criteria of EDNP.(5) Foods containing over 1,000kcal or over 8g of saturated fat per serving among foods that do not meet criteria of 1~4 |
|--|

^a Children's favorite foods are defined as "Foods that children prefer or eat frequently among foods under the Food Sanitation Act or the Livestock Products Sanitary Control Act, which are prescribed by Presidential Decree" (the Special Act on safety management of children's dietary life. Act no. 119882013). The list of children's favorite foods is in Appendix B.

If the policies had been implemented as intended, school store food environments in South Korea would have improved and students would not have access to unhealthy foods in school stores. News media and several studies have reported consistently, however, that EDNP foods are still available in many school stores (Ahn, 2009; S. C. Kim et al., 2010; S. Y. Lee et al., 2012; B. Song, 2010). Several studies also found

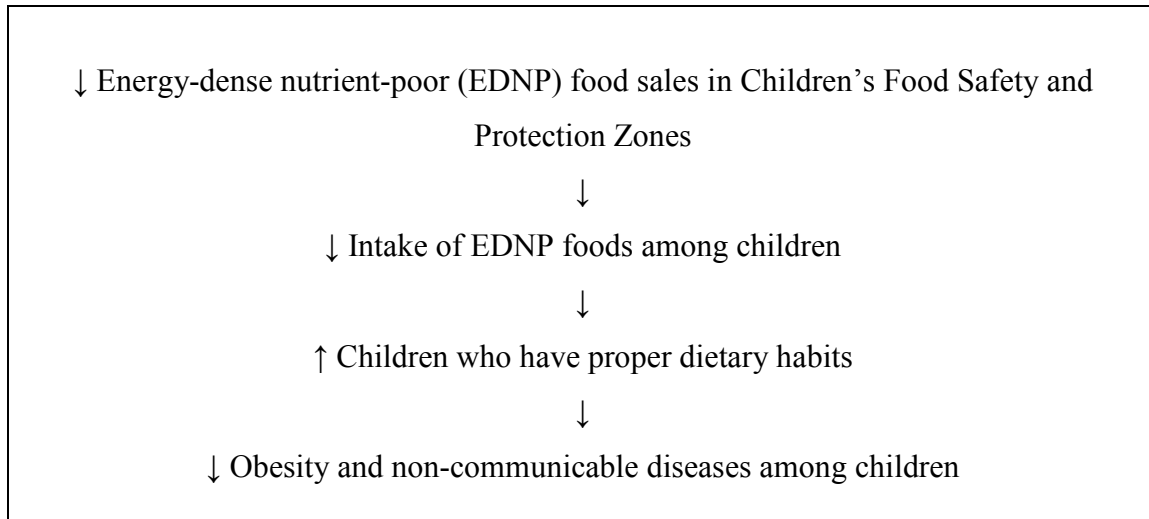


Figure 2.1 The causal model of the 2009 policy on restriction energy-dense nutrient-poor food sales in Children's Food Safety and Protection Zones

EDNP foods in school stores: 27.8% of foods sold in school stores in 2009 (S. Y. Lee et al., 2012) and 31 school stores sold EDNP foods among 51 school stores that were observed in 2010 (S. C. Kim et al., 2010). Nevertheless, two studies that evaluated the impact of the school nutrition policies on Korean adolescents' food intake reported positive changes such as decreased intake of soft drinks, confectionaries, instant noodles, and fast foods (S. G. Bae et al., 2012; K. Kim, Park, & Oh, 2013). These studies focused only on the overall frequency of food intake regardless of the eating place and did not consider the quantity of the food consumed. Thus, it is not known to what extent school nutrition policies affect Korean adolescents' food intake and whether the changes differ in each eating place (in school and out of school) before and after implementation of policies.

In addition, there is a lack of understanding of implementation processes of school store policies. In South Korea, nutrition policy processes have not been well

documented, although evaluation of the effectiveness of nutrition policies has been conducted frequently (S. Kim, 2010; S. Kim et al., 2013; S. K. Lee, 2012). If the policy process is not understood or addressed well, the sustainable effectiveness of the policy cannot be guaranteed (Pelletier et al., 2012).

2.6 Conceptual Framework

The policy process is complex (Buse, 2008; Walt et al., 2008). Although there may be political attention paid to a specific issue, it does not always turn into policy formulation and implementation (Pelletier et al., 2012). After law enactment, we cannot expect that a policy will be implemented according to the legislative intent (Kingdon, 2002). The ways that a policy is being implemented and individuals or groups who implement the policy shape implementation processes (Birkland, 2005). During the policy implementation, social values, norms, and practices are intertwined and affect its processes and results (Paudel, 2009). Implementation processes reflect interactions between implementers and other actors as well as interactions among actors. Implementation processes also explain the variation of the implementers' performance (Winter, 2003).

The policy enactment itself cannot guarantee its successful implementation (Kingdon, 2002). Understanding policy implementation processes is important because it is a critical step of the policy process (Birkland, 2005). It is problematic if policy implementation processes are treated as a "black box" when the policy evaluation is conducted (Hill & Hupe, 2002). Studies of policy implementation processes can also provide information regarding better ways to make policies whose implementation will

be consistent with their legislative intention (Birkland, 2005). This study includes an inquiry as to why school stores implement the same policy differently. Regardless of whether the policy is implemented well, policy makers and implementers can learn from both the successes and failures of the policy by tracking policy implementation processes.

Two approaches are commonly used to assess policy implementation (Ripley & Franklin, 1986). One is focusing on the compliance of implementers. Policy implementation is assessed based on whether implementers comply with a preexisting model of correct implementation in terms of procedures, timetables, and restrictions. Another approach is interested in “what is happening and why?” during policy implementation processes. This study uses both approaches to understand implementation processes of the school store policies in South Korea.

This study is guided by Lasswell (1971)’s social process model. The model emphasizes interaction between participants, who seek to maximize values, and between participants and resource environments in the social process. The model explains social process using the following seven categories:

- (1) Participants: Individuals, groups, and organizations who are interacting in the social process
- (2) Perspectives: Participants’ identity, demands, and expectations
- (3) Situations: Where social interactions take place in terms of geographic location, timing and process of events, institutionalization, and crisis
- (4) Base values: Assets or resources that participants possess: power, enlightenment, wealth, well-being, skill, affection, respect, and rectitude
- (5) Strategies: Ways to achieve values

(6) Outcomes: Changes in base values as a result of the social process

(7) Effects: Long-term outcomes

The participants include not only those who participate in the process, but also those who do not currently participate in the process, but should or could participate, and are affected by the problem, situation, and the process. Perspectives are the ways participants see social problems. It is reflected by participants' perception of who they are (identity), what they want (demands), and what they assume or anticipate happening (expectations) in the social process. Situations are venues where interactions occur while people's values change. Eight values can be found in the social process include: power (making/influencing decisions), enlightenment (gathering and disseminating knowledge), wealth (production, distribution, and control of resources), wellbeing (being physically and psychologically healthy and safe), skill (having special abilities), affection (having family, friendship, intimacy, and warm relationships), respect (showing and receiving deference, freedom of choice), and rectitude (having ethical standards) (Clark, 2002; Lasswell, 1971).

Base values are values that participants possess. These can be used to obtain more values. When the values become participants' demands or outcomes that are sought, those values are scope values. Strategies include various tactics to pursue scope values. Outcomes are short-term results of social interaction which are shown as gain or loss of values. Effects are long-term outcomes of the social process (Clark, 2002; Lasswell, 1971).

Each element of the social process model affects others and shapes the process. Mapping the elements of the social process model is useful for understanding how, by whom, and why the social interaction is occurring. The social process model considers legal (policy) process as a part of the social process. Using elements of the social process model, this study attempts to understand implementation processes of the Korean school store policy (2009 policy).

Paudel (2009) described policy implementation as location- or country-specific processes which carry social values, norms, and practices and are situation-specific. This study defines implementation, using terms from the social process model (Clark, 2002), as a process that is laden with participants' values, perspectives, and interaction among participants.

In implementation research, policy implementation processes are often explained with policy outputs and outcomes together (Winter, 2003). These are, however, different in their concepts and the way they are measured. Birkland (2005) defined policy outputs as "the effort that government expends to address problems" (p. 158). Policy outcomes reflect how the target population responds to the policy implementation (Winter, 2003). It could be either intended or unintended, positive or negative (Birkland, 2005; Clark, 2002). Winter (2003) emphasized the needs to examine policy output and outcomes separately as dependent variables.

This study attempts to distinguish policy implementation processes, outputs, and outcomes and then assess all of them (Figure 2.2). Implementation processes are qualitatively measured, and outputs and outcomes of two Korean school store policies are quantitatively measured as dependent variables. Policy outputs and outcomes are

determined based on the causal model of the 2009 policy (Figure 2.1). Policy outputs are considered to be what policy implementers do. Implementers of school store policies are school store owners; thus, the policy output in this study is what school store owners do in response to the policy. School store owners select the foods they are going to sell, thus food availability in school stores reflects how well they implement school store policies. The policy output of school store policies is the food availability, specifically, availability of soft drinks (for the 2007 policy) and EDNP foods (for the 2009 policy) in school stores. The outcomes of school store policies are changes in adolescents' food intake, especially soft drinks and EDNP food intake.

2.7 Significance

An increasing amount of research has been done to evaluate school-based food and nutrition policies to improve school food environments (O'Toole et al., 2007; Schwartz et al., 2009; Vericker, 2013). There are not many studies, however, that consider both policy implementation processes and its effectiveness in terms of improving school food environments and changing diets of students simultaneously (Mâsse et al., 2013).

Implementation research can help policy makers to be aware of the root causes of problems, barriers, and facilitators of implementation. Understanding these will increase the chance of ensuring high-quality policy implementation and positive effects on public health (Panisset et al., 2012). This study examines both school store policy implementation processes and its effects to the target population.

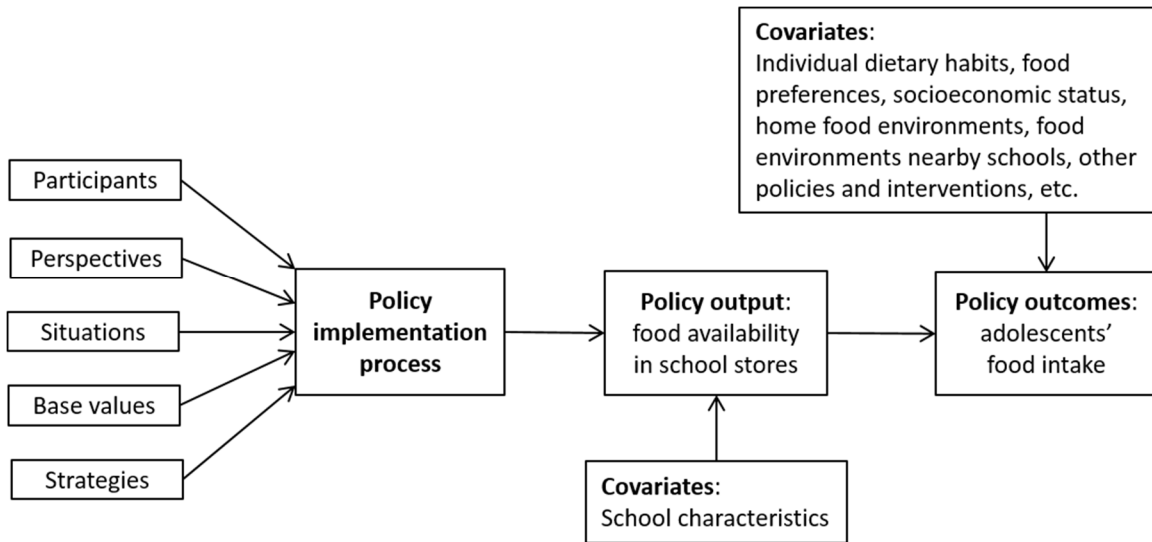


Figure 2.2 Conceptual model of the processes of the Korean school store policies

This is the first study applying qualitative research methods to examine nutrition policy processes in South Korea. Although qualitative research methods including interviews with policy actors have been used in nutrition policy research in the U.S. and other countries, research on nutrition policy in South Korea has been conducted only to enumerate problems and to evaluate the effectiveness of the policy rather than to understand what factors affect policy implementation. This study could be a starting point to facilitate in-depth research on nutrition policies in South Korea.

Many countries have enacted policies to improve school food environments. The U.S. Department of Agriculture announced a school store policy on competitive foods in schools on February 1, 2013 (Nixon, 2013). This study will be able to provide insights for policy implementation to improve school food environments globally based on South Korea's case.

To our knowledge, the places where Korean adolescents consume foods targeted by the school store policies have not been studied, even though their food intake away from home and the frequency of overall snack intake have increased during the last decade (Y. Lee, Shim, & Yoon, 2012). This study will add a deeper layer to our understanding of the impact of nutrition policies on changes in food intake by identifying where shifts in food intake occur after policy implementation.

Previous studies regarding school nutrition policies mostly focused on the policy implementation in public schools (Chriqui et al., 2013; Peart et al., 2012; Samuels et al., 2009; Templeton, Marlette, & Panemangalore, 2005). Public and private schools have different school management systems, including operation of school stores. In South Korea, 80% of public schools make contracts with school stores through a public competitive bidding process, whereas 63% of private schools have private contracts (H. Lee, Jang, & Kim, 2011). For schools using a public competitive bidding, the right of school store operation is sold to the highest bidder (i.e., pays the school the most for school food sales rights). The right of operation expires every year, thus the current school store owner needs to participate in the bidding annually. Store owners in public schools reported that high bidding prices are overly burdensome (Choi, Frongillo, Blake, Thrasher, & Tompkins, 2015). These differences in school store management systems may affect school store owners' selection of foods sold in school stores. School store owners who already paid high cost for the right to the store need to make more profits, thus they may want to sell high-profit products regardless of the nutritional quality of foods. Since public and private high schools in South Korea have the same tuition (excluding specialized schools; tuition for middle schools is free), attendance in private

or public schools does not reflect students' socioeconomic status. Thus, comparison of food availability between public and private schools in South Korea could provide an example of impact of school management systems on food availability in school stores.

CHAPTER 3

Methodology

The 2009 policy was a part of a larger policy (the Special Act) that aimed at improving children's diets. Several food and nutrition policies are being implemented simultaneously with the 2007 and 2009 school store policies. The two policies are implemented nationwide. Hence, the policy implementation can be considered as natural experiments. It does not have a control group since the policy is implemented nationwide. The policy implementation may occur in various ways in terms of the timing and the extent of the implementation (Petticrew et al., 2005). In addition, it is impossible to distinguish whether the changes in the target population's behaviors are due to the 2007 and 2009 policies or other similar policies and interventions. Because of these uncertainties, the causal relationship between the policies and key outcomes is difficult to assess. Thus, factors that could directly or indirectly affect policy outcomes should be acknowledged and analyzed, to the extent possible. For evaluation of natural experiments, multi-method evaluations, such as using qualitative data or routine data, are useful (Petticrew et al., 2005).

This study employed mixed methods. Changes in students' food intake (policy outcomes) and food availability in school stores (policy outputs) are quantitatively assessed and policy implementation processes are qualitatively examined.

3.1 Methods for manuscript 1

Data and participants. The Korea National Health and Nutrition Examination Survey (KNHANES) is a nationally representative, cross-sectional survey designed to assess the health and nutritional status of the population in South Korea. The survey was conducted 2-3 months in 1998 (first cycle, survey was conducted from November to December), 2001 (second cycle, survey was conducted from November to December), and 2005 (third cycle, survey was conducted from April to June). From the fourth cycle of KNAHENS (2007-2010), the period for data collection was extended to reduce seasonal bias (i.e., different foods available at different times of the year). The 2007 KHANES was conducted from July to December, and from 2008 onwards, KNHANES was conducted from January to December (<http://knhanes.cdc.go.kr>). Additional details of survey design and procedures were reported elsewhere (Korea Ministry of Health and Welfare & Korea Centers for Disease Control and Prevention [KCDC], 2013a; Kweon et al., 2014; <http://knhanes.cdc.go.kr>).

The participants of this study were adolescents who attend middle- (equivalent to 7-9 grades of the U.S. school system) or high-schools (equivalent to 10-12 grades of the U.S. school system), and participated in a 24-hour dietary recall of one of the KNHANES conducted during 1998-2012. Of 74,342 participants who completed both the demographic survey and the 24-hour dietary recall, 5,025 participants were middle- or high- school students (age range: 12-19 years). After exclusion of 66 participants who reported <500kcal or $\geq 5,000$ kcal per day, a total of 4,959 participants were included in the analysis.

Intake of school store foods. One 24-hour dietary recall was administered by trained dietitians to each participant. Although a single 24-hour dietary recall is inadequate for assessing individual intake or the distribution of usual intake, it provides suitable assessment of the mean intake of groups, which was the goal in this study (National Center for Health Statistics, 1992). In addition, data from 24-hour dietary recalls in large-scale surveys are useful to evaluate health policy impacts (Hebert et al., 2014). A further advantage of 24-hour recall for this study is its utility for identifying individual foods that the policies target, which could not be done using food frequency questionnaire data that group together food items. Participants were asked about their food intake during the previous day, as well as the eating place and the food source (e.g., school meal service, restaurant, etc.). We calculated energy intake from chips & cookies (including crackers), candy (including chocolate, gum, and jelly), milk (including flavored milk), soft drinks, fruit and vegetable juice (FVJ), and instant noodles. Energy intake from each food was examined according to eating places (home; school store; school; away from home or school). For eating episodes which occurred in a school, the eating place was considered school or school store based on the reported source for the food. Where the food source was school meal service, lunch box, or foods from home or other restaurants, we considered the eating place as school, not the school store. For other food sources, for example, purchased foods, we assumed the eating place was a school store.

Statistical analysis. Descriptive statistics were presented with weighted percentages, least squares means, and standard errors. Multiple linear regression models were used to estimate energy intake from each school store food by eating place.

Adjusted means of energy intake from each food were graphically presented to investigate the secular trend of food intake over time to take into consideration the uncertainties around policy implementation, including varied compliance across schools. Plots were drawn for each eating place using locally weighted scatter plot smoothing (LOWESS) (Cleveland, 1979). The smoothing parameter for LOWESS curves was set to a relatively high value, 0.75, to see long-term trends of food intake.

When a distinct change in energy intake from the food was seen in the graph, we estimated and compared slopes of energy intake from foods by eating place before and after the point in time for which the trend appeared to change using piecewise linear regression models. Positive values of slope indicate an increasing trend of energy intake from the food; negative values of slope indicate a decreasing trend of energy intake from the food.

All analyses were conducted using SAS survey procedures (SAS Institute Inc., Cary, NC) with sampling weights, primary sampling units, and stratification to take into account the complex sampling design (Korea Ministry of Health and Welfare & KCDC, 2013a). Potential confounders - sex, age, area of residence (metropolitan, non-metropolitan), household income (quartiles), and total energy intake - were adjusted for all analyses. A p-value <0.05 was considered statistically significant.

3.2 Methods for manuscript 2

Participants and procedure. School stores in middle and high schools located in Seoul, South Korea were observed before (school year 2006) and after (school year 2013) implementation of school store policies. The school store observations in 2006 and 2013

had different purposes. Observations conducted in 2006 were aimed at collecting availability of school stores foods from representative sample of middle and high school in Seoul, Korea. Thus, one middle school and one high school were randomly selected from each school district among 11 school districts in Seoul. Of the 22 schools, 15 agreed to observation of their school store. Observations conducted in 2013 were a part of qualitative study (manuscript 3). We tried to select school stores with various characteristics in terms of students' sex, school level, and school type (private, public). Thus, six school stores each from one high-income school district and one low-income school district were purposefully selected. Among the total of 12 school stores observed in 2013, two school stores were also observed in 2006. The observations were conducted from December 2006 to February 2007 and from October 2013 to December 2013.

Four observers conducted school store observation in 2006. In 2013, one observer, who also participated in the observation in 2006, conducted all school store observation with the same material and method in 2006. When an observer visited school stores, all types of foods and beverages sold in the school stores were recorded. Product name, manufacturer, size, and flavor (if varied) were recorded. When school stores owners allowed, the observer took photographs of school stores and food items. For foods in school stores observed in 2013, nutrient content was recorded from the nutrition label of products, including calories, protein, saturated fat, sugar, and sodium content per one serving. In most cases, it was not possible to record nutrient content for all foods during the school store observation, because school store owners did not want the observer to stay in their school stores for a long time. If nutrient information was not

obtained by on-site observation, the information was obtained from the manufacturers' websites or by purchasing the product.

Data analysis. All foods and beverages were categorized as soft drinks, fruit and vegetable juice, tea, coffee, sports drinks, bottled water, other beverages, chips & cookies, candy, ice cream, bread, hamburger & pizza, fruit, other foods, yoghurt, milk, or flavored milk. Milk and flavored milk were further categorized based on the fat content (full- or reduced-fat). Based on the 2009 criteria for EDNP (Table 2.2), all food and beverage items available in school stores in 2013 were classified as either EDNP or not.

Descriptive statistics for school characteristics, including school level (middle school, high school), school type (private, public), students' sex (coeducational, boys only, girls only), and income level of school district (high-income, low-income), were computed using Fisher's exact test to compare characteristics of school stores observed in 2006 and 2013. Crude numbers of all types of foods and beverages sold in school stores and of foods in each category were compared between 2006 and 2013 using Student's t-tests. To compare the number of foods between 2006 and 2013 controlling for school characteristics, mixed models were fitted with school districts as random effects. Then, the total number of foods sold in school stores was included in the models in addition to school characteristics, to examine food composition in school stores in 2006 and 2013. Student's t-test was used to compare crude number of total foods and EDNP foods, and percentage of EDNP in 2013 by school level, school type, students' sex, and income level of school district. Mixed models with school districts as random effects were used to control school characteristics. The α level of 0.05 was used to determine statistical

significance. All statistical analyses were conducted using SAS 9.4 (SAS Institute, Inc., Cary, NC).

3.3 Methods for manuscript 3

This study is guided by Lasswell (1971)'s social process model. Using elements of the social process model, this study attempts to understand the implementation processes of the school store policy. We considered participants of the school store policy process as policy actors.

Participants. Participants in the school store policy implementation were considered as potential interviewees. We first chose six schools each from two school districts in Seoul, South Korea. We assumed that various school characteristics – income-level, students' sex composition (only for boys, only for girls, coeducational), school level (middle schools, high schools), and school type (private, public) – might be related to the processes of policy implementation. Thus, we purposefully selected two school districts based on the income level (high- versus low-income) and then selected schools to have different characteristics. When there was more than one school that had the same characteristics in the same school district, interviewed schools were randomly selected.

Conceptually-driven sequential sampling was used, wherein the initial interviewees were selected based on existing understanding, and then the rest of the interviewees were purposefully selected based on themes that emerged during the previous interviews (Miles & Huberman, 1994). We identified potential interviewees that were expected to be involved in the implementation processes of the school store policy based on reviews of research papers, government reports, and news articles that reported

on school food environments (Varvasovszky & Brugha, 2000). The pre-identified interviewees were policy actors in schools including school store owners, principals, teachers, dietitians, and administrative staff; and outside of schools including government agencies, food industry, and advocacy groups for healthy eating. During the interviews with pre-identified interviewees, if specific people or their roles related to policy implementation were mentioned, these people were sought out and recruited for interviews.

School store owners, as front-line implementers of the policy, were contacted for the interviews first. After the interviews with school store owners, potential in-school actors (e.g., school staff) in the same school were asked for the interviews. We also reached out to food industry, at least one public official in community health centers and offices of education in each school district that we selected, and public officials in the national-level governments (e.g., MFDS, MoE) for interviews. Politicians, consumer associations, and academia were frequently mentioned during the interviews, thus, they were also contacted for interviews.

Research instrument. The social process model informed the development of a semi-structured interview guide (Clark, 2002; Lasswell, 1971). It consisted of main questions, follow-up questions, and probes into emergent topics that interviewees brought up (Ulin, Robinson, & Tolley, 2004) to gain information from policy actors about the policy implementation processes focusing on policy actors, their roles, perspectives, perceptions, and relationships with other actors (Clark, 2002; Lasswell, 1971). Additional questions were included to address enforcement and monitoring of the policy. The interview guide included some different questions for each policy actor group that were

specific to their roles in the policy implementation processes. After review of the field notes and memos from the previous interviews, the interview guide was revised to include questions that emerged for subsequent interviews.

Procedure. The first author conducted all interviews. The interviewer visited school stores and asked school store owners if they were willing to participate in the interviews. The visits were made without prior notice to prevent the possibility that school store owners might change foods sold in school stores if they were aware of the interview in advance. For the same reason, contacts and interviews with school staff were always conducted after the interview with the school store owner of the same school. If a school store owner agreed to the interview, then the interview was conducted in the same day the interviewer visited. After the interview, the interviewer recorded all food and beverage sold in the school store. The details of the process of school store observations and food availability in the school stores are described in the manuscript 2. One school store owner among the 12 selected schools refused the interview, but allowed school store observation. Interviews with school staff in the same school were conducted. For other interviewees, the interviewer contacted them via phone or email to explain the purpose of the interview. Interviews were conducted either face-to-face or by phone in Korean and lasted 15-60 minutes.

A total of 33 people, including 11 school store owners; 8 school staff members; 6 public officials in community health centers, an office of education, Seoul Metropolitan government, and MFDS; 2 politicians; 3 from food company representatives; and 3 people who have been involved in school store related work (a professor, a school principal, and a person from a consumer organization), participated in the interviews.

Interviews were audio-recorded upon agreement of the interviewees. When interviewees did not want to be recorded, interview notes were taken by the interviewer. Eight school store owners, 3 school staff members, 1 public official, 1 politician, 1 from a food company representative, and 2 people who have been involved in school store related work were agreed to audio-record interviews, thus, a total of 16 interviews was audio-recorded. Among interviewees who did not agree to audio-record interviews, 1 politician and 1 food company representative provided their own memos related to interview contents to the interviewer. All data collection took place in Seoul, South Korea from October 2013 to January 2014.

Data analysis. All recorded interviews were transcribed verbatim; unrecorded interviews were reconstructed into transcripts within a day using the memos taken during the interview, field notes, and memory of the interviewer. De-identified transcripts and field notes were used for the analysis. All transcripts were reviewed by the interviewer for accuracy of the data. A subset of transcripts (n=5) was initially analyzed using open coding to capture emergent codes (Strauss & Corbin, 1990) and to label the responses of the interviewees. Using these emergent codes and elements of the social process model (Lasswell, 1971), a preliminary set of codes was developed. These codes were then applied to the first set of transcripts again and to the rest of transcripts. One researcher, who conducted all the interviews, coded all transcripts and worked with team members to develop the code list and identify themes. As the code list was revised or new themes were identified, all transcripts were re-coded using the new codes or themes. Themes based on the elements of the social process model – policy actors, base values (e.g., wealth, wellbeing, power, and relationship [affection]); perspectives (i.e., demands,

expectation, and identity), and policy outcomes – and additional themes emergent from interviews – perception of the policy, and compliance with the policy were identified. Upon completion of coding, selected themes were put in matrices to see the commonalities shared by interviewees from each policy actor group as well as different points expressed by them for the same themes (Miles & Huberman, 1994; Ulin et al., 2004). Peer review with one of co-author was conducted to reach consensus on the coding, grouping of the codes into themes, and identified themes. All transcripts were managed using NVivo 10 (QSR International, Melbourne, Australia) and analyzed by the first author.

3.4 Ethical approval

The study was reviewed and deemed exempt by the Institutional Review Board at the University of South Carolina. The protocol of the school store observation in 2006 for manuscript 2 was approved by the Institutional Review Board at the Graduate School of Public Health, Seoul National University.

CHAPTER 4

Results

4.1 Manuscript 1

KOREAN ADOLESCENTS' ENERGY INTAKE OF SELECTED FOODS
BY EATING PLACE FROM 1998 TO 2012 DURING IMPLEMENTATION OF
TWO NATIONAL SCHOOL NUTRITION POLICIES¹

¹ Choi, S.K., Frongillo, E.A., Blake, C.E., and Thrasher, J.F. Submitted to *Journal of Hunger and Environmental Nutrition*, 9/18/2015.

Abstract

This study examines changes in Korean adolescents' energy intake from selected foods that were offered in school stores over 15 years, during which the two policies prohibiting unhealthy food sales in school stores were implemented in 2007 and in 2009. Using 24-hour dietary recall from the Korea National Health and Nutrition Examination Surveys 1998-2012, adolescents' energy intake in each eating place was calculated. Energy intake from instant noodles consistently decreased both at home and in school stores. Energy intake from soft drinks away from home or school rapidly increased beginning in 2008. Policies regulating unhealthy food sales in school stores appear to have had a modest impact on adolescents' overall consumption of unhealthy foods. Comprehensive policies, targeting diverse eating places, are needed to improve adolescents' overall diet.

Key words: school food environments; school nutrition policy; adolescents; school store; eating place

Introduction

The school food environment influences students' food choices and dietary behaviors (Briefel, Crepinsek, et al., 2009; Chriqui et al., 2014; Larson & Story, 2010). Given that foods and beverages available in school stores are often high in energy and low in nutritional value (Story et al., 2006), policies to limit unhealthy foods in schools have increasingly been adopted around the world (U.S. Department of Agriculture & Food and Nutrition Service, 2013). A recent systematic review of research in the United States reported that policies restricting unhealthy foods in schools have reduced

unhealthy food availability and students' in-school consumption of those foods, but these policies did not influence students' overall diet and body mass index (Chriqui et al., 2014). Students may compensate for restrictions in school by consuming more of the restricted foods when they are not in school (E. Finkelstein et al., 2004; Vecchiarelli et al., 2006). Less is known, however, about where the compensation behavior occurs and how it affects overall diet. Thus, the need to understand school nutrition policies' influence on students' consumption in school and out of school has been brought to the fore (Chriqui et al., 2014; Cullen et al., 2008).

South Korea has made several efforts to improve the school food environment. For Korean students, major food sources in schools are from school meal services (mainly for lunch) and school stores. All middle and high schools in South Korea provide school lunch to 99% of their students (Korea Ministry of Education, 2015). School lunch is managed by registered dietitians in each school and is provided based on a nutrition standard stated in the School Meals Act (Yoon et al., 2012). School stores in South Korea are not allowed to sell cooked foods, thus mostly offer snack foods and beverages to students during school hours. Since most of school stores are operated by private retailers, not schools, foods offered by school stores that Korean students eat mostly between meals were less managed while nutritional quality of school lunch has been improved. Thus, the Korean government has enacted policies to reduce unhealthy foods in school stores that might contribute to excessive intake of energy, fat, or sugar. The Korean Ministry of Education required a ban on soft drinks sales in schools and recommended banning instant noodles, fried foods, and fast foods sales in schools at the beginning of the school year in 2007 (herein after 2007 policy). In addition, the Special

Act on Safety Management of Children's Dietary life that was enforced in 2009 includes a restriction of energy-dense nutrient-poor (EDNP) foods sales in school stores (herein after 2009 policy) (Table 4.1). Most school stores, however, still sell EDNP foods, thus, it is unclear to what extent the school store policies have changed food availability in school stores (Choi, Frongillo, Blake, & Thrasher, 2016). Two studies have evaluated the impact of the school nutrition policies on adolescents' intake of soft drinks, confectionaries, instant noodles, and fast foods; these studies focused only on overall frequency of food intake regardless of the eating place (S. G. Bae et al., 2012; K. Kim et al., 2013). It is not known how school nutrition policies affect Korean adolescents' food intake and whether the changes differ in each eating place (school and out of school) over a long period of time before and after implementation of policies.

We aimed to examine how Korean adolescents' energy intake from selected foods changed over 15 years. Due to the inconsistent timing of school store policy implementation in each individual school store, the changes in foods sold in school stores varied across schools and made it difficult to identify specific points to compare adolescents' food intake. Thus, we visualized food intake trends first over time and then examined how the national implementation dates of school store policies corresponded to those changes. We focused on the intake of some selected foods that adolescents could buy from their school stores (herein after school store foods) and the introduction of national policies regulating access to these foods, during this 15 year time period.

Table 4.1 Two nutrition policies focusing on the school food environment^a in South Korea

| Policy | Policy contents |
|---|--|
| Ban on soft drink sales (Ministry of Education) | |
| March 2006 | Korea National Youth Commission <i>recommended</i> banning soft drink sales in schools and youth training facilities |
| February 2007 | Announcement of the ban on soft drink sales in schools |
| March 2007 | Implementation of the ban on soft drink sales in schools |
| The Special Act (Ministry of Food and Drug Safety) | |
| March 2008 | Enactment of the Special Act |
| March 2009 | Enforcement of the Special Act Begin banning energy-dense nutrient-poor (EDNP) foods sales in exemplary stores located in Children's Food Safety and Protection Zones |
| May 2010 | First announcement of the list of EDNP products |

^a Policies regarding school meal services were not considered in this study.

^b After the Ministry of Education's recommendation of ban on instant noodle sales in school, most regional offices of education banned instant noodle sales in school stores.

^c All school stores are considered as exemplary stores

Methods

Data and participants

The Korea National Health and Nutrition Examination Survey (KNHANES) is a nationally representative, cross-sectional survey designed to assess the health and nutritional status of the population in South Korea. The survey was conducted during different periods each year (<http://knhanes.cdc.go.kr>). Additional details of survey design and procedures were reported elsewhere (Korea Ministry of Health and Welfare & KCDC, 2013a; Kweon et al., 2014; <http://knhanes.cdc.go.kr>).

The participants of the study were adolescents who attend middle- or high-schools, and participated in a 24-hour dietary recall of one of the KNHANES conducted during 1998-2012. Of 74,342 participants who completed both the demographic survey and the 24-hour dietary recall, 5,025 participants were middle- or high- school students (age range: 12-19 years). After exclusion of 66 participants who reported <500kcal or $\geq 5,000$ kcal per day, a total of 4,959 participants were included in the analysis.

Intake of school store foods

One 24-hour dietary recall was administered by trained dietitians to each participant. Although a single 24-hour dietary recall is inadequate for assessing individual intake or the distribution of usual intake, it provides suitable assessment of the mean intake of groups, which was the goal in this study (National Center for Health Statistics, 1992). In addition, data from 24-hour dietary recalls in large-scale surveys are useful to evaluate health policy impacts (Hebert et al., 2014). A further advantage of 24-hour recall for this study is its utility for identifying individual foods that the policies target, which could not be done using food frequency questionnaire data that group together food

items. Participants were asked about their food intake during the previous day, as well as the eating place and the food source (e.g., school meal service, restaurant, etc.). We calculated energy intake from chips & cookies (including crackers), candy (including chocolate, gum, and jelly), milk (including flavored milk), soft drinks, fruit and vegetable juice (FVJ), and instant noodles. Energy intake from each food was examined according to eating places (home; school store; school; away from home or school). For eating episodes which occurred in a school, the eating place was considered school or school store based on the reported source for the food. Where the food source was school meal service, lunch box, or foods from home or other restaurants, we considered the eating place as school, not the school store. For other food sources, for example, purchased foods, we assumed the eating place was a school store.

Statistical analysis

Descriptive statistics were presented with weighted percentages, least squares means, and standard errors. Multiple linear regression models were used to estimate energy intake from each school store food by eating place. Adjusted means of energy intake from each food were graphically presented to investigate the secular trend of food intake over time to take into consideration the uncertainties around policy implementation, including varied compliance across schools. Plots were drawn for each eating place using locally weighted scatter plot smoothing (LOWESS) (Cleveland, 1979). The smoothing parameter for LOWESS curves was set to a relatively high value, 0.75, to see long-term trends of food intake.

When a distinct change in energy intake from the food was seen in the graph, we estimated and compared slopes of energy intake from foods by eating place before and

after the point in time for which the trend appeared to change using piecewise linear regression models. Positive values of slope indicate an increasing trend of energy intake from the food; negative values of slope indicate a decreasing trend of energy intake from the food.

All analyses were conducted using SAS survey procedures (SAS Institute Inc., Cary, NC) with sampling weights, primary sampling units, and stratification to take into account the complex sampling design (Korea Ministry of Health and Welfare & KCDC, 2013a). Potential confounders - sex, age, area of residence (metropolitan, non-metropolitan), household income (quartiles), and total energy intake - were adjusted for all analyses. A p-value <0.05 was considered statistically significant.

Results

As shown in Table 4.2, 52.4% were middle school students, 52.9% were boys, and 81.8% resided in metropolitan areas. More than 60% of their household income level was in the third or fourth quartiles.

Energy intake from school store foods away from home or school were lower than intake at home, except energy intake from soft drinks after 2009, and were higher than those intake in school or in school stores, except energy intake from milk (Figure 4.1). Energy intake from school store foods in school and in school stores were relatively small.

Energy intake from soft drinks away from home or school rapidly increased beginning in 2008. In-school store consumption of soft drinks slightly decreased after 2005, then increased again (Figure 4.1a). Although energy intake from milk at home

Table 4.2 Demographic characteristics of adolescents from 1998-2012 Korea National Health and Nutrition Surveys^a

Weighted %, Least Square Mean \pm Standard Error

| Year | 1998 (n=917) | 2001 (n=619) | 2005 (n=515) | 2007 (n=250) | 2008 (n=558) | 2009 (n=691) | 2010 (n=514) | 2011 (n=465) | 2012 (n=430) |
|-----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| School level | | | | | | | | | |
| Middle school | 43.3 | 55.4 | 58.9 | 51.3 | 57.9 | 53.4 | 54.6 | 50.6 | 47.5 |
| High school | 56.7 | 44.6 | 41.1 | 48.7 | 42.1 | 46.6 | 45.4 | 49.4 | 52.5 |
| Sex | | | | | | | | | |
| Boy | 51.4 | 50.5 | 53.2 | 56.2 | 49.1 | 53.3 | 52.8 | 50.1 | 56.9 |
| Girl | 48.6 | 49.5 | 46.8 | 43.8 | 50.9 | 46.7 | 47.2 | 49.9 | 43.1 |
| Residential area | | | | | | | | | |
| Urban | 76.8 | 77.9 | 80.0 | 81.5 | 83.8 | 84.2 | 79.1 | 83.5 | 81.5 |
| Rural | 23.2 | 22.1 | 20.0 | 18.5 | 16.2 | 15.8 | 20.9 | 16.5 | 18.5 |
| Household income (quartile) | | | | | | | | | |
| Q1 | 16.4 | 15.9 | 15.1 | 8.1 | 11.8 | 14.9 | 15.8 | 15.6 | 11.5 |
| Q2 | 22.2 | 25.7 | 28.5 | 27.0 | 20.4 | 22.6 | 31.7 | 27.8 | 23.8 |
| Q3 | 34.1 | 28.8 | 30.7 | 33.8 | 29.2 | 33.5 | 26.0 | 29.5 | 31.3 |
| Q4 | 27.3 | 29.6 | 25.7 | 31.1 | 38.5 | 29.0 | 26.4 | 27.1 | 33.5 |

^a Tabulations are weighted for the sample design. Sample sizes are unweighted.

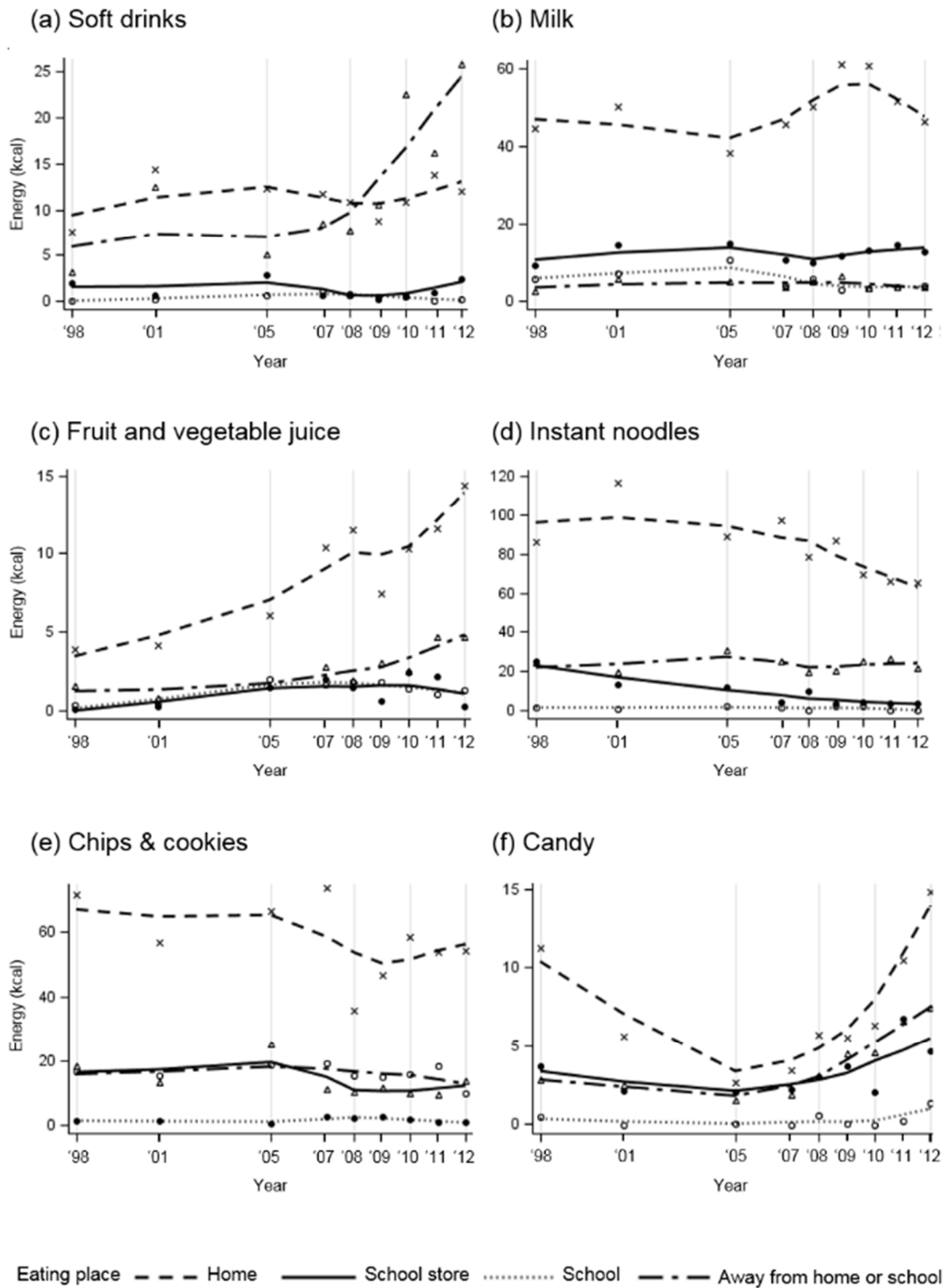


Figure 4.1 Secular trends of energy intake from selected school store foods

fluctuated over time, milk consumption in other places changed little during the study period (Table 4.3, Figure 4.1b), while energy intake from soft drinks and FVJ increased (Figure 4.1a, 4.1c). Energy intake from instant noodles at home and in school stores decreased continuously, but the intake away from home or school remained constant over time (Figure 4.1d). Energy intake from chips & cookies at home dropped in 2008 (38.1 kcal decrease from 2007, $p=0.002$) then increased again. Intake of chips & cookies in school stores dropped in 2007 (13.8 kcal decrease from 2005, $p=0.045$), then after it remained constant (Figure 4.1e). Energy intake from candy significantly increased since 2005 in all places except school (Table 4.3, Figure 4.1f).

Energy intake from school store foods away from home or school were lower than intake at home, except energy intake from soft drinks after 2009, and were higher than those intake in school or in school stores, except energy intake from milk (Figure 4.1). Energy intake from school store foods in school and in school stores were relatively small.

Energy intake from soft drinks away from home or school rapidly increased beginning in 2008. In-school store consumption of soft drinks slightly decreased after 2005, then increased again (Figure 4.1a). Although energy intake from milk at home fluctuated over time, milk consumption in other places changed little during the study period (Table 4.3, Figure 4.1b), while energy intake from soft drinks and FVJ increased (Figure 4.1a, 4.1c). Energy intake from instant noodles at home and in school stores decreased continuously, but the intake away from home or school remained constant over time (Figure 4.1d). Energy intake from chips & cookies at home dropped in 2008 (38.1 kcal decrease from 2007, $p=0.002$) then increased again. Intake of chips & cookies in

Table 4.3 Distinct changes in trend of energy intake from school store foods during selected periods

| Food | Eating place | Time period | Estimate ^a ±Standard Error | P |
|-------|---------------|-------------|---------------------------------------|--------|
| Milk | Home | 2005-2009 | 6.24±1.66 | 0.002 |
| | | 2009-2012 | -4.24±2.19 | |
| Candy | Home | 1998-2005 | -1.51±0.44 | <0.001 |
| | | 2005-2012 | 1.68±0.47 | |
| | School stores | 1998-2005 | -0.31±0.17 | 0.013 |
| | | 2005-2012 | 0.54±0.20 | |
| | Other places | 1998-2005 | -0.33±0.20 | 0.015 |
| | | 2005-2012 | 0.91±0.35 | |

^a Slope, adjusted for age, sex, residential area, and household income (quartiles)

school stores dropped in 2007 (13.8 kcal decrease from 2005, $p=0.045$), then after it remained constant (Figure 4.1e). Energy intake from candy significantly increased since 2005 in all places except school (Table 4.3, Figure 4.1f).

In-school store consumption of soft drinks and instant noodles, which are target foods of the 2007 policy, decreased beginning at or before the 2007 policy implementation; there were no notable changes, however, in energy intake from school store foods after the 2009 policy implementation. School store food consumption was mostly unchanged after 2009, with energy intake from soft drinks in school stores higher after 2009 compared to 2007-2009.

Discussion

We examined trends in Korean adolescents' energy intake from selected school store foods during 1998-2012. At-home intake accounted for the highest proportion of energy intake from school store foods over time, with the exception of energy intake from soft drinks away from home or school after 2009. Over the entire period, energy intake both from soft drinks away from home or school and from FVJ at home and away from home or school consistently increased, while energy intake from instant noodles at home and in school stores decreased.

Given that home contributes the highest proportion of both healthy and unhealthy food consumption among adolescents (Briefel, Wilson, et al., 2009), improvement of at-home consumption might benefit adolescents' diets more than improvement in other places. The change in energy intake from instant noodles at home is a positive example. Energy intake from instant noodles at home dramatically decreased, while the intake away from home or school remained constant. Instant noodles have high sodium and fat contents and are major sources of sodium and fat intake for Koreans (Korea Ministry of Health and Welfare & KCDC, 2013b; D. Y. Song, Park, Shim, & Lee, 2013). Due to consistent efforts to reduce sodium intake by the Korean government (Korea Ministry of Food and Drug Safety, 2014b) and negative images of instant noodles generated by media (Korea Food Industry Association & Chung-Ang University, 2011), a widespread perception that instant noodles are unhealthy has been created. This change in public perception may have influenced parents' provision of instant noodles to their children at home (Korea Food Industry Association & Chung-Ang University, 2011), thus, adolescents' instant noodles intake has decreased. Efforts of parents as well as

adolescents are required in order to improve adolescents' at-home diet by creating healthier home food environments, providing healthy foods, and becoming role models for healthy eating (Hanson, Neumark-Sztainer, Eisenberg, Story, & Wall, 2005; Story et al., 2006).

Korean adolescents consumed more unhealthy foods away from home or school where less restriction on food choices exists, as shown by a rapidly increasing trend of energy intake from soft drinks and a lack of reduction in energy intake from instant noodles away from home or school. Adolescents can access various food outlets with more food choices away from home or school under less supervision from their parents or teachers. Thus, food environments away from home or school need to be improved to steer adolescents to make healthy food choices. Restricting advertisements and sales of unhealthy foods and encouraging healthy food production and sales could be possible ways to improve food environments outside of home or school (Gittelsohn, 2012; World Health Organization, 2010).

Our study results suggest that the 2007 policy aimed at decreasing availability of specific foods in schools led to decreased consumption of the target foods, as seen in the decreased energy intake from instant noodles and soft drink intake in school stores in contrast to trends in intake in other eating places. Over 90% of middle and high schools sold soft drinks through vending machines or school stores before the 2007 policy (Korea National Youth Commission, 2006). By October 2007, soft drinks were available in only 7% of middle and high schools (Korea Ministry of Education & Human Resources Development, 2007). Energy intake from soft drinks in school stores decreased after the 2007 policy was implemented while intake away from home or school increased during

the same period. Energy intake from instant noodles in school stores also decreased while the intake away from home or school remained flat.

It is unclear to what extent the 2009 policy influenced adolescents' intake of specific school store foods. It raises questions about why the intake of target foods of the 2009 policy (EDNP foods) was changed less than the intake of target foods of the 2007 policy (soft drinks). Several Korean nutrition policies are simultaneously addressed by multiple government agencies. These policies often overlap and lack consistency (H. R. Kim, 2008). The 2007 and 2009 policies also overlap in terms of the targeted setting and populations, but the target foods and the way to define restricted foods differ. The 2007 policy was a food-based policy that specifically indicated which foods should not be sold in schools. It might have been easy for school store owners to take the restricted foods out of their stores. On the other hand, the 2009 policy was a nutrient-based policy. To determine restricted foods, the contents of energy, saturated fat, sugar, protein, and/or sodium per serving had to be considered (Table 2.2). Based on the 2009 policy, soft drinks and instant noodles can be sold in school if those are not EDNP. We assume one of reasons why energy intake from soft drinks in school stores increased after 2011 is that school stores resumed sales of soft drinks that were not classified as EDNP, for example a soft drink with less than 250 kcal per serving, after the 2009 policy implementation. An investigation of food availability in school stores in 2013 found that 50% of school stores in Seoul, South Korea sold soft drinks although the number of soft drinks in school stores was lower than in 2007 (Choi et al., 2016).

Not only does the nutrient-based policy allow some unhealthy food sales, but the complexity of the policy makes it hard to achieve its goals. School store owners and

school staff may be easily confused by the nutrient criteria of restricted foods and have difficulty discerning which foods they can or cannot sell (Choi et al., 2015; Woodward-Lopez et al., 2010). In the case of the 2009 policy, the nutrient criteria are complicated, and differ between types of snacks (e.g., chips & cookies) and meal substitutes (e.g., instant noodles). In addition, nutrient-based policies may have loopholes. For example, food manufacturers can avoid making EDNP products by changing the content of only one or two nutrients in their products (Choi et al., 2015; H. Kim, 2014). Previous studies reported that food-based policies make it easier to achieve compliance to a policy, and nutrient-based policies allow unhealthy foods that technically meet the nutrient criteria of the policy to be available in schools (Samuels et al., 2009; Woodward-Lopez et al., 2010). Increased energy intake from candy in school stores may be due in part to the increased in-school store availability of candy meeting the nutrient criteria of the 2009 policy (e.g. a candy with less than 17g of sugar per serving). Based on our study results, in South Korea, it is hard to make improvements to the nutritional quality of the foods available in school and to influence adolescents' intake of school store foods with a nutrient-based policy. Further studies are needed to evaluate which kind of policy is more effective to improve adolescents' food intake in which circumstances (Shroff, Jones, Frongillo, & Howlett, 2012).

In-school consumption of selected school store foods is lower than consumption in other places (Briefel, Wilson, et al., 2009); nevertheless, the school food environment is still important to adolescents' diets. Schools can help students to eat healthier foods that they would not eat away from home or school. Higher energy intake from milk in school or school store than away from home or school shown in this study could be an

example of the schools' positive influence on students' diet choices. Milk availability in school as a part of the school meal service and in school stores helps adolescents to drink more milk in school. Schools could be venues to provide healthy foods to their students to promote healthy diets (Briefel, Crepinsek, et al., 2009). Strategies aiming to improve students' diet should consider both the increase of healthy foods and the decrease of unhealthy foods in school. Unhealthy food consumption may alter intake of other healthy foods, for example, when milk is replaced by soft drinks and FVJ (Y.-J. Bae & Yeon, 2013; Korea Ministry of Agriculture, Food and Rural Affairs, & Korea Food Industry Association, 2013b; Vatanparast et al., 2006). Our results also showed that energy intake from soft drinks and FVJ increased while energy intake from milk decreased or remained unchanged. Both the 2007 and 2009 policies only focused on the decrease of unhealthy foods in school. With the restriction of unhealthy foods in school, requiring healthy foods would be effective approach to improve students' diets.

Previous studies reported that Korean adolescents' consumption of unhealthy foods, including soft drinks, instant noodles, confectionary, and fast foods, had decreased after implementation of the 2007 and 2009 policies (S. G. Bae et al., 2012; K. Kim et al., 2013). To our knowledge, the places where Korean adolescents consume foods targeted by the policies has not been studied, even though their food intake away from home and their frequency of overall snack intake have increased during the last decade (Y. Lee et al., 2012). Our study adds a deeper layer to our understanding of the impact of nutrition policies on changes in food intake by identifying where shifts in food intake occur after policy implementation.

This study has several limitations. One of the potential limitations is that we could not discern EDNP foods, which are the target of the 2009 policy, from non-EDNP foods because the KNHANES food database does not provide sugar content of foods. Thus, we were focused on specific types of foods instead of EDNP foods. In addition, the KNHANES food database lacks information about processed foods, hence respondents' intake of particular foods could be misclassified with other similar food when the database does not have information of the specific food. Also, no distinction was made between zero-calorie drinks and regular drinks or full-fat milk and reduced-fat milk, therefore we grouped these in our analyses. We found that no one reported consuming zero-calorie soft drinks prior to 2009, which is unlikely to be accurate. We used the amount of food consumed in grams for sensitivity analysis; the results remained unchanged from the results that are presented in this paper. Thus, we considered that energy intake represented in this study can reflect the amount of food consumed despite the limitations of the food database. Another limitation is seasonal differences of dietary intake. Since KNAHNES was conducted in different periods by each cycle, seasonal differences in food intake may impede the estimation of real changes in food intake. In general, candy sales increase at the beginning and end of the year in South Korea because candy is often used for gifts (Korea Ministry of Agriculture, Food and Rural Affairs, & Korea Food Industry Association, 2013a). Thus energy intake from candy in 1998 and 2001, when KNHANES was conducted during November and December, may be overestimated and the decreasing trend of energy intake from candy from 1998 to 2005 shown in the study would be smaller once the seasonal variability is taken into consideration. Among Korean adults, seasonal variation on food intake is generally small

(D. W. Kim et al., 2013). We found some consistent decreasing or increasing trends of food intake over time regardless of the different survey periods, thus we believe that seasonal variability of food intake does not significantly affect the study results. Social desirability bias may affect adolescents' response regarding intake of unhealthy foods, which are target foods of the policies. For example, adolescents may be more aware of the nutrition policies and report lower intake of the targeted foods. These do not necessarily affect the study results, however, because our purpose was to observe population-level dietary change trends rather than to examine individual-level food intake (National Center for Health Statistics, 1992). The statistical analysis we did was not hypothesis-driven because of the uncertainties of policy implementation across individual school stores.

We considered only two policies in South Korea related to the school food environment. Other policies like nutrition labeling and reductions in sodium in processed foods have been implemented during the study period. The 2009 policy originally intended to improve out-of-school food environments by prohibiting EDNP foods sales in “volunteer” stores located nearby schools, and restricting advertisement of EDNP foods on television during 5-7 pm beginning September 2010. Given that only 4.2% of stores near schools voluntarily participated in stopping the sale of EDNP foods as of 2012 (Korea Ministry of Food and Drug Safety, 2013), and we did not find a notable change in intake of specific foods after restriction of EDNP foods advertisement on television, we considered that other components of the 2009 policy mentioned above did not affect adolescents' diets during the study period. It is possible that the food industry increased

other forms of marketing to adolescents such as advertisements through the Internet, video-games, or point-of-sale (Dietz, 2013; Henriksen, 2012).

Conclusions

Our analysis highlights that attention to the diverse eating places, including school, at-home, and away from home, are important to consider when developing and evaluating policies that aim to improve adolescents' overall dietary intake. This can provide an implication not only in South Korea, but also other countries that develop and implement nutrition policies to improve adolescents' diet and health. Existing policies and previous efforts to improve adolescents' diets in South Korea mostly focused on in-school (including school store) consumption, with no policy to improve at-home diet (S. G. Bae et al., 2012). Policies regulating the school food environment may be able to change in-school consumption, but may not be enough to improve overall diet (Briefel, Crepinsek, et al., 2009; Briefel, Wilson, et al., 2009; Taber et al., 2012; Taber, Chriqui, Vuillaume, & Chaloupka, 2014). Policies that restrict one setting (e.g., school) are not enough to improve adolescents' diet (Taber et al., 2014; Vecchiarelli et al., 2006) possibly because adolescents can easily access unhealthy foods outside of school or at home (Briefel, Crepinsek, et al., 2009). Comprehensive policies and interventions targeting multiple settings and both parents' and adolescents' dietary behaviors are needed (Briefel, Wilson, et al., 2009). Policies are more likely to be effective when they are consistent with previous efforts and effectively implemented.

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4.2 Manuscript 2

COMPARISON OF FOOD AVAILABILITY IN SCHOOL STORES IN SEOUL,
SOUTH KOREA BEFORE AND AFTER IMPLEMENTATION OF TWO NATIONAL
FOOD- AND NUTRIENT-BASED POLICIES²

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ABSTRACT

BACKGROUND

To improve school store food environments, the South Korean government implemented two policies restricting unhealthy food sales in school stores. A food-based policy enacted in 2007 restricts specific food sales (soft drinks); and a nutrient-based policy enacted in 2009 restricts energy-dense, nutrient-poor (EDNP) food sales. The purpose of the study was to assess how the two policies have changed the school store food environment.

METHODS

Foods sold in school stores in Seoul, South Korea were observed before (2006, 15 stores) and after (2013, 12 stores) implementation of the school store policies. Food availability in school stores in 2006 and 2013 was compared and EDNP food availability in 2013 was examined.

RESULTS

When controlling the total number of foods sold in school stores and school characteristics, the mean number of soft drinks sold in a school store in 2013 (0.3 items) was significantly lower than in 2006 (1.9 items, $p=0.032$). Soft drinks were still available in 50% of school stores observed in 2013, with all school stores selling EDNP foods in 2013.

CONCLUSIONS

South Korean policies have had a modest influence on availability of unhealthy school store foods. Alternative strategies to improve school store food environments are needed.

Keywords: Health Policy, Nutrition & Diet, School Food Services

School food environments affect students' dietary behaviors since students are in school most of the time they are awake, having at least one meal or snack while there (Briefel, Wilson, et al., 2009; Story et al., 2006). Efforts to improve school food environments have been mostly focused on the school meal service and other foods sold in school stores or vending machines. Increasingly, countries have attempted to regulate foods outside of the school meal program, in particular, because those foods are often energy-dense and nutrient-poor (EDNP). Consumption of unhealthy foods outside of the school meal program affects the diets of students during school hours (Cullen & Zakeri, 2004; Templeton et al., 2005; Vericker, 2013).

Policies targeting foods outside of the school meal program attempt to either limit specific food items or set a standard for nutrient content of the food. The first type of policy, the food-based policy, is most often used to restrict sales of soft drinks or fried foods. The second type of policy, the nutrient-based policy, is more often used to limit foods with high energy, fat, sugar, or sodium. Both types of policy can decrease the availability of the unhealthy foods in schools (Chriqui et al., 2013; Samuels et al., 2009) although the reduction in unhealthy food availability varies across studies (Peart et al., 2012; Samuels et al., 2009; Woodward-Lopez et al., 2010). Less is known about which type of policy most improves school food environments and whether policy impacts differ by school characteristics. Knowing policy impacts and the conditions under which they are most effective could help in developing and implementing more effective policies in the future. Two South Korean policies enacted to improve the nutritional quality of foods in school stores provide an opportunity to compare the two types of policy.

In South Korea, school children can obtain foods from school meal services, school stores, and outside of school. All elementary, middle, and high schools in South Korea hire registered dietitians, thus school meals are provided under the supervision of dietitians. In contrast, there was a lack of supervision over school store foods, which students themselves choose, until the early 2000s. Since public discomfort with unhealthy foods in school stores and students' unhealthy food choices had been growing, the Korean government implemented two national policies to improve the quality of foods sold in school stores. The Korean Ministry of Education announced a food-based policy in February 2007 (hereafter 2007 policy). The 2007 food-based policy forbade soft drink sales and recommended stop selling instant noodles and fried food in schools including vending machines and school stores by the onset of the 2007 school year (hereafter 2007 policy). A second comprehensive nutrition policy, the Special Act on Safety Management of Children's Dietary Life, targeted multiple nutritional problems of Korean children and was implemented beginning in March 2009 (hereafter 2009 policy). One component of the 2009 policy is a nutrient-based policy that restricts EDNP foods sales in school stores. The 2009 policy set a nutrient standard for energy, protein, saturated fat, sugar, and/or sodium to define EDNP foods and beverages, forbidding their sale in school stores after March 2009 (the beginning of the 2009 school year).

Previous studies regarding school nutrition policies mostly focused on the implementation of policy in public schools (Chriqui et al., 2013; Peart et al., 2012; Samuels et al., 2009; Templeton et al., 2005). Public and private schools often have different school management systems, including operation of school stores. In South Korea, 80% of public schools contract with school stores through a public competitive

bidding process, whereas 63% of private schools have private contracts (H. Lee et al., 2011). For schools using public competitive bidding, the right of operation is sold to the highest bidder (i.e., pays the school the most for school food sales rights). The right of operation expires every year, thus the current school store owner needs to participate in the bidding annually. Store owners in public schools report that high bidding prices are overly burdensome (Choi et al., 2015).

These differences in school store management systems may affect school store owners' selection of foods sold in school stores. School store owners who already paid a high cost for the right to the store need to make more profits; they may want to sell high-profit products regardless of the nutritional quality of the food. Thus, we hypothesized that school stores in public and private schools sell different types of foods and different numbers of foods that policies banned to sell. Since public and private high schools in South Korea have the same tuition (excluding specialized schools; tuition for middle schools is free), attendance in private or public schools does not reflect students' wealth. Thus, comparison of food availability between public and private schools in South Korea could provide an example of impact of school management systems on food availability in school stores.

The purpose of the study was to assess how the two different national school store policies change the school store food environments. We compared foods and beverages sold in school stores in 2006 and 2013 to assess if the 2007 food-based policy affected availability of foods and beverages in school stores. EDNP food availability in 2013 was examined to assess impacts of the 2009 nutrient-based policy. We also explored differences in food availability in school stores by school characteristics that might affect

foods sold in school stores. We hypothesized that students' age, sex, and their household income, that are related to eating behaviors and snack purchase (Briefel, Crepinsek, et al., 2009; Choi et al., 2008), and the school management type (public/private) could be related to foods and beverages sold in school stores.

METHODS

Participants and Procedure

School stores in middle and high schools located in Seoul, South Korea were observed before (school year 2006) and after (school year 2013) implementation of school store policies. In 2006, one middle school and one high school were randomly selected from each school district among 11 school districts in Seoul, South Korea. Of the 22 schools, 15 agreed to observation of their school store. In 2013, six school stores each from one high-income school district and one low-income school district were purposefully selected to make selected schools have various characteristics in terms of students' sex, school level, and school type (private, public). Among the total of 12 school stores observed in 2013, two school stores were also observed in 2006. The observations were conducted from December 2006 to February 2007 and from October 2013 to December 2013.

Four observers conducted school store observation in 2006. In 2013, one observer, who also participated in the observation in 2006, conducted all school store observation with the same material and method in 2006. When an observer visited school stores, all types of foods and beverages sold in the school stores were recorded. Product name, manufacturer, size, and flavor (if varied) were recorded. When school stores

owners allowed, the observer took photographs of school stores and food items. For foods in school stores observed in 2013, nutrient content was recorded from the nutrition label of products, including calories, protein, saturated fat, sugar, and sodium content per one serving. In most cases, it was not possible to record nutrient content for all foods during the school store observation, because school store owners did not want the observer to stay in their school stores for a long time. If nutrient information was not obtained by on-site observation, the information was obtained from the manufacturers' websites or by purchasing the product.

Data Analysis

All foods and beverages were categorized into soft drinks, fruit and vegetable juice, tea, coffee, sports drinks, bottled water, other beverages, chips & cookies, candy, ice cream, bread, hamburger & pizza, fruit, other foods, yoghurt, milk, and flavored milk. Milk and flavored milk were further categorized based on the fat content (full- or reduced-fat). Based on the 2009 criteria for EDNP (Table 4.4), all food and beverage items available in school stores in 2013 were determined to be either EDNP or not.

Descriptive statistics for school characteristics, including school level (middle school, high school), school type (private, public), students' sex (coeducational, boys only, girls only), and income level of school district (high-income, low-income), were computed using Fisher's exact test to compare characteristics of school stores observed in 2006 and 2013. Crude numbers of all types of foods and beverages sold in school stores and of foods in each category were compared between 2006 and 2013 using Student's t-tests. To compare the number of foods between 2006 and 2013 controlling for school characteristics, mixed models were fitted with school districts as random effects. Then,

Table 4.4 Criteria of the energy-dense nutrient-poor (EDNP) foods

A. Criteria for snacks among children's favorite foods^a

- (5) Foods containing over 250kcal and less than 2g of protein per serving.
 - (6) Foods containing over 4g of saturated fat and less than 2g of protein per serving.
 - (7) Foods containing over 17g of sugar and less than 2g of protein per serving.
 - (8) Foods containing over 500kcal or over 8g of saturated fat or over 34g of sugar per serving among foods that do not meet criteria of 1~3.
- ※ For foods which the serving size is less than 30g, the criteria is applied to 30g of the foods instead of the actual serving size.

B. Criteria for meal substitutes among children's favorite foods

- (1) Foods containing over 500kcal and less than 9g of protein per serving.
- (2) Foods containing over 500kcal and over 600mg of sodium per serving. For deep-fried noodles and noodles among noodles (only applied to noodles in containers), over 1,000mg of sodium is applied to as a criteria of EDNP.
- (3) Foods containing over 4g of saturated fat and less than 9g of protein per serving.
- (4) Foods containing over 4g of saturated fat and over 600mg of sodium per serving. For deep-fried noodles and noodles among noodles (only applied to noodles in containers), over 1,000mg of sodium is applied to as a criteria of EDNP.
- (5) Foods containing over 1,000kcal or over 8g of saturated fat per serving among foods that do not meet criteria of 1~4.

^a Children's favorite foods are defined as "Foods that children prefer or eat frequently among foods under the Food Sanitation Act or the Livestock Products Sanitary Control Act, which are prescribed by Presidential Decree" (the Special Act on safety management of children's dietary life. Act no. 119882013). The list of children's favorite foods is in Appendix B.

the total number of foods sold in school stores was included in the models in addition to school characteristics, to examine food composition in school stores in 2006 and 2013. Student's t-test was used to compare crude number of total foods and EDNP foods, and percentage of EDNP in 2013 by school level, school type, students' sex, and income level of school district. Mixed models with school districts as random effects were used to

control school characteristics. The α level of 0.05 was used to determine statistical significance. All statistical analyses were conducted using SAS 9.4 (SAS Institute, Inc., Cary, NC).

RESULTS

On average, 40.7% of school stores were located in middle schools and 33.3% were in private schools (Table 4.5). Most school stores observed in 2006 were located in public schools (86.7%) while 41.7% of school stores observed in 2013 were located in public schools ($p=0.037$). More than half, 55.6% of the school stores were located in coeducational schools, 33.3% in boys' schools, and 11.1% in girls' schools. About half of the school stores were located in low-income school districts.

The mean number of food and beverage types sold in school stores was significantly higher in 2013 (102.3 items) than in 2006 (41.1 items; $p<0.001$), even after adjusting for school characteristics ($p=0.022$, Table 4.6). Within most food categories, mean numbers of food types sold in school stores observed in 2013 were significantly higher than those sold in school stores observed in 2006 ($p<0.05$). After adjusting for school characteristics, the mean number of some foods that can be considered healthy or low-calorie foods, such as tea, bottled water, other beverages, fruit, yoghurt, and reduced-fat non-flavored milk, and high-calorie foods including chips & cookies and hamburger & pizza, sold in 2013 was significant higher than in 2006 ($p<0.05$). When controlling for school characteristics and total number of food and beverage items, only the mean number of other beverages and hamburger & pizza sold was significantly higher in 2013 ($p=0.037$ and $p=0.005$, respectively), and the number of soft drinks, the target food of the

Table 4.5 Characteristics of school stores observed in 2006 and 2013

| | Total (n=27) | School Year | | p ^a |
|------------------------|-----------------|----------------|----------------|----------------|
| | | 2006 (n=15) | 2013 (n=12) | |
| School level | | | | |
| Middle school | 11 (40.7) | 6 (40.0) | 5 (41.7) | >0.99 |
| High school | 16 (59.3) | 9 (60.0) | 7 (58.3) | |
| School type | | | | |
| Private | 9 (33.3) | 2 (13.3) | 7 (58.3) | 0.037 |
| Public | 18 (66.7) | 13 (86.7) | 5 (41.7) | |
| Students' sex | | | | |
| Coeducational | 15 (55.6) | 10 (66.7) | 5 (41.7) | 0.110 |
| Boys only | 9 (33.3) | 5 (33.3) | 4 (33.3) | |
| Girls only | 3 (11.1) | 0 (0.0) | 3 (25.0) | |
| School district | | | | |
| Low income district | 14 (51.9) | 8 (53.3) | 6 (50.0) | 0.863 |
| High income district | 13 (48.2) | 7 (46.7) | 6 (50.0) | |

^a Fisher's exact test

was significantly lower in 2013 ($p=0.032$).

The 2009 nutrient-based policy seemed ineffective in prompting removal of restricted foods in school stores. All school stores observed in 2013 sold EDNP foods that were restricted by the 2009 policy. On average, 7.0 items out of 102.3 items (7.6%) sold in a school store were EDNP products (Table 4.7). School stores located in high schools and in private schools sold significantly higher number of food items (130.9 items for high schools and 130.0 items for private schools) than those located in middle schools and in public schools (62.4 items for middle schools, 63.6 items for public schools; $p=0.012$ and $p=0.016$, respectively). The number of EDNP foods was slightly higher for school stores in private schools than for those in public schools ($p=0.070$). School stores in high-income school districts sold more food items than those in low-

Table 4.6 Mean number of foods and beverages sold in school stores in 2006 and 2013

| School Year | Crude | | | | Adjusted for school characteristics ^a | | | | Adjusted for school characteristics and total number of food and drink items ^b | | | |
|---------------------------|--------------------------------|-----------|--------------------------------|------------|--|-----------|-----------|--------------|---|----------|--------------|--|
| | 2006 | | 2013 | | 2006 | | 2013 | | 2006 | | 2013 | |
| | Number of schools ^c | Mean±SD | Number of schools ^c | Mean±SD | p | Mean±SE | Mean±SE | p | Mean±SE | Mean±SE | p | |
| Total | 15 | 41.1±27.1 | 12 | 102.3±50.7 | 0.001 | 59.7±12.5 | 98.5±10.7 | 0.022 | | | | |
| Soft drinks | 9 | 1.8±1.9 | 6 | 0.8±0.9 | 0.070 | 1.5±0.5 | 0.7±0.9 | 0.433 | 1.9±0.5 | 0.3±0.5 | 0.032 | |
| Fruit and vegetable juice | 14 | 3.2±2.3 | 12 | 7.1±5.6 | 0.041 | 5.9±1.2 | 6.7±1.0 | 0.590 | 6.5±1.0 | 4.8±0.9 | 0.249 | |
| Tea | 6 | 0.7±1.1 | 11 | 4.3±3.3 | 0.004 | 1.4±0.8 | 4.1±0.6 | 0.007 | 1.7±0.7 | 3.0±0.6 | 0.143 | |
| Coffee | 4 | 0.4±0.8 | 2 | 0.2±0.4 | 0.345 | 0.3±0.3 | 0.2±0.3 | 0.728 | 0.4±0.3 | 0.0±0.4 | 0.356 | |
| Sports drinks | 14 | 1.9±1.1 | 11 | 3.5±2.9 | 0.087 | 1.7±0.6 | 2.9±0.7 | 0.196 | 1.9±0.5 | 2.2±0.6 | 0.783 | |
| Bottled water | 2 | 0.1±0.4 | 8 | 0.8±0.6 | 0.003 | 0.2±0.2 | 0.7±0.1 | 0.031 | 0.2±0.2 | 0.5±0.2 | 0.211 | |
| Other beverages | 12 | 1.9±1.8 | 12 | 8.3±4.9 | 0.001 | 2.5±1.2 | 7.9±1.1 | 0.002 | 3.2±0.8 | 5.5±0.7 | 0.037 | |
| Chips & cookies | 15 | 12.4±8.7 | 12 | 34.3±19.6 | 0.003 | 18.0±5.2 | 33.5±3.9 | 0.020 | 21.2±2.0 | 21.9±1.9 | 0.808 | |
| Candy | 12 | 6.5±6.3 | 12 | 16.4±10.0 | 0.004 | 8.9±3.1 | 15.7±3.3 | 0.133 | 11.0±1.2 | 8.8±1.1 | 0.198 | |
| Ice cream | 10 | 4.2±4.5 | 11 | 11.8±7.6 | 0.004 | 8.2±1.9 | 11.2±1.5 | 0.204 | 8.9±1.7 | 8.9±1.6 | 0.982 | |
| Bread | 13 | 2.6±1.4 | 11 | 3.0±2.2 | 0.573 | 3.2±0.7 | 3.0±0.5 | 0.793 | 3.3±0.7 | 2.8±0.7 | 0.622 | |
| Hamburger & pizza | 11 | 1.4±1.4 | 12 | 4.7±2.9 | 0.003 | 1.3±0.7 | 4.5±0.5 | 0.001 | 1.3±0.7 | 4.5±0.7 | 0.005 | |
| Fruit | 0 | 0.0±0.0 | 2 | 0.2±0.4 | 0.108 | -0.1±0.1 | 0.2±0.1 | 0.042 | -0.1±0.1 | 0.0±0.1 | 0.468 | |
| Other foods | 6 | 1.7±2.7 | 8 | 1.3±1.3 | 0.549 | 2.1±1.0 | 1.2±1.8 | 0.653 | 2.4±0.9 | 0.4±1.6 | 0.288 | |
| Yoghurt | 1 | 0.1±0.3 | 7 | 1.1±1.2 | 0.003 | 0.4±0.3 | 1.1±0.2 | 0.041 | 0.5±0.2 | 0.7±0.2 | 0.529 | |
| Milk | 5 | 0.3±0.5 | 8 | 0.8±0.6 | 0.062 | 0.6±0.2 | 0.7±0.1 | 0.690 | 0.6±0.2 | 0.6±0.2 | 0.827 | |
| Flavored milk | 13 | 1.8±1.1 | 12 | 4.3±2.4 | 0.002 | 3.0±0.6 | 4.1±0.5 | 0.130 | 3.2±0.5 | 3.6±0.5 | 0.547 | |

Table 4.6 Mean number of foods and beverages sold in school stores in 2006 and 2013 (continued)

| School Year | Crude | | | | | Adjusted for school characteristics ^a | | | Adjusted for school characteristics and total number of food and drink items ^b | | | | | |
|--------------------------------|--------------------------------|---------|--------------------------------|---------|--------------|--|---------|--------------|---|---------|---------|---------|---------|---------|
| | 2006 | | 2013 | | p | 2006 | | 2013 | | p | 2006 | | 2013 | |
| | Number of schools ^c | Mean±SD | Number of schools ^c | Mean±SD | | Mean±SE | Mean±SE | Mean±SE | Mean±SE | | Mean±SE | Mean±SE | Mean±SE | Mean±SE |
| Milk categorization | | | | | | | | | | | | | | |
| Non-flavored milk, full-fat | 5 | 0.3±0.5 | 6 | 0.6±0.7 | 0.272 | 0.7±0.2 | 0.5±0.2 | 0.507 | 0.7±0.2 | 0.5±0.2 | 0.528 | | | |
| Non-flavored milk, reduced fat | 0 | 0.0±0.0 | 2 | 0.2±0.4 | 0.108 | -0.1±0.1 | 0.2±0.1 | 0.042 | 2.4±0.5 | 2.9±0.6 | 0.563 | | | |
| Flavored milk, full-fat | 11 | 1.2±1.0 | 11 | 3.0±1.9 | 0.004 | 2.4±0.5 | 2.9±0.6 | 0.485 | -0.1±0.1 | 0.0±0.1 | 0.468 | | | |
| Flavored milk, reduced fat | 8 | 0.6±0.6 | 9 | 1.3±1.1 | 0.058 | 0.7±0.4 | 1.2±0.3 | 0.224 | 0.8±0.3 | 0.9±0.3 | 0.870 | | | |

SD: standard deviation; SE: standard error

^a Adjusted for school level (middle, high school), school type (public, private), students' sex (coeducational, boys only, girls only), and income level of the school district. School districts were considered as random effects.

^b Same as above but with additional adjustment for total number of food items in the school store.

^c Number of schools sold the food item

Table 4.7 Availability of energy-dense nutrient-poor (EDNP) foods in school stores in 2013

| | Crude | | | | Adjusted for school characteristics ^a | | | | | | | |
|------------------------|-----------------------|--------------|----------------------|-------|--|-------|-----------------|--------------|----------------------|-------|--------------|-------|
| | Total number of foods | | Number of EDNP foods | | % EDNP foods ^b | | Number of foods | | Number of EDNP foods | | % EDNP foods | |
| | Mean±SD | p | Mean±SD | P | Mean±SD | p | Mean±SE | p | Mean±SE | p | Mean±SE | p |
| All schools | 102.3±50.7 | | 7.0±3.6 | | 7.6±2.8 | | 102.7±23.9 | | 7.8±1.9 | | 7.8±1.8 | |
| School level | | | | | | | | | | | | |
| Middle school | 62.4±21.8 | 0.012 | 5.2±1.6 | 0.150 | 9.1±2.6 | 0.114 | 77.4±20.8 | 0.147 | 5.7±1.6 | 0.402 | 8.8±1.6 | 0.354 |
| High school | 130.9±46.1 | | 8.3±4.2 | | 6.5±2.6 | | 122.2±14.6 | | 7.6±1.1 | | 6.7±1.1 | |
| School type | | | | | | | | | | | | |
| Private | 130.0±47.2 | 0.016 | 8.6±3.7 | 0.070 | 7.1±2.5 | 0.478 | 121.0±14.5 | 0.042 | 8.5±1.1 | 0.060 | 7.8±1.1 | 0.986 |
| Public | 63.6±22.7 | | 4.8±2.2 | | 8.3±3.4 | | 70.1±16.5 | | 4.8±1.3 | | 7.8±1.2 | |
| Students' sex | | | | | | | | | | | | |
| Coeducational | 72.6±33.4 | 0.197 | 6.2±3.1 | 0.176 | 9.3±2.6 | 0.109 | 91.5±17.4 | 0.819 | 7.2±1.3 | 0.127 | 8.6±1.3 | 0.287 |
| Boys only | 113.3±62.2 | | 5.5±2.9 | | 5.4±2.7 | | 89.3±18.8 | | 4.1±1.5 | | 5.9±1.4 | |
| Girls only | 137.3±42.7 | | 10.3±4.0 | | 7.8±1.5 | | 105.8±23.6 | | 8.7±1.9 | | 8.8±1.8 | |
| School district | | | | | | | | | | | | |
| Low income district | 76.7±40.5 | 0.076 | 5.8±4.3 | 0.281 | 8.0±3.4 | 0.598 | 85.0±14.1 | 0.316 | 6.4±1.2 | 0.737 | 7.7±1.2 | 0.947 |
| High income district | 128.2±49.2 | | 8.2±2.6 | | 7.1±2.4 | | 109.8±17.0 | | 7.1±1.5 | | 7.9±1.4 | |

SD: standard deviation; SE: standard error

^a Among school level (middle, high school), school type (public, private), students' sex (coeducational, boys only, girls only), and income level of the school district, school characteristics except the analytic characteristic were adjusted. School districts were considered as random effects.

^b Percentage of EDNP foods may differ the result of calculation that number of EDNP foods divided by total number of foods since only specific food groups are eligible to be determined EDNP or non-EDNP foods.

-income school districts ($p=0.076$), but there was no difference in number of EDNP foods. After controlling for school characteristics, the differences in the total number of foods, total number of EDNP foods, and percentage of EDNP foods by school characteristics became smaller. The total number of food items and total number of EDNP foods sold in school stores was higher in those located in private schools than in public schools after adjusting for other school characteristics ($p=0.042$ and $p=0.060$, respectively). Although the number of EDNP foods was slightly higher in school stores located in private schools ($p=0.060$), when school characteristics were adjusted, the percentages of EDNP foods were not differ by school level, school type, students' sex, or income level of the school district.

DISCUSSION

We examined changes in the foods and beverages available in school stores before and after implementation of the school store policies. The school stores observed in 2013, after the implementation of the 2007 policy that restricts soft drink sales, had significantly less soft drinks than those in 2006. Yet, half of the school stores observed in 2013 still sold soft drinks. Although the 2009 policy forbids EDNP foods sales in school stores, EDNP foods were found in all school stores observed in 2013, representing about 7.6% of foods sold.

While the quantity of food types sold in school stores has increased, the quality of school store foods has not changed much between 2006 and 2013. Despite the implementation of policies intending to improve school store food environments, there was no significant difference in the foods offered in school stores between 2006 and

2013, when the total number of food in school stores was adjusted, with one exception: the decrease of soft drinks. This change was likely the result of the 2007 policy that bans sales of soft drinks. The increased number of other types of beverages may be due in part to substitution for soft drinks. On the other hand, the number of hamburger & pizza options sold in school stores was significantly higher in 2013 than in 2006, even after adjusting for the total number of food items sold in school stores. Hamburger & pizza products that were observed in 2013 in this study had the highest energy and sodium content per serving among all food categories (data not shown). All hamburger & pizza foods, however, had higher protein and lower energy, saturated fat, and sugar per serving than the EDNP criteria of the 2009 policy, and thus are allowed to be sold. Previous studies have reported that schools tend to remove only the least healthy foods that school nutrition policies require, but not replace those unhealthy items with healthy items (Samuels et al., 2009; Taber et al., 2015; Woodward-Lopez et al., 2010). Thus policies regulating unhealthy food sales may not contribute to increase of healthy food availability in schools (Fernandes, 2013; Peart et al., 2012). The increased availability of hamburger & pizza products which are not restricted by the policies, but are still unhealthy, and insignificant increase of availability of healthy foods such as bottled water, fruit, and reduced-fat milk, shown in this study indicates that South Korean policies also have not eliminated all unhealthy items while healthy food availability is not increased.

EDNP foods were still available after the 2009 policy implementation. There are two possible explanations. First, school store owners may not know which foods are EDNP due to a lack of information about the policy or to the complexity of applying EDNP criteria. Indeed, school store owners often do not know specific EDNP criteria and

have difficulties discerning EDNP foods (Choi et al., 2015; Samuels et al., 2009). The Korea Ministry of Food and Drug Safety (MFDS) has posted the list of EDNP products on their website monthly and developed a smart phone application that identifies foods as EDNP using the barcode on product packaging (Korea Food and Drug Administration, 2012; Korea Ministry of Food and Drug Safety, 2014a). Most school store owners did not know about the MFDS's materials, however, and the materials did not include information of all foods sold in school stores or new food products (Choi et al., 2015).

Another possible explanation for the lack of compliance that this study found is the different contract system for the school store operation between public and private schools. School stores in private schools sold more EDNP foods than those in public schools. In contrast to public schools that have an annual public bidding for school store operation, most private schools make private contracts with school store owners and the duration of the contract is usually multiple years. Even for some private schools, school store owners are relatives of the people from the school foundation. Because of their close relationship and a long history of operation, school stores of private schools are expected to experience less monitoring compared to those in public schools (Choi et al., 2015). Yet, school stores in public schools also sold EDNP foods. With consideration of the total number of food types sold in school stores, the percentage of EDNP foods among all foods in school stores was not different between public and private schools. If EDNP foods are high-selling and high-profit products, school store owners would not want to remove the items from their stores. Since the winning bid through the public competitive bidding is increased every year, school store owners of public schools need to earn more money to apply for the next year's right of operation. Under these

circumstances, it would be hard to convince school store owners to halt specific food sales.

Given that all school stores observed in 2013 sold EDNP foods, it is questionable whether monitoring on school store foods is conducted well. During the school store observation in 2013, school store owners stated that irregular monitoring of school store foods is conducted by public officials or school staff; but they have not been caught due to violation of the policy. A qualitative study reported that one of the possible reasons of lack of compliance with the 2009 policy is inadequate monitoring of school store foods, such as no monitoring by school staff and decreased frequency of monitoring by public officials due to budget limitation (Choi et al., 2015).

This study shows that the two different types of policies in South Korea had different influences in food availability in school stores. There was a significant decrease in soft drinks which the 2007 food-based policy required, but no difference in availability of other foods in school stores between 2006 and 2009 was found despite of implementation of the 2009 nutrient-based policy. The 2007 food-based policy, however, did not completely eliminate the restricted items from the observed school stores. California's competitive food policy that included both food-based (beverage standards) and nutrient-based (energy, energy from fat and saturated fat, and sugar) policies also showed that compliance was easier to achieve with food-based than nutrient-based food policies (Peart et al., 2012; Samuels et al., 2009; Woodward-Lopez et al., 2010). The greater compliance with food-based policies may be because they are easier to interpret than nutrient-based policies (Samuels et al., 2009; Woodward-Lopez et al., 2010). No prior policy evaluation has reported complete elimination of restricted foods, regardless

of whether the restriction was made by nutrient- or food-based policies. Other factors, however, such as revenue loss, inadequate monitoring system, and students' preferences, may hinder 100% compliance of the policies (Greves & Rivara, 2006). Observation of school stores before and after the implementation of the school store policies allowed us understanding of the contexts in which these policies were implemented and helps to identify possible reasons for non-compliance with the policies. We were also able to identify where more efforts are needed for better achievement of policy intention.

Limitations

The findings of this study should be interpreted with caution due to different school stores observed over time, small sample sizes, and different characteristics of selected school stores between 2006 and 2013. Although only two school stores were observed both in 2006 and 2013, changes in the two school stores were similar with changes in overall samples; for example, the two school stores sold increased number of foods (1.9 times and 2.7 times each), less soft drinks, and more hamburger & pizza and other beverages in 2013 than in 2006. Significantly more stores in private schools were observed in 2013 than in 2006. The different contract systems may affect school store owners' food selection, but we did not find significant difference in type of foods sold in school stores between private and public schools. We did not obtain contract information, although there is a possibility that some of stores in private schools made a contract through the public competitive bidding. Future research needs to follow-up with changes in food availability in same school stores using a larger sample size in order to track the impacts of policies.

Because of the 7-year gap between two observations, we had different data in 2006 and 2013. In 2006, nutrition labeling policy in South Korea did not require labeling of saturated fat and sugar content of food products. Thus, we were unable to compare EDNP food availability in school stores between 2006 and 2013, and it was impossible to know whether EDNP food availability changed after the 2009 policy. The same observer conducted the school store observations both in 2006 and 2013, using the same materials to record foods in school stores and photos of foods in school stores were taken to ensure accuracy of the records. Thus, we believe that reliability of observation is not a concern in this study. In addition, validity of the data obtained by the research staff's direct observation may be higher than indirect observation by school staff or school store owners. School store observations were conducted only in one city; thus foods in school stores in other cities may differ. This study may not represent availability of foods in school stores in entire country; however, it can still provide policy implications by comparison of two different kinds of school store policy.

Conclusions

In conclusion, the two school store policies in South Korea have had a modest influence on the improvement of school store food environments. Both policies are restrictive in terms of forbidding sales of specific items or EDNP food. Restrictive policies may not change school store food environments much if unhealthy foods that meet the policy criteria are sold in school stores. A policy that requires sales of healthy foods with the restriction of unhealthy foods could be an alternative. An increase of healthy food availability and a decrease of unhealthy food availability at the same time

could improve school store food environments as well as students' diet. Future studies need to investigate how to increase healthy foods and reduce unhealthy foods in school stores and how to encourage students to buy healthy foods instead of unhealthy foods.

In addition, increased benefits for school stores may help to reduce EDNP food availability in school stores. Current policies have only restrictions that may reduce revenue of school stores, but there is no incentive for compliance to the policy. If school store owners perceive more benefits from the compliance of the policy than non-compliance, then they are more likely to comply. Financial incentives or advantages in renewal of the school store contract could increase school store owners' perceived benefits to comply with the policy. With the direct incentives, strategies to promote school store owners' understanding of why they should not sell specific foods and how to avoid revenue loss when they comply with the policy would be helpful to improve school store food environments.

Implications for school health

These results have important implications for informing school administrators for improving school store food environments. School store food environments may not be improved by only governmental policies if school administrators are not involved. School teachers, staff, and dietitians work in schools, thus they are in a better position to monitor foods in school stores than other officials. School administrators should monitor what foods are sold in their school stores and ask for school store owners to sell healthier foods. Schools have leverage to require school stores sell healthy foods when schools make a contract with school stores. In addition, schools can utilize their dietitians or

school nurses to inform students to make a healthier food choice in school stores. Furthermore, schools can seek for help from outside to improve the school store food environments. Many governments or research teams in academia run public health intervention program such as Healthy School Store Program of the Seoul Metropolitan government. Schools should play a proactive role to make healthier food environments for students in their schools.

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4.3 Manuscript 3

WHY DO SCHOOL STORES IN SOUTH KOREA STILL SELL RESTRICTED FOODS FOUR YEARS AFTER THE SCHOOL STORE POLICY?³

³ Choi, S.K., Frongillo, E.A., Blake, C.E., and Thrasher, J.F. To be submitted to *Journal of the Academy of Nutrition and Dietetics*

Abstract

The South Korean government has banned sales of unhealthy foods in school stores since 2009; however, most school stores still sell restricted foods. This study aimed to understand the implementation processes and the reasons for incomplete implementation of the school nutrition policy in South Korea. Semi-structured interviews were conducted with 33 policy actors including school store owners, school staff, public officials, politicians, employees of food companies, and experts. Observations of food sold in school stores were conducted. Interview transcripts were analyzed using both emergent codes and an a priori code list (participants, base values, perspectives, and effects) based on Lasswell's social process model using NVivo 10. All interviewees perceived that school stores complied with the policy well; however, restricted foods were found in all interviewed school stores during the observations. Although all policy actors understood the intent of the policy; some of them were not interested in the policy or were unsatisfied with the policy and its outcomes such as profit loss. Perspectives and values towards the policy were different for each policy actor group. Poor monitoring of school store foods, lack of awareness of the policy, profit-seeking, and lack of interest in school stores were identified as reasons for incomplete implementation of the policy. The findings support the needs for consideration of various actors' perspectives, especially for those who are affected by the policy, when implementing school nutrition policies. A stronger understanding of various actors' involvement in policy processes can inform strategies to enhance implementation and thereby reach outcomes that align with the original policy intent.

Key Words: Policy implementation, food policy, nutrition

Introduction

Many school policies aimed at improving school food environments are being enacted worldwide, but these policies often involve challenges to intended implementation (Jaime & Lock, 2009; Kingdon, 2002). Poor implementation contributes to the limited success of the intended policy objectives (Kocken, van Kesteren, Buijs, Snel, & Dusseldorp, 2015). Thus, the study of policy implementation processes is critical to understand policy processes (Birkland, 2005). Understanding implementation processes will allow policy makers and implementers to know why some policies work and others do not and to be more readily achieved policy objectives (Birkland, 2005; Hill & Hupe, 2002).

Various people and groups participate in, affect, or are affected by policy processes. Recognizing these “policy actors” is critical to understanding the policy’s effects (Clark, 2002; Clarke et al., 2013). They shape implementation processes; for example, their perspectives affect how the policy is being implemented (Vine & Elliott, 2014). In addition, difficulties in satisfying different perspectives and responsibility conflicts among actors, such as expecting other actors to support the policy, may hinder implementation (Clarke et al., 2013; Green & Aarons, 2011). Various actors, from governments to individuals, are involved in implementation of school nutrition policies (Clarke et al., 2013). Yet, what policy actors do, how they interact, and what they think about the policy are often omitted from formal documents (Tansey, 2007). Thus, as direct witnesses of and participants in the policy processes, policy actors can be important resources in understanding policy implementation.

The social process model emphasizes interaction between participants and between participants and resource environments in the social process (Lasswell, 1971). The social process can be mapped using participants, perspectives, situations, base values, strategies, outcomes, and effects (Table 4.8). Elements of the social process model affect each other and shape the process. Mapping these elements is useful for understanding how, by whom, and why the social interaction occurs. As a social process, policy implementation processes can be understood using the elements of the social process model.

The South Korean government enacted the Special Act on Safety Management of Children's Dietary Life in 2009 to restrict sales of energy-dense, nutrient-poor (EDNP) foods in school stores. EDNP foods are determined based on the nutrient content of the foods per serving size. School stores are prohibited from selling EDNP foods, but despite policy implementation, EDNP foods are still available in school stores (Choi et al., 2016; S. C. Kim et al., 2010).

While several studies have been conducted to examine the effectiveness of the Korean school store policy (K. Kim et al., 2013; S. C. Kim et al., 2010), the implementation processes are relatively unknown. In this study, we traced implementation processes of the school store policy using qualitative interviews with policy actors. Interviewing policy actors enabled us to reconstruct implementation processes and to identify various factors that affect policy implementation (Tansey, 2007).

The overall aim of this study was to understand implementation processes of the Korean school store policy. Specific aims were to understand: (1) the policy

Table 4.8 Selected interview questions relevant to the elements of the social process model

| Elements of the social process model | Definition | Selected questions asked |
|--------------------------------------|--|---|
| Participants (policy actors) | Individuals, groups, or institutions who are interacting in the social process | Is there anyone who influences on the selection of foods sold in school stores? |
| Perspectives | Identity, demands, and expectations of participants | What do you do regarding school stores? What did you expect regarding the influence of the change of foods and beverages sold in (your) school store(s)? |
| Base values | Assets or resources that participants possess Power: making/influencing decisions Wealth: production, distribution, and control of resources Well-being: Being physically and psychologically healthy and safe Affection (relationship): having family, friendship, intimacy, warm relationships | What do you find satisfying or fulfilling about your work (or foods sold in school stores)? |
| Outcomes | Changes in base values as a result of the social process | How the change of foods and beverages sold in (your) school store(s) affect school store operation? |

Source: Lasswell (1971)

implementation processes from diverse policy actor perspectives, and (2) why the policy has not achieved complete implementation in terms of elimination of EDNP foods in school stores. This study answered the following research questions: (1) How is the policy being implemented? (2) What do different policy actors value and how are their

values reflected on their perspectives and thoughts regarding the policy and its outcomes?
and (3) Why do school stores still sell EDNP foods?

Materials and Methods

This study is guided by the social process model (Lasswell, 1971). Using elements of the social process model, we attempted to understand implementation processes of the school store policy. We considered participants of the school store policy process as policy actors.

Participants

Participants in the school store policy implementation were considered as potential interviewees. We purposefully selected two school districts in Seoul, South Korea first based on the income-level (high- versus low-income). Then we selected 6 schools each to have various characteristics in students' sex composition, school level (middle-, high-schools), and school type (private, public).

Conceptually-driven sequential sampling was used, wherein initial interviewees were selected based on existing understanding, and then the rest of the interviewees were purposefully selected based on themes that emerged during the previous interviews (Miles & Huberman, 1994). We identified potential interviewees that were expected to be involved in the policy based on reviews of research papers, government reports, and news articles. The pre-identified interviewees were policy actors in schools including school store owners, principals, and school staff; and outside of schools including governments and food industry. During the interviews with pre-identified interviewees, if specific

people's roles related to policy implementation were mentioned, these people were recruited for interviews.

School store owners, as front-line implementers of the policy, were contacted for the interviews first. After the interviews with school store owners, in-school actors in the same school were asked for the interviews. We also reached out to food industry, at least one public official in community health centers (CHCs) and offices of education in each school district that we selected, and public officials in the national-level governments (e.g., Ministry of Food and Drug Safety [MFDS], Ministry of Education [MoE]) for interviews. Politicians, consumer associations, and academia were frequently mentioned during the interviews, thus, they were also contacted for interviews.

Research instrument

The social process model informed the development of a semi-structured interview guide (Table 4.7) (Clark, 2002; Lasswell, 1971). The interview guide consisted of main questions, follow-up questions, and probes into emergent topics that interviewees brought up (Ulin et al., 2004) to gain information about implementation processes focusing on policy actors, their roles, perspectives, and relationships with other actors (Clark, 2002; Lasswell, 1971). The interview guide included different questions for each actor group that were specific to their roles in implementation processes. After review of field notes and memos from the previous interviews, the interview guide was revised to include questions that emerged for subsequent interviews.

Procedure

The first author conducted all interviews. The interviewer visited school stores and asked school store owners for the interviews. The visits were made without prior

notice to prevent the possibility that school store owners might change foods sold in school stores. When a school store owner agreed to the interview, the interview was conducted in the same day of the visit. After the interview, the interviewer recorded all items sold in the school store. The details of school store observations and food availability in school stores are described elsewhere (Choi et al., 2016). For other interviewees, the interviewer contacted them via phone or email to explain the purpose of the interview. Interviews were conducted either face-to-face or by phone and lasted 15-60 minutes.

We interviewed a total of 33 people, including 11 school store owners; 8 school staff; 6 public officials in CHCs, an office of education, Seoul Metropolitan government, and MFDS; 2 politicians; 3 food company representatives; and 3 people who have been involved in school store related work (a professor, a school principal, and a consumer organization representative). Interviews were audio-recorded upon agreement of the interviewees. When interviewees disagreed on recording, the interviewer took interview notes. Eight school store owners, 3 school staff members, 1 public official, 1 politician, 1 from a food company representative, and 2 people who have been involved in school store related work were agreed to audio-record interviews, thus, a total of 16 interviews was audio-recorded. Among interviewees who did not agree to audio-record interviews, 1 politician and 1 food company representative provided their own memos related to interview contents to the interviewer. All data collection took place in Seoul, South Korea from October 2013 to January 2014. The study protocol was reviewed and exempted by the University of South Carolina Institutional Review Board.

Data analysis

All recorded interviews were transcribed verbatim; unrecorded interviews were reconstructed into transcripts within a day using the memos taken during the interview, field notes, and memory of the interviewer. De-identified transcripts and field notes were used for the analysis. A subset of transcripts (n=5) was initially analyzed using open-coding to capture emergent codes (Strauss & Corbin, 1990) and to label the interviewees' responses. Using these emergent codes and elements of the social process model (Lasswell, 1971), a preliminary set of codes was developed. These codes were then applied to the first set of transcripts again and to the rest of transcripts. The first author coded all transcripts and worked with team members to develop the code list and identify themes. As the code list was revised or new themes were identified, all transcripts were re-coded. Themes based on the elements of the social process model – policy actors, base values, perspectives, and policy outcomes – and additional themes emergent from interviews were identified. Upon completion of coding, selected themes were put in matrices to interpret new themes and to split or to combine existing codes. The commonalities shared by interviewees from each policy actor group as well as different points expressed by them for the same theme were mapped in matrices (Miles & Huberman, 1994; Ulin et al., 2004). Peer review with one of co-authors was conducted to reach consensus on the coding, grouping of the codes into themes, and identified themes. All transcripts were managed and analyzed using NVivo 10 (QSR International).

Results

The results were organized into themes based on the social process model (Lasswell, 1971). These themes included policy actors and their base values,

perspectives, and thoughts regarding the policy and its outcomes. Compliance to the policy and its reasons were emerged during the analysis, thus these were also described.

Policy actors

Interviewees described implementation processes of the school store policy and who play as policy actors. Public officials in local (CHCs, Seoul Metropolitan government, and offices of education) and national (MFDS and MoE) governments, food industry, school staff, and school store owners were frequently mentioned as policy actors. The roles of academia and consumer associations were also mentioned.

Public officials, school store owners, and school staff mentioned what public officials do in the policy implement processes. Public officials informed policy information and monitored school food environments. CHCs hired citizens to monitor foods sold in school stores and other stores near to the schools. The monitors provided policy information to school store owners during the monitoring. In case of the city of Seoul, both the Seoul Metropolitan government and each CHC shared the budget for hiring monitors. Compared to 2012, the budget decreased in 2013, resulting in a decreased number of monitors and a lower frequency of monitoring. CHCs regularly reported the monitoring results to the Seoul Metropolitan government. Afterwards, the Seoul Metropolitan government reported it to the MFDS. The office of education in each school district also monitored school store foods. Public officials in CHCs and offices of education were specialized in food sanitation rather than school nutrition. They were in charge of school store monitoring, but did not always monitor school stores by themselves. They mentioned that direct monitoring on school stores was conducted once a year for some selected school stores.

In-school actors' roles were mentioned by public officials, school store owners, and school staff. School staff, especially those in the administrative office, was mainly in charge of the supervision of school store management. They made contracts with school store owners and observed school store foods when monitoring was required. The steering committee in each school, which consists of teachers, parents, students, and outside members, decided which foods can be sold in their school store, but the committees in some of the interviewed schools did not work for school stores. School store owners chose what to sell in school stores based on students' preference, profit, and relevant governmental and school's policies. Most teachers, students, and parents did not participate in the policy process and even were less interested in school stores.

Politicians described their role as policy making. Food industry changed some of their products to comply with the policy. The MFDS asked academia's and consumer associations' professional opinions and worked together to promote the policy.

Base values, perspectives, and thoughts regarding the policy and its outcomes

Interviewees expressed their values, perspectives, and thoughts regarding the school store policy and its outcomes. These were described below by policy actor groups.

School store owners

School store owners stated wealth, wellbeing, relationship, and power as their important values. Wealth for school store owners was represented as revenue and income. School stores were their way "to make a living", thus they were concerned about their revenue decreasing due to the policy. Nevertheless, one of their important values was wellbeing of children. Although they did not like the negative impacts of the policy, they supported the policy from their perspectives "as parents." One of the school store owners

described her contradictory situations, struggling with decreasing revenue and considering children's health, as "double-sidedness."

"Taking into consideration children's health, I shouldn't sell soft drinks. I feel that it's difficult to do my business with many regulations. I don't want to feed bad food to children because I also have children. But everyone has double-sidedness. For children, I should not sell those (EDNP) foods to them, but for my business, it's running a deficit due to many regulations."

School store owners also valued relationships with students, school staff, and public officials. Having a good relationship with students is important for sales, which directly relate with school store owners' income, thus they tried to sell foods that students like. School store owners identified themselves as "weaker ones" and consequently they have to comply with the policy to not make any trouble with public officials and school staff. In addition, they reported having not been asked about their opinions regarding the policy because they are "weaker ones."

Although school store owners agreed that improving students' health are important, most of them (9 out of 11) claimed that the policy is unfair to them. They perceived that the policy violates freedom of business and were dissatisfied with the policy because it only blames school stores. Some of them pointed out that this "unrealistic policy" is made because public officials do not know food environments out of schools. They were unsure if the policy is effective, because of the unhealthy foods available outside of schools.

"Governments regulate only school stores although children don't become obese here [school store]; children become obese outside (of school)... The government

works without any clear plan. When they visit schools for inspection, they shouldn't look at only schools. They should go out and see what children eat first. Children just come by schools. They spend more time outside. They eat more outside. But governments blame just school stores. It seems like governments want school store owners to die.”

School store owners' dissatisfaction towards being blamed and decreased revenue turned to emphasizing their weak power and distrust of governments.

Food companies

Wealth, represented by profit, was a main value of food companies. They stated that the policy is an excessive and unilateral regulation, and were concerned that the policy may result in downsizing of the food industry. They insisted that policies should focus more on nutrition education rather than regulation of specific food sales.

Food companies changed nutrient content of certain products, but did not think that the policy affects their revenue since school stores are a small portion of the market. Food company representatives described that it was not hard to comply with the policy because of ease of dodging the EDNP classification. They could change only one nutrient content or reduce portion size of their products to avoid being classified as EDNP. One interviewee expected that the policy will not change children's diet due to the loophole. He wanted to make the policy stricter for children's health as a parent.

“It's a blind spot of the policy, or a loophole. If a product passes one of the EDNP criteria among energy, sugar, protein, and saturated fat, then it's not EDNP, even though the product does not meet the other three criteria... The current policy that allows meeting only one criterion to be non-EDNP is burying

our heads in the sand. Honestly, we [food companies] can take advantage of the policy loophole... As a parent, I think if the policy really wants to do it right, if it wants to improve children's health, then it should require meeting all the four criteria... We [food companies] can avoid to being classified EDNP now, so I think the policy means nothing."

Public officials

Public officials claimed to value children's wellbeing the most. They expected that their work could help children having healthier diets. Thus, enlightenment was also an important value for public officials. The MFDS has developed educational materials, including a guidebook, a website, and a smartphone application, to increase public awareness of the policy. Public officials in local governments informed school store owners about the policy. This was accomplished through on-site monitoring or by sending documents to school administrative offices. Wealth (budget) was also reported as important to public officials since it allowed for monitoring. They were aware of the importance of profit for school stores. Some of them guessed that revenue of school stores might decrease, but others did not think the policy affects profits of school stores and food companies.

They thought that there is no difficulty in implementing the policy in general, but those in local-level governments (e.g., CHCs) expressed high burden of workload. Some public officials had doubts about the policy effectiveness in improving children's diets. They suggested more efforts to provide healthy foods to children and management of other kinds of unhealthy foods (e.g., high-energy and high-protein foods: pizza, hamburger).

School staff

School staff was not interested in school stores because they did not consider school store monitoring to be a part of their job. They described work related to school stores as “annoying” because it was “additional work” and increased their workload.

“I have not thought that school store related work is my work, although I monitor what foods the school store sells... I have not thought of the school store seriously.”

All of the school staff interviewed, except for one, reported that they did not have any problem in school store management because their school stores do not sell restricted foods. They considered their relationship with school store owners important. They did not want to interrupt private business as long as school store owners comply with the schools’ requests.

Politicians

Both politicians interviewed supported the policy. For the regions they represent, they had proposed ordinances to enhance policy implementation. They expressed that the policy could contribute to healthier school food environments. They were aware of the importance of profit for school store owners; but they did not think the policy affects profits of school stores and food companies. They required more efforts from other actors including school store owners, children, and food industry, to improve school food environments.

Perceived policy compliance

All interviewees thought that school stores do not sell EDNP foods; however, each actor group described different reasons for compliance. Public officials perceived

that the policy has been settled and school store owners are aware of the policy.

“School store owners’ awareness has improved. When I worked for the Healthy School Store Program first (at another CHC), school store owners said ‘whatever’ although I explained EDNP foods. After I came here [current CHC she works], I visited school stores to explain the policy and then noticed that they already knew EDNP foods... Their awareness has been changed... They cooperated favorably.” (A public official in a CHC)

School store owners and food companies expressed that there is no way to not comply with the policy. Both expressed that they comply with the policy because “it’s the law.” Concerns for the relationships between school store owners and school staff, as well as school store owners and public officials were reported as one of the reasons of policy compliance for school store owners. In addition, school store owners were worried that they may lose their stores if they violate the policy.

Why do school stores still sell EDNP foods?

In contrast to interviewees’ perceived compliance to the policy, we found EDNP foods in all school stores during school store observations (3-11% of items sold in a school store) (Choi et al., 2016). Four reasons for the policy incompliance were found during the interviews.

Poor monitoring

Although all school stores sold EDNP foods, no one reported that they had been caught by monitoring. School store owners mentioned that monitoring is done without prior notice. Each of them reported a different frequency of monitoring ranging from three times a month to once a year. They described the fine or punishment, which they

may get if they sell EDNP foods, as hearsay, but no one claimed to know exactly. They expected that they would get a warning if restricted foods are caught during monitoring, and they would be fined only if they sold restricted foods after the warning. Their description was accurate in case of monitoring by CHCs. The monitors hired by CHCs do not have the authority to impose fines or legal sanctions. If they find a school store sells restricted foods, they only can report the violation to public officials in CHCs. After that, public officials visit the store to see if the store really sells restricted foods. It is possible that school stores change their food products between visits from monitors and public officials. In addition, monitoring by CHCs has been decreased due to budget constraints. Although monitoring by offices of education is done through public officials, an interviewee from an office of education said he had not imposed a fine on school stores. Both CHCs and offices of education seem to focus more on sanitation than EDNP foods when they monitor school stores. For both of them, monitoring EDNP foods was competing with other tasks, thus was ended up having a low priority.

Though two government agencies concurrently monitor school stores, they did it separately and did not know what each other monitor. A public official in an office of education thought that CHCs do not monitor school stores, because schools are under the jurisdiction of the MoE and offices of education. Moreover, two different divisions in CHCs involved in school store monitoring – division of sanitation is in charge of sanitation, including EDNP food monitoring; the division of health management monitors foods in school stores that participate in the Healthy School Store Program.

While multiple government agencies monitor school stores, schools do not monitor their stores. School staff monitored school stores only when the offices of

education required it; some school staff asked school store owners to record the foods they sold by themselves.

Lack of awareness of the policy

Although public officials considered that policy awareness had increased, one school store owner, who has run the store for 8 months at the time of the interview, and half of the school staff interviewed (4 out of 8) were not aware of the policy. In addition, most school store owners had difficulties discerning EDNP and non-EDNP foods. They expressed that the nutrient criteria of the policy are complex. School store owners who ran the store prior to the policy implementation remembered that all school store owners were required to attend an education session regarding the policy at the beginning of its implementation. After then, there was no education, although ownership of many school stores had changed. School store owners who run stores for a relatively short time reported that they have not attended an education session regarding the policy. They were aware of the policy because they “heard” it from people who visit their stores for monitoring, from school staff, or from the previous school store owner. Despite the MFDS’s efforts in developing materials regarding the policy, most school store owners did not know where to find the information; they relied on a policy guidebook that was developed by the MFDS in 2009, which means the list of EDNP foods in the guidebook are outdated. In addition, some school store owners had a lack of nutrition knowledge. It would be hard to understand the policy that requires considering serving size, energy, saturated fat, protein, sugar, and sodium to determine EDNP foods for school store owners without sufficient nutrition knowledge.

For profit

Since wealth was an important value for school store owners, they tried to make a profit. Some school store owners complained about the skyrocketing cost of winning the bid to have the right to operate the school store. The competitive bidding system requires school stores owners of all public schools and some private schools to participate in the bidding every year. School store owners cannot continue to run the store if another person submits a higher bid. Thus, school store owners need to make more profit to submit a higher bid. Given that students prefer EDNP foods, it would be difficult for school store owners to not sell EDNP foods in consideration of profit.

“Children like EDNP foods, soft drinks, etc., that all policies and guidelines recommend eating less. They can’t eat those foods at home because their parents don’t allow. The only haven to eat those is the school store... Because children want EDNP foods, school stores sell those, which schools don’t allow, secretly. I asked students to report [EDNP food sales], but they never report. Because those are what they want. In this situation, customers’ and providers’ interests are coincidence. Although it [EDNP food sales] is illegal, socially unacceptable, and bad for health, school store owners sell foods that make profits.” (A high school principal)

The combination of interests between customers (students prefer EDNP foods) and providers (school store owners need profit and a good relationship with students) might hinder elimination of EDNP foods in school stores.

Lack of interest in school stores

Teachers and parents in general are not interested in school stores. Even students,

the customer of school stores, and school staff who are in charge of supervision do not pay attention to school stores. Most schools did not have their own school food policy; in cases in which schools have their own policy, they are almost the same as the government policy.

Public officials in local governments are supposed to monitor school stores, but they are less interested in school stores than in other work. They “don’t know much” about school stores because they are too busy to visit school stores. Work related to school stores is a small part of their work.

Discussion

Four years after the policy restricting EDNP food sales was implemented, the school food environments had not changed much in South Korea (Choi et al., 2016; S. C. Kim et al., 2010). This study aimed to find the reasons for why school stores still sell the restricted EDNP foods. Public officials made efforts to implement the policy, but there was a lack of interest in school stores among policy actors. All actors understood the policy intent, but not every actor was satisfied with the policy and its outcomes. All the interviewees, including school store owners, stated that school stores do not sell EDNP foods, but this was contradicted by the school store observations. From the interviews, we found that school stores sell EDNP foods because of poor monitoring, lack of awareness or understanding of the policy and EDNP foods, profit-seeking, and lack of interest in school stores.

The school store policy is implemented by public officials, school staff, and school store owners. While public officials’ and school staff’s roles in policy implementation were conveyed well by all of the interviewees, school store owners’

participation was not clearly expressed neither by public officials nor by school store owners. This may be linked to the store owners' self-identity as "weaker ones." School store owners are front-line implementers, and they choose what to sell to students. They felt, however, that they were being forced to follow the policy rather than working with the government for students' health. Although public officials and politicians interviewed said that everyone could express their opinion during a certain period of the policy development, school store owners may not have known about the opportunity. In addition, if some school store owners were aware of the opportunity, their voices might not have had enough power to influence the policy. Actors who are affected by policies are often excluded in the decision-making process, which turns into a misunderstanding of the policy intent, distrust of the government, or unsupportive responses to the policy (Roberts et al., 2009). Studies suggest that policy makers need to include front-line implementers in the decision-making process and communicate with all actors to inform them about the policy (McDonnell, Probart, Weirich, Hartman, & Bailey-Davis, 2006; Roberts et al., 2009; Vine & Elliott, 2014). This would increase policy awareness among actors, improve implementation processes, and promise long-term success of the policy (McDonnell et al., 2006; Roberts et al., 2009; Vine & Elliott, 2014).

Understanding actors' values and expectations can guide development of strategies to improve policy implementation (Pan Canadian Joint Consortium for School Health, 2010). School store owners expressed double-sidedness regarding the policy. Although they were happy about the government's efforts to improve children's health, they were unhappy about their decreased income. Yet, public officials and politicians did not expect the decreased income for school store owners. These unmatched expectations

among actors may be a reason for the double-sidedness that was felt towards the policy. When participants are aware of discrepancies between their expectations and actual situations as a result of a policy, problems that may hinder policy implementation arise (Lasswell, 1971). As school store owners perceive that their two values (wealth and wellbeing) cannot be compatible under the policy, they may find their own way, such as selling EDNP foods, to try to satisfy both values. One of the possible strategies to reduce EDNP food sales could be filling the gaps between school store owners' two values, wealth and wellbeing, and between different expectations among actors (Green & Aarons, 2011). Actors' values hint towards incentives to which they are likely to respond. An important value of school store owners is wealth, which public officials and politicians did not consider in policy design and implementation. If the policy guarantees school store owners' wealth, they may be more willing to comply with the policy. Securing the school store ownership could be an incentive for policy compliance. As school store owners pointed out, the high-bidding price is one of the difficulties in running school stores; therefore, schools may provide advantages during the bidding process to the school store owners that do not sell EDNP foods.

We found a discrepancy between perceived policy compliance by policy actors, even school store owners, and the actual compliance. Interviewees believed that the policy is being implemented well, which is not true. One of the reasons for the discrepancy in perceived and actual policy compliance by school store owners and school staff may be a lack of policy awareness. Additionally, those who know the policy also had difficulties in discerning between EDNP and non-EDNP foods. Interviewees pointed out that the current EDNP criteria are too complex to understand. In consideration of the

frequent changes in school store ownership, regular education or training for school store owners and school staff, especially for those new to the job, is needed to ensure the policy implementation (Durlak & DuPre, 2008). The MFDS has developed various materials to improve awareness of the policy; but the materials do not reach to front-line implementers. Thus, strategies to promote the existing materials are needed.

The monitoring system adds another layer of complexity, creating challenges for school store owners and public officials. Both nationally and locally, the responsibilities regarding school health in South Korea overlap among multiple government agencies. For example, the MoE is responsible for all school-related issues including school store management. The MFDS works in food and nutrition issues, thus school foods are also their interest. From the beginning of the policy, the risk for duplicated policy enforcement has been inevitable. Currently, school store monitoring is split among multiple governmental agencies at the national (MFDS and MoE), municipal (e.g., Seoul Metropolitan government), and local (CHCs and offices of education) levels. This duplicated policy enforcement neither contributed effective monitoring nor reduced EDNP foods in school stores. Rather these uncoordinated efforts added burdens to public officials who felt that they had a heavy workload, as well as to school store owners who felt that their businesses were controlled by the government. Poor coordination among multi-agencies often leads to poor implementation (Pelletier et al., 2012). The current policy does not specify how to coordinate monitoring among multi-agencies. A formal mechanism will be needed to enhance coordination of multi-agencies' monitoring. It will enable government agencies to manage school store foods in a more systematic way and to set clear responsibilities of each agency for adequate allocation of human and financial

resources (Holmes, 1992). This will also ensure regular monitoring which was impossible due to a limited budget and the high workload of public officials. Additionally, the current monitoring conducted by monitors without the authority to impose a fine needs to be reconsidered. Because of the absence of regulatory authority, on-site monitoring has not been effective to capture policy violations. People in charge of monitoring should be given appropriate authority that allows their monitoring to be effective.

Some policy actors have not paid attention to school stores. Public officials in local governments and school staff who are supposed to be in charge of school store monitoring expressed little interest in monitoring school stores. Further, most parents have no interest in school stores. A lack of support from key stakeholders is a barrier for policy implementation (Agron et al., 2010; Clarke et al., 2013). Previous studies consistently emphasized the need for marketing or education strategies to inform people of the potential benefits of the policy (Agron et al., 2010; Thrasher et al., 2011; Vine & Elliott, 2014). It could garner actors' supports for the policy implementation and enhance the implementation processes (Agron et al., 2010; Vine & Elliott, 2014). Especially, if students, the customers of school stores, are aware of the policy and its importance and buy non-EDNP foods, the school store owners' concern regarding profit loss might be reduced.

The school staff's lack of interest in school stores resulted in no monitoring conducted by schools. Previous research reported schools with a formal group or designated personnel who are responsible for school nutrition and high support from staff and administrators are more likely to implement the policy well (Lucarelli et al., 2014; Thacher, 2005). Therefore, school administrators, teachers, and staff need to pay attention

to their school food environment to improve students' health. Each school also should extend the job description of an individual to include the school store management as a part of their duties.

This study has several limitations. First, for some actor groups, the number of interviewees was too small to show their perspectives as representing their groups. We were only able to use their interview content to support or verify interviews with other groups. Second, we might have missed perspectives of some potential key actors. We were unable to conduct interviews with public officials in the MoE, parents, and teachers. Lastly, the interviewees might have responded in a socially desirable manner, for example, insisting they comply with the policy.

This study also has strengths. Our study conducted interviews with diverse policy actors. Previous research on implementation of school wellness policy mostly focused on the perspectives of a limited range of actor groups, e.g., in-school actors, actors in school districts. Thus, our study could reflect a greater variety of perspectives of policy actors. While the number of interviewees is relatively small, our findings are transferable to school nutrition policy issues in other countries. Previous studies conducted in the United States, Canada, and Mexico also showed different perspectives on school nutrition policies among policy actors and dissonant perspectives that are related to incomplete policy implementation (French, Story, Fulkerson, & Gerlach, 2003; McDonnell et al., 2006; Monterrosa et al., 2015; Vine & Elliott, 2014).

Conclusion

Policy enactment does not guarantee successful implementation (Kingdon, 2002;

McDonnell et al., 2006). This study supports the need for attention on various actors' perspectives when implementing school nutrition policies (Monterrosa et al., 2015). Policy decisions are often made by those who have higher power with minimal input from powerless actors who are affected by the policy. For future development and implementation of school nutrition policies, all policy actors should be given opportunities to discuss their thoughts on the policy. These discussions would increase actors' awareness of the policy and generate shared understanding of the policy among actors.

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CHAPTER 5

Summary, Implications, and Recommendations

The two Korean school nutrition policies have been implemented to improve school store food environments and diets of Korean adolescents. This study showed that the two policies have had a modest impact on the availability of foods offered in school stores and on diets of adolescents. Food access away from home or school, however, still has considerable impact on diets of adolescents. The possible reasons for the modest impact of policies are poor monitoring of school store foods, a lack of awareness or understanding of the policies, profit-seeking, and a lack of interest in school stores.

In the first manuscript, we examined trends in Korean adolescents' energy intake from selected school store foods that are targets of the policies during 1998-2012. Korean adolescents had more energy intake from school store foods at home than in schools or in school stores. This was consistent with our interviewees' perception described in the third manuscript that restriction on school store foods might have a little impact on students' diets because of unhealthy foods available outside of schools. Given that students' food intake in school stores is relatively small, policies targeting a single eating place (school store) are insufficient to alter students' diets. This result highlights the need for a comprehensive policy that targeting multiple eating places, including school, at-home, and away from home to improve adolescents' overall diets. Although at-home intake contributes the highest proportion of both healthy and unhealthy foods among

adolescents (Briefel, Wilson, et al., 2009) and home food environments affect food choice (Holsten, Deatrick, Kumanyika, Pinto-Martin, & Compher, 2012), there is no policy to improve the at-home diet in South Korea. Rather, policies and efforts to improve adolescents' diets have mostly focused on the in-school consumption (S. G. Bae et al., 2012). In addition, Korean adolescents consumed more unhealthy foods, such as soft drinks away from home or school, where they have various food choices under less supervision from their parents and teachers. Future policies need to be more holistic by targeting multiple eating places and to ask both adolescents and parents for involvement in the efforts to have a healthier diet.

Our study results in the second manuscript suggest that the 2007 food-based policy aimed at decreasing availability of specific foods in school stores led to decreases in availability and consumption of the target foods in school stores, as seen in the decreased availability and intake of instant noodles and soft drinks in school stores while the intake was increased or unchanged in other eating places. The 2009 nutrient-based policy seemed to have less influence on improving school store food environments and adolescents' intake of target foods of the policy. EDNP foods that the 2009 policy targeted to remove from school stores were available in all school stores observed in 2013; in addition, there was no distinct change in adolescents' intake of school store foods after 2009.

One of the possible reasons for less impact of the 2009 policy is the nature of the nutrient-based policy. EDNP foods are determined based on serving size and amount of energy, saturated fat, protein, sugar, and sodium in the foods. In the interviews with policy actors in our third manuscript, food companies expressed that they could easily

make their previously EDNP products to non-EDNP by changing one nutrient content to avoid being EDNP. Previous studies reported that nutrient-based policies may reduce less healthy foods, but still allow unhealthy foods that technically meet the nutrient criteria of the policy to be available in schools (Samuels et al., 2009; Woodward-Lopez et al., 2010). Thus, the 2009 nutrient-based policy is not enough to remove unhealthy foods from school stores. The complex nutrient criteria also made it hard for school store owners to comply with the 2009 policy. The determination of EDNP foods requires consideration of various combinations of nutrient content that differ by food types (snack versus meal substitutes) while the 2007 food-based policy has a simpler and more specific requirement. Most school store owners did not understand the nutrient criteria to determine EDNP foods, and they had difficulties to distinguish EDNP foods. Food-based policies are easier to interpret than nutrient-based policies (Samuels et al., 2009; Woodward-Lopez et al., 2010). Because of the contract system for school store ownership in South Korea, school store owners are changed frequently (minimum of one semester). Government agencies will be able to help school store owners to overcome the complexity of the nutrient-based policy through monitoring policy implementation processes and school store foods. The monitoring is not only for detecting violations of the policies, but also for providing support to school stores that are struggling with policy implementation (Mâsse et al., 2013). Regular education, training, and technical support, especially for those new to the job, is needed to ensure the implementation of the policy (Davee et al., 2005; Durlak & DuPre, 2008).

Although soft drink availability in school stores has decreased after implementation of the 2007, half of the school stores observed still sold soft drinks in

2013. In the third manuscript, wealth was reported as one of the values that school store owners considered important. Given the school store owners' perception that students prefer soft drinks and EDNP foods, it would be difficult for school store owners to not sell the restricted foods for their profit (wealth), even though they valued students' health (wellbeing). One of the possible strategies to reduce the restricted food sales could be to fill the gaps between school store owners' two values, wealth and wellbeing (Green & Aarons, 2011). The current policies are only restrictive and may cause a decrease in school store owners' profit, but there is no benefit for them in complying with the policies. As school store owners pointed out, the high-bidding price is one of the difficulties in running school stores; therefore, providing advantages during the bidding process to the school store owners who do not sell restricted foods may encourage them to not to sell the restricted foods. Replacement of unhealthy foods to healthier foods does not necessarily generate revenue loss (French, Story, Fulkerson, & Hannan, 2004). Public officials and food companies should work with school store owners to find healthier food items that meet policies' criteria, but will not affect revenue of school stores.

Lack of interest and accountability in school stores and poor monitoring of school store foods also allowed the restricted foods being sold in school stores. Work related to school stores had a low priority for school staff and public officials; some of them thought that it is not their responsibility. Several government agencies monitored school stores concurrently, but the duplicated monitoring was not effective in capturing restricted food sales. Rather, these uncoordinated efforts added burdens to public officials as well as to school store owners, who felt that their businesses were controlled by the government. Poor coordination among multi-agencies can lead to poor implementation

(Pelletier et al., 2012). The policies will need to have a formal mechanism to enhance coordination of multi-agencies' tasks regarding policy implementation and school store monitoring. It will enable government agencies to manage school store foods in a more systematic way and to set clear responsibilities of each agency and policy actors for adequate allocation of human and financial resources (Holmes, 1992). Also, having a council at the school and/or school district level may increase awareness, interests, and responsibilities of in-school and school district actors' and family of students' on school store foods through engagement of a variety of actors in policy implementation processes (Kubik, Farbakhsh, & Lytle, 2011; Kubik, Lytle, & Farbakhsh, 2011). Designated responsibilities through the council will enable school store foods be a higher priority among actors' work. This could lead to more frequent and well-managed monitoring of school store foods and improvement on the policy implementation.

This study showed room for improvement in students' diets and school food environments. Since in-school consumption of school store foods is lower than consumption in other places, the two school store policies might not be enough to improve students' overall diets. Nevertheless, efforts to improve school food environments are still important. Schools can help students to eat healthier foods that they would not eat away from home or school. The higher energy intake from milk in school or school store compared to away from home or school shown in the first manuscript could be an example of the schools' positive influence on students' food choices. Previous studies also showed that school nutrition policies requiring healthy foods in schools are more effective to improve students' diets for those from low-income households, thus contributing to reduced disparities in healthy food consumption (Taber,

Chriqui, & Chaloupka, 2013; Vericker, 2013). Thus, in addition to the policies restricting unhealthy foods in schools, efforts to increase provision of healthy foods to students would help to improve students' diets and to reduce disparities in dietary intake. Better implementation of the policies and appropriate monitoring will also contribute to improve students' diets and food environments in school stores.

The changes reported in this study in the intake of selected foods that frequently offered in school stores of Korean adolescents are different than reported in previous studies. Previous studies reported that Korean adolescents' consumption of unhealthy foods, including soft drinks, instant noodles, confectionary, and fast foods, had decreased after implementation of the 2007 and 2009 policies (S. G. Bae et al., 2012; K. Kim et al., 2013). These studies, however, focused only on overall frequency of food intake regardless of the amount of consumption and the eating place. It is hard to know what eating episodes contribute to the decrease of the overall intake of unhealthy foods without consideration of eating places. Our study adds a deeper layer to our understanding of the impact of nutrition policies on changes in food intake by identifying where shifts in food intake occur after policy implementation.

This study has several limitations. First, we considered two policies in South Korea related to school store food environments. Other nutrition policies that have been implemented during the study period (e.g., nutrition labeling and reductions in sodium in processed foods) may affect adolescents' diets. In addition, the Special Act, the umbrella policy of the 2009 policy, originally intended to improve out-of-school food environments by prohibiting EDNP food sales in stores located near schools and restricting advertisements of EDNP foods on television during 5-7 pm beginning

September 2010. The non-sale of EDNP foods in stores outside of schools were not mandatory, however, and only a few stores voluntarily participated in stopping the sale of EDNP foods (less than 4.2% of stores as of 2012) (Korea Ministry of Food and Drug Safety, 2013). Since there was not a notable change in food intake after restriction of EDNP food advertisements on television in our analysis, we considered that other components of the 2009 policy did not affect adolescents' diets during the study period. Second, we were not able to examine changes in intake of EDNP foods and its availability in school stores. Since the KNHANES food database does not provide sugar content of foods, it was impossible to distinguish EDNP foods from non-EDNP foods. When we observed school store foods in 2006, the nutrition labeling policy in South Korea did not require labeling of saturated fat and sugar content of food products. Thus, we could not determine EDNP foods using the observation data obtained in 2006. Lastly, in our qualitative study, we had a small number of interviewees from some actor groups and were unable to conduct interviews with some of potential key actors because of their unavailability and/or refusal.

Schools could be venues to provide healthy foods to their students to promote healthy diets (Briefel, Crepinsek, et al., 2009). Many policies to improve school food environments have been enacted worldwide, but enactment of policies do not always guarantee its intended outcomes (Kingdon, 2002). The present study showed changes in Korean adolescents' consumption of selected school store foods and foods offered in school stores after the enactment of two policies and implementation processes of a nutrient-based policy. This study emphasizes the need of comprehensive policies aiming at improvement of food environments in diverse eating places. Further research is needed

to examine closely adolescents' main food sources in each eating place to find what kind of action is needed in which place. Understanding various policy actors' perspectives is important in policy implementation processes (Monterrosa et al., 2015). It can explain the underlying reasons for policy successes or failures and can provide opportunities to improve the policy processes. In the future policy development process, various policy actors should be given opportunities to participate in the policy process.

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APPENDIX A

Interview Guide

Interview questions: School store owners

1. Could you tell about your school store?

- Please tell me your work experience.
 - How long have you run the current school store?
 - Before running this school store, have you run other school stores? If so, how long and where?
- What do you do? [perspectives: identity]
 - What you are doing for the school store?
 - Why do you think your role is important?
 - What do you find satisfying or fulfilling about your work? [base values]
 - What are the challenges that you face in doing your work?

2. How do you decide food and beverage items that you sell in your school store?

- Could you tell me about your priority when you decide the food items what you are going to sell? [base values]
- Does anyone influence your decision about the food items? If so, who influence your decision and in what ways? [participants]

- Have anyone monitored foods that sold in your school stores?
 - (If yes) Who are responsible to monitor foods that sold in your school store?
 - How often do(es) he/she/they monitor school stores?
 - What elements do they focus on when they monitor school stores?
 - If they find faults (e.g. some foods that are not allowed to be sold in school stores), then what happens?

3. Please tell me about policies or regulations that make change of foods and beverages in your school store.

- Have you heard that you need to change foods and beverages in your stores?
 - (If yes) Could you explain more what do you know about it?
 - Do you know why you need to change foods and beverages in your school store?
 - What do you think about it?
 - How does it affect your choice of food and beverage items that you sell?
- Does your school have own policy related to the school store?
 - (If yes) Is the school's own policy different from another policy/regulation that you told before? Could you tell me about the differences?

[Question 4: ask only to the interviewees who are aware of the school store policy]

4. How is food and beverage items changed in your school store?

- How do you change the foods and beverages in the school store? [strategies]
 - How did you know that you need to change food and beverages in your store?
 - Have you been informed about the change? If yes, by whom?
 - How did you prepare to implement the changes?

- Did you need other's help or advice? Has anyone helped you? [perspectives: demands]
- What do you think of your role in the changes of foods and beverages? [perspectives: identity]
 - Do you think your role in the change is consistent with the role that you are supposed to do?
 - Do you satisfy with your role? Why do you think so?
- Do you feel your opinion is respected in the changes of foods and beverages? Why?
- Let's talk about other people who are involved in the changes.
 - Who do they represent? [participants]
 - What are their roles and influences?
 - How do they interact with each other to change foods and beverages in the school store?
 - Are there any other people or organizations that are not directly involved, but who may have impact on the process?
 - (If yes) Who are these people/organizations?
 - How do they impact the process?
- Please tell me what has been changed.
 - Could you tell me the change in foods and beverages in your school store?
 - Has the number of [chips, cookies, soft drinks, etc.] changed?
 - What items are increased/decreased?

- How has students' behavior changed after foods and beverages in school stores changed? [outcome]
 - (If yes) Please describe students' behavior change that you notice.
 - Is the change desirable for the students and for you? [outcome, effects]
- What did you expect regarding the influence of the change of foods and beverages in the school store? [perspectives: expectation]
 - Influence to the school store/students/other people
 - Was your expectation positive or negative? Why?
 - Was the expectation the same with the current situation?
- Are there any conflicts of interest in change of foods and beverages in your school store? For example, does the change affect management of your school store?

5. I would like to ask about your school store more.

- Did you make contract for running the school store through a competitive bidding or a private contract?
- How long is the contract duration?
- If you want to renew the contract, how can you renew?
 - What factors are considered for renewing the contract?

Interview questions: Policy actors in schools (principal, teachers, school staff)

1. Could you tell about you regarding the school store in your school?

- Please tell me your work experience.
 - How long have you worked in this school?
 - How long have you worked related to school store in this school?

- Before working in this school, have your work related to school stores in other schools? If so, how long and where?
 - What do you do? [perspectives: identity]
 - What you are doing in the school?
 - Why do you think it is important?
 - What do you find satisfying or fulfilling about your work? [base values]
 - What are the challenges that you face in doing your work?
 - What is your roles regarding the school store?
2. In general, how are food and beverage items selected in the school store?
- Is there anyone who can influence food availability in school stores?
 - (If yes) Who and in what ways?
 - What is the priority when the food items are selected?
 - Have anyone monitored foods that sold in your school stores?
 - (If yes) Who are responsible to monitor foods that sold in your school store?
 - How often do(es) he/she/they monitor school stores?
 - What elements do they focus on when they monitor school stores?
 - If they find faults (e.g. some foods that are not allowed to be sold in school stores), then what happens?
3. How would you describe the current school store policy?
- Have you heard that school stores need to change foods and beverages that they sell?
 - (If yes) Could you explain more what do you know about it?
 - Do you know why school stores need to change foods and beverages that they

sold?

- What do you think about it?
- How does it affect choice of food and beverage items in the school store?
- o Does your school have own policy related to the school store?
 - (If yes) Is the school's own policy different from another policy/regulation that you told before? Could you tell me about the differences?

[Question 4: ask only to the interviewees who are aware of the school store policy]

4. How is food and beverage items changed in the school store?

- o How do you change the foods and beverages in the school store? [strategies]
 - How did you know that the school store in your school need to change food and beverages that they sell?
 - Have you been informed about the change? If yes, by whom?
 - How did you prepare to implement the changes?
 - Did you need other's help or advice? Has anyone helped you? [perspectives: demands]
- o What do you think of your role in the changes of foods and beverages?
[perspectives: identity]
 - Do you think your role in the change is consistent with the role that you are supposed to do?
 - Do you satisfy with your role? Why do you think so?
- o Do you feel your opinion is respected in the changes of foods and beverages?
Why?
- o Let's talk about other people who are involved in the changes.

- Who do they represent? [participants]
- What are their roles and influences?
- How do they interact with each other to change foods and beverages in the school store?
- Are there any other people or organizations that are not directly involved, but who may have impact on the process?
 - (If yes) Who are these people/organizations?
 - How do they impact the process?
- Please tell me what has been changed.
 - Could you tell me the change in foods and beverages in the school store in your school?
 - Has the number of [chips, cookies, soft drinks, etc.] changed?
 - What items are increased/decreased?
 - How has students' behavior changed after foods and beverages in the school store changed? [outcome]
 - (If yes) Please describe students' behavior change that you notice.
 - Is the change desirable for the students and for your school? [outcome, effects]
- What did you expect regarding the influence of the change of foods and beverages in the school store? [perspectives: expectation]
 - Influence to the school store/students/other people
 - Was your expectation positive or negative? Why?
 - Was the expectation the same with the current situation?

- Are there any conflicts of interest in change of foods and beverages in the school store? For example, does the change affect the school store or your school?

5. I would like to ask about your school store more.

- Did you make contract with the school store through a competitive bidding or a private contract?
- How long is the contract duration?
- If the school store owner wants to renew the contract, how can he/she renew?
 - What factors are considered for renewing the contract?

Interview questions: Public officials, politicians

1. Could you tell about your school district?

- Please tell me your work experience.
 - How long have you worked in this school district?
 - Before working in this school district, have you worked in other school districts or in schools? If so, how long and where?
- What do you do? [perspectives: identity]
 - What you are doing in the government agency?
 - Why do you think your role is important?
 - What do you find satisfying or fulfilling about your work? [base values]
 - What are the challenges that you face in doing your work?
- What is your duty regarding school food policy? [perspectives: identity]

2. Could you tell me about food availability in school stores in your school district?

- In general, how do school stores decide food and beverage items that they sell in school stores?
 - In your opinion, what should be considered when school stores decide the food items what they are going to sell? [base values]
 - Is there anyone who can influence food availability in school stores? If so, who and in what ways?
- Have you monitored foods that sold in school stores (in your school district)?
 - (If no) Is there anyone who is responsible to monitor foods that sold in school store?
 - How often do(es) he/she/they monitor school stores?
 - What elements do they focus on when they monitor school stores?
 - If they find faults (e.g. some foods that are not allowed to be sold in school stores), then what happens?

3. How would you describe the current school store policy?

- Have you heard about ‘the Special Act on safety management of children’s dietary life’?
- If so, what do you know about it and what do you think about this policy?
- Is there any other regulation or policy that affects food and beverage items in school stores in your school district?
 - (If yes) Could you explain what the policy or regulation is and how it affects food availability in school stores?
- Does your school district have own policy related to school stores?
 - (If yes) Is the school district’s own policy different from the national policy?

Could you tell me about the differences?

- Has the national policy (and school district's own policy) been met with acceptance or opposition?
 - (If yes) By whom and why?

4. How is the current policy implemented in your school district?

- How have you been involved with the implementation of the policy in your school district?
 - When the school store policy was enacted, how did you know there is a policy?
- Have you been informed about the school store policy? If yes, by whom?
- What do you think of your role in the implementation of the policy?
[perspectives: identity]
 - Do you think your role in the implementation of the policy is consistent with the role that you are supposed to do?
 - Do you satisfy with your role in the policy implementation? Why do you think so?
- Do you feel your opinion is respected in the policy implementation? Why?
- How do you implement the policy? [strategies]
 - How did you prepare to implement the policy?
 - Did you need other's help or advice? Has anyone helped you for the policy implementation? [perspectives: demands]
 - (If so) Who were they? What were needed? Did they help you?
- Let's talk about other people who are involved in the process of policy

implementation.

- Who do they represent? [participants]
- What are their roles and influences?
- How do they interact with each other to implement the policy?
 - How is information shared between/among the people involved?
 - How are the decisions made?
- Are there any other people or organizations that are not directly involved, but who may have impact on the process?
 - (If yes) Who are these people/organizations?
 - How do they impact the process?
- Please tell me what has changed after the policy implementation.
 - Could you tell me the change in food items in school stores in your school district after the policy implementation?
 - Has the number of [chips, cookies, soft drinks, etc.] changed after the policy implementation?
 - What food items are increased/decreased?
 - Have you seen students' behavior change after the policy implementation?
[outcome]
 - (If yes) Please describe students' behavior change that you notice.
 - Is the change desirable for the students? [outcome, effects]
- What did you expect regarding the influence of the policy? [perspectives: expectation]
 - Influence to school stores/students/other people

- Was your expectation positive or negative? Why?
- Was the expectation the same with the current situation?
- o Are there any conflicts of interest in the policy implementation? For example, does the policy affect management of school stores in your school district?

APPENDIX B

List of Children's Favorite Foods

| Classification | | Food types |
|-----------------|----------------|--|
| Snack | Processed Food | <ul style="list-style-type: none"> - Confectionaries: chips, cookies, biscuits, snacks, and others (excluding Hangwa - Korean traditional confectionaries), candies, ice candies - Bakery foods and chocolates - Processed dairy products: processed milk, fermented milk (excluding fermented butter milk and fermented milk powder), ice creams - Processed fish meat products: fish meat sausages - Beverages: fruit/vegetable beverages, carbonated beverages, yogurt drink, and mixed drinks |
| | Prepared Food | Confectionaries, bakery foods, and ice creams |
| Meal substitute | Processed Food | <ul style="list-style-type: none"> - Noodles (only applied to noodles in containers): deep-fried noodles and noodles - Ready-to-eat foods: Kimbab (rolled rice in sea weed), hamburgers, and sandwiches |
| | Prepared Food | Hamburgers, pizzas |