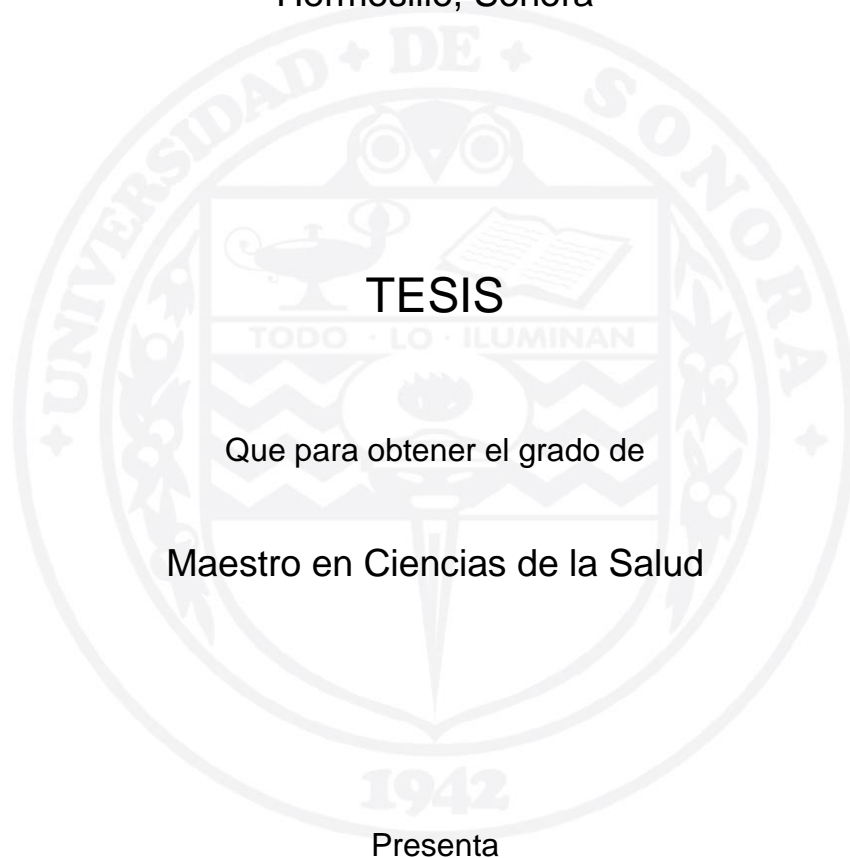


UNIVERSIDAD DE SONORA

DIVISIÓN DE CIENCIAS BIOLÓGICAS Y DE LA SALUD
PROGRAMA DE MAESTRÍA EN CIENCIAS DE LA SALUD

Description of the Food Environment in Elementary Schools in
Hermosillo, Sonora



TESIS

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Presenta

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**"El saber de mis hijos
hará mi grandeza"**



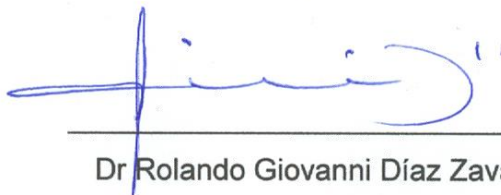
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Los miembros del Jurado Calificador designado para revisar el trabajo de Tesis de **Yazmín Hugues Ayala**, lo han encontrado satisfactorio y recomiendan que sea aceptado como requisito parcial para obtener el grado de Maestría en Ciencias de la Salud.



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DEDICATORY

This is dedicated to my family, I would not be here without you. I love you.

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OBJECTIVE

To describe the food environment of elementary schools in Hermosillo, Sonora by using the national guidelines that regulate the sale and distribution of prepared and/or processed food and beverages in schools of the national education system.

Specific Objectives

- To measure the implementation of the AGREEMENT in elementary schools of Hermosillo
- To measure compliance with the AGREEMENT in elementary schools of Hermosillo
- To measure the knowledge that the school authorities have regarding the AGREEMENT
- To identify the existing barriers and/or facilitators for the implementation of, and compliance with, the AGREEMENT in elementary schools of Hermosillo

ABSTRACT

Introduction: In Mexico, 33.2% of school-age children are overweight or obese and the consumption of sugar-sweetened beverages and energy-dense, nutrient-poor foods is high. Justification: The school food environment is important since children spend an important part of their time at school and consume one-third to one-half of their daily meals at school. In 2014, general guidelines for the regulation of foods and beverages in schools was published, but the extent of their implementation is not known. Objective: To describe the food environment in elementary schools in Hermosillo against the 2014 AGREEMENT that regulates the sale and distribution of food and beverages in schools. Methods: Descriptive cross-sectional study in a representative, random sample of elementary schools in Hermosillo, using the INFORMAS network tools. Data collection included: a) an interview with a school authority to identify barriers or facilitators for the application of the AGREEMENT; b) a checklist of items in the school canteen; c) a checklist of the school breakfast menu; d) structural evaluation verifying availability of water and other relevant aspects. The main indicators were: percentage of implementation (self-report) of the AGREEMENT and percentage of compliance with the AGREEMENT (based on tools b and c; verified by the researchers). Results: 119 schools participated (response rate 87.5%), with 15.1% (95%CI 9.2–22.8) of the schools reporting having fully implemented the AGREEMENT. However, only 1% (95%CI 0–5.3) of the school canteens and 71.4% (95%CI 57.8–82.7) of the breakfast menus fully complied with the AGREEMENT. A variety of sugar-sweetened beverages and energy-dense, nutrient poor products were found in the school canteens. Further, only 43.7% of the water fountains in schools were functional and 23.4% were clean. Conclusions: The AGREEMENT has been poorly implemented. Actions are needed to encourage and support its full implementation to improve the food environment in Mexican schools.

RESUMEN

Introducción: En México, 33.2% de los escolares padecen sobrepeso u obesidad, y el consumo de bebidas azucaradas y de alimentos densos en energía y pobres en nutrientes es alto. Justificación: El entorno alimentario escolar es importante, los niños pasan gran parte de su tiempo en él y allí consumen de un tercio a un medio de sus comidas diarias. En 2014, se publicaron los lineamientos generales para la regulación de alimentos y bebidas en las escuelas pero su implementación se desconoce. Objetivo: Describir el entorno alimentario de escuelas primarias de Hermosillo conforme al ACUERDO-2014. Métodos: Estudio descriptivo-transversal en una muestra representativa de escuelas primarias de Hermosillo, utilizando las herramientas de la red INFORMAS. La recolección de datos incluyó: a) entrevista con autoridad académica para identificar barreras y/o facilitadores del ACUERDO; b) lista de verificación de artículos de la tienda escolar; c) lista de verificación para el menú de desayunos escolares; d) evaluación estructural que verifica la disponibilidad de agua y otros aspectos relevantes. Los principales indicadores fueron: porcentaje de implementación del ACUERDO (auto-reporte) y porcentaje de cumplimiento del ACUERDO (basado en las herramientas b y c; verificado por los investigadores). Resultados: Participaron 119 escuelas (tasa de respuesta 87.5%), 15.1% (95%CI 9.2–22.8) de las escuelas reportaron tener totalmente implementado el ACUERDO. Sin embargo, solo 1% (95%CI 0–5.3) de las tiendas escolares y 71.4% (95%CI 57.8–82.7) de los menús de desayuno cumplían completamente el ACUERDO. Se encontró variedad de bebidas azucaradas y alimentos densos en energía y bajos en nutrientes en las tiendas escolares. Solo 43.7% de las fuentes de agua eran funcionales y 23.4% limpias. Conclusiones: El ACUERDO ha sido pobremente implementado. Se requieren acciones que fomenten y apoyen su implementación, y mejoren el ambiente alimentario escolar en México.

INTRODUCTION

Overweight and obesity are a public health problem in Mexico (Instituto Nacional de Salud Pública, 2016) and affect all groups of the population, including children and adolescents (Colchero et al., 2016; Theodore et al., 2018). According to the latest report from the National Health and Nutrition Survey (ENSANUT 2016), 33.2% of Mexican school age children were overweight or obese in 2016 (Instituto Nacional de Salud Pública, 2016). The state of Sonora is not an exception, with a prevalence of overweight and obesity of 36.9% in school age children in 2012, which was above the national average of 34.4% (Instituto Nacional de Salud Pública, 2012).

Children with obesity are more prone to be obese adults and are at greater risk of developing chronic diseases such as heart disease, stroke, type 2 diabetes, several types of cancer, and osteoarthritis (Daniels et al., 2005; The GBD Obesity Collaborators et al., 2017). Further, children's future health is critically influenced by their eating behaviors in their early years of life (Kudlová et al., 2012).

Much obesity research has focused on the biological and behavioral determinants of obesity. However, food and eating environments are likely to be major contributors; with environmental and policy interventions considered to be among the most effective strategies for creating population-wide improvements in obesity (Day et al., 2011; Story et al., 2008).

For children, the school food environment is particularly important because they spend an important part of their time in it (approximately 30 hours a week) (He et al., 2014; Theodore et al., 2018) and consume one-third to one-half of their daily meals at school, making this a crucial setting for interventions that alter the food environment (Micha et al., 2018).

Policies designed to influence the school food environment have been successful in changing dietary behaviors (Micha et al., 2018) and are key to improving it (Hawkes et al., 2015). In recognition of this, in 2010 the Mexican government established the general guidelines for dispensing and distribution of foods and beverages at school food establishments of elementary schools, with the objective of stopping the epidemic of overweight and obesity (Jimenez-Aguilar et al., 2017).

However, an evaluation of the policy in 2012 showed a lack of improvement of the nutritional content of foods and beverages in schools (Jimenez-Aguilar et al., 2017; Theodore et al., 2018). In 2014 an updated version of the national guideline (AGREEMENT that establishes the general guidelines for the sale and distribution of prepared and processed foods and beverages in the schools of the National Education System) was implemented (Secretaría de Educación Pública et al., 2014). This AGREEMENT prohibits the sale of energy-dense, nutrient-poor (EDNP) food from Monday to Thursday and, on Fridays only EDNP foods that meets certain criteria can be sold. However, the extent of its implementation is not known. The aim of the current research was to describe the food environment in elementary schools in Hermosillo against the 2014 version of the AGREEMENT.

REVIEW OF THE LITERATURE

General Dietary Habits in Mexico

A particular concern in Mexico is the excessive intake of sugar-sweetened beverages (SSBs), which includes flavored drinks, fruit juices, carbonated drinks and others beverages with added sugar (Gómez-Miranda et al., 2013). According to the ENSANUT 2016, 81.5% of Mexican school-age children regularly consume SSBs (definition does not include sweetened milk) (Instituto Nacional de Salud Pública, 2016).

Increased consumption of SSBs among children and adolescents is associated with higher caloric intake (Mathias et al., 2013) and there is increasing and stronger evidence that consumption of SSBs is a risk factor for obesity and other health complications (Colchero et al., 2015; Gómez-Miranda et al., 2013). That is why the high consumption of SSBs has become a serious public health challenge in Mexico (Rodríguez-Burelo et al., 2014).

Mathias and colleagues analyzed the SSB consumption in two groups of children: one group included consumers of SSBs and the other group were non-consumers (Mathias et al., 2013). They found a positive association between SSBs consumption and caloric intake in the SSB consumers group, with food intake increasing by 36 ± 14 kcal per 100-kcal increase in SSB consumption) (Mathias et al., 2013).

In addition, there is evidence that children's energy excess comes predominantly from processed foods with high levels of cholesterol, saturated fats, sugar, and sodium (Jimenez-Aguilar et al., 2017). The intake of EDNP foods like salty snacks, pastries, cookies, cakes, candies, chocolates, sweeteners, and ready-to-eat cereals (Batis et al., 2016), is high in Mexico (12). According to ENSANUT 2016, 61.9% of school-age Mexican children regularly consume

snacks, candies and deserts, and 53.4% regularly consume sweetened cereals (Instituto Nacional de Salud Pública, 2016).

In addition, fruit and vegetable intake is related with a healthy diet, and with the prevention of health complications like cardiovascular diseases and some types of cancers, such as cancer of the digestive system (World Health Organization, 2002). Only 22.6% of school-age Mexican children regularly consume vegetables, 45.7% fruits and 60.7% legumes (Instituto Nacional de Salud Pública, 2016).

An important issue is food advertising; children are exposed to television advertisements for unhealthy foods and beverages but they cannot understand the advertised food messages or the relationship between food choices and future health complications (Magnus et al., 2009). Further, there is evidence that demonstrates a logical pathway from food advertising (especially of energy-dense, nutrient-poor food and beverages) to weight gain in children (Magnus et al., 2009).

Having this increasing intake of SSBs and EDNP foods and a high prevalence of overweight and obesity in Mexico, the federal government implemented a tax of 1 Mexican peso per liter to all SSBs in 2014. The tax excludes 100% fruit juices and all beverages with artificial added sweeteners (Colchero et al., 2017). Compared with the expected for 2014, the tax reduced purchases of sugary drinks in households of high socioeconomic status by 5.8%, and by 10.3% in households of low socioeconomic status (Colchero et al., 2017).

As part of the campaign, the Senate also approved an increase of 8 percent on the Special Tax over Products and Services (IEPS) to processed foods with a determined caloric value (“junk food”) that contain 275 Kcal or more for every 100 grams, including: snacks, confectionary, chocolates, custards and flan, fruit jam,

paste, peanut and hazelnut butter, ice cream and cereal-based products (cookies, sweet bread, breakfast cereals, etc.) (Salcido, 2014).

Before the implementation of the 2010 obesity prevention regulations in Mexican schools studies documented the wide availability of high-energy foods at schools (Jimenez-Aguilar et al., 2017). There is evidence up to 2013 that both SSBs and EDNP foods were still available for children's consumption in Mexican elementary schools (Jimenez-Aguilar et al., 2017).

School Food Environment

According to Swinburn and colleagues, the food environment is defined as “the collective physical, economic, policy and sociocultural surroundings, opportunities and conditions that influence people's food and beverage choices and nutritional status” (Swinburn et al., 2013).

Children spend many years at school and this environment becomes an opportunity for health promotion efforts and impacts their behaviors and future disease risks (Micha et al., 2018). A healthy school food environment allows and encourages children, families, school staff and all the school community to make better food choices (Food and Agriculture Organization of the United Nations, 2019; Mâsse et al., 2014).

Alarming rates of childhood obesity and poor dietary habits reported in Mexican children are attributed, in part, to changes in Mexico's food environment (Soltero et al., 2017). Over the past two decades, Mexico's food environment has evolved to offer increased availability of fast food, table service restaurants, convenience stores, and mobile food vendors, which can lead to increased consumption of meals away from home and to weight gain over time (Soltero et al., 2017).

The environment surrounding schools offers children access to a wide variety of foods and beverages (Day et al., 2011; Fitzpatrick et al., 2017). Examples are fast food outlets and convenience stores that tend to cluster around schools, particularly in those located in disadvantaged neighborhoods (Day et al., 2011; Fitzpatrick et al., 2017; Soltero et al., 2017). Furthermore, the number of mobile food vendors around elementary schools is associated with a higher body mass index in Mexican children (Hernández et al., 2016).

Fast food and table service restaurants offer affordable meals that are frequently accompanied by SSBs and are often larger in portion and higher in fat than home-cooked meals (Soltero et al., 2017). This represents an important public health concern, as well as an opportunity to improve the health of disadvantaged children, who already face greater cumulative risks for the development of obesity than their more advantaged peers (Fitzpatrick et al., 2017).

Inside schools, the situation is even more worrying. In a random sample of Mexican schools, there was a broad availability of energy-dense foods in school food establishments in 2011-13 (Jimenez-Aguilar et al., 2017). There is evidence that the availability of healthy food items in school meals is associated with children's consumption of healthy foods, and that facilitating a healthy school environment may promote children's healthy eating behaviors (He et al., 2014). However, the study in Mexican schools showed that vegetables, fruits, and plain water represented less than 7 percent of the foods and drinks available in schools (Jimenez-Aguilar et al., 2017).

The availability of potable water is poor in Mexican schools. This contrasts with the increased availability of SSBs inside schools (Piernas et al., 2014). Piernas and collaborators analyzed the water consumption in Mexican children and adolescents aged 1–18 years (n = 6867). Although the daily water

recommendation for children is from 1 to 1.5 liters (depending on physical activity and water loss), they found that Mexican children consume approximately 427.1 milliliters of plain water per day (Piernas et al., 2014).

Beyond the low consumption of potable water and the high availability of SSBs and EDNP foods, Mexico has malnutrition problems. Among the assistance strategies implemented to combat malnutrition in Mexico is the School Breakfast Program (SBP), which aims to offer a nutritional supplement to school-age Mexican children (González et al., 2016). The SBP has been criticized internationally, especially since its coverage depends on economic resources, often based on current political decisions (González et al., 2016). Issues also involve problems in the planning and designing of the menus, as well as in the lack of evaluations to monitor the nutritional content (González et al., 2016).

In general, schools are a critical environment to improve healthy lifestyles in the childhood population (Colchero et al., 2016; Day et al., 2011; He et al., 2014), and for the development of policies and programs to promote them (L'Abbé et al., 2013). Creation of policies to promote a healthy food environment in schools seems to be the key to improving it (Theodore et al., 2018). Several studies have shown promising results for a positive effect of the implementation of specific school food service policies, finding, for example, increased consumption of fruits and vegetables after policy implementation (Ganann et al., 2014). To date, the principal guideline for regulation of SSBs and EDNP foods in Mexican schools is the 2014 AGREEMENT.

Regulation of the School Food Environment in Mexico

As new knowledge is discovered related to the relationship between food environments and eating behaviors, initiatives to improve food environments are increasing in a parallel fashion (Ni Mhurchu et al., 2013). However, the limited

evidence available suggests that capacity building, resources and infrastructure are needed to support the full implementation of policies (de Silva-Sanigorski et al., 2011).

To facilitate change and promote healthy lifestyles, a number of key documents have called for nutrition standards in schools. In the 2004 World Health Organization (WHO) “Global Strategy on Diet, Physical Activity and Health”, governments were encouraged to adopt policies that support healthy diets at schools and to limit the availability of products high in salt, sugar and fats (L'Abbé et al., 2013; World Health Organization, 2004). Agencies such as the WHO, the Center for Disease Control and Prevention, the Institute of Medicine (IOM) and the WHO European Region have also recommended the development of nutrition standards for food provided or sold in schools (L'Abbé et al., 2013).

In attention to the latter mentioned, the Mexican Ministry of Public Education (SEC) and the Ministry of Health (SS) established general guidelines for the dispensing and/or distribution of foods and beverages in Mexican elementary schools in 2010 (Jimenez-Aguilar et al., 2017; Secretaría de Educación Pública et al., 2014). Mandatory implementation of the guidelines began in January 2011 (Jimenez-Aguilar et al., 2017). They aimed to ensure that school food establishments dispense healthy foods and beverages with low energy density, prepare them hygienically, promote healthy habits, and to create a healthy environment in schools (Jimenez-Aguilar et al., 2017; Theodore et al., 2018).

The actual version of this document is the AGREEMENT of 2014, titled “AGREEMENT that establishes the general guidelines for the sale and distribution of prepared and processed foods and beverages in the schools of the National Education System”. This new version now applies to all school levels (Secretaría de Educación Pública et al., 2014).

The AGREEMENT specifies the nutritional characteristics for foods and beverages dispensed at any school food establishment. In addition, it establishes that there must be policies that prohibit the sale of food and beverages that do not meet the nutritional criteria in the AGREEMENT.

Among the most important criteria, the AGREEMENT requires that school food establishments:

- Only offer natural foods from Monday to Thursday
- Do not sell sodas any day of the week
- Junk food (EDNP foods) and SSBs that meet certain criteria can only be sold on Fridays

Some of the other criteria included in the AGREEMENT are:

- The school must have a Committee for School Food Consumption Establishments
- The Committee for School Food Consumption Establishments must convene parents to participate in actions related to the sale and distribution of food and beverages in the school
- Education authorities should coordinate with the government to regulate mobile food vendors
- Food and/or beverage providers must comply with the criteria of the AGREEMENT
- The education authorities diffuse the content of the AGREEMENT
- The education authorities guarantee that schools have potable water and infrastructure for proper food hygiene
- The education and health authorities provide information and training to the Committee of School Food Consumption Establishments, food providers and parents

This AGREEMENT is the main law for the regulation of food and beverages available in Mexican schools. We assessed the quality of foods provided or sold in schools against this AGREEMENT.

The International Network INFORMAS

INFORMAS (International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support) is a global network of public interest, non-government organizations and researchers that aims to monitor, benchmark, and support public and private sector actions to create healthy food environments and reduce obesity, non-communicable diseases and their related inequalities (Swinburn et al., 2013). This network has developed eleven modules and a stepwise approach ('minimal', 'expanded', 'optimal') to data collection and analysis (Swinburn et al., 2013). The eleven modules are:

1. Public sector policies and actions
2. Private sector policies and actions
3. Food composition
4. Food labelling
5. Food provision
6. Food retail
7. Food prices
8. Food trade and investment
9. Population diet
10. Physiological and metabolic risk factors
11. Health outcomes

For this study the "Food provision" module was used. This module seeks to answer the question: 'What is the nutritional quality of foods and non-alcoholic beverages provided in different settings (e.g. schools, hospitals, workplaces)?'

(L'Abbé et al., 2013). Data collection and evaluation within this INFORMAS monitoring framework consists in two components (L'Abbé et al., 2013):

- In component I, information on existing food or nutrition policies and/or programmes within settings would be compiled
- In component II, the quality of foods provided or sold in public sector settings is evaluated relative to existing national or sub-national nutrition standards or voluntary guidelines

The application of the INFORMAS framework and indicators, will allow us to make comparisons with other countries that implement the same module for the evaluation of school food environments. In addition, this framework will give us the opportunity to suggest modifications to the Mexican AGREEMENT.

MATERIALS AND METHODS

This was a descriptive, cross sectional study, representative of elementary schools in Hermosillo Sonora. School food environments were examined in terms of foods both provided and sold (e.g. those available in vending machines, foods sold in cafeterias or school canteens and foods provided in school lunch or breakfast programs) and according to relevant nutrition guidelines. The AGREEMENT is the actual guideline that applies to schools in Hermosillo Sonora.

The protocol for the study was approved by the Bioethics Committee of the Department of Medicine and Health Sciences, University of Sonora. Permission to contact schools was also obtained from the Ministry of Education (SEC), who also sent a letter to each of the schools to inform them about the project and to introduce the researchers so that they would be allowed entry to the school.

An informed consent was obtained from the school authority of each school (usually the Director) before including the school in the study (Appendix 1). The school authorities were given enough time to read and understand the document and the data collectors clarified any doubts where necessary. The data collectors did not collect any information before the school authority accepted and signed the informed consent. Once consent was obtained, the data collectors obtained general information about the school (Appendix 2).

Interview with a School Authority

A school authority from each school was interviewed, the interview was conducted through a structured questionnaire. The person interviewed could be the school principal or some other school authority with sufficient knowledge of the school's policies and infrastructure (as determined by each school). The interview instrument (Appendix 3) was adapted from a tool developed by Erica D'Souza

and colleagues as part of the New Zealand project of INFORMAS (Vandevijvere et al., 2018) and is based on the wording and intent of the AGREEMENT.

The interview sought to obtain information about the level of implementation of the AGREEMENT and to identify barriers and facilitators to its implementation. The questionnaire included questions such as, “Do you have access to a printed or digital copy of the Agreement?”, “Does your school have a committee (including parents) to oversee the implementation of the Agreement?” and “Is there an internal/external control of mobile food vendors outside of the school?”

School Canteens

For the data collection in school canteens, and/or vending machines, the food and beverages were classified into three different categories based on their nutritional status and level of restriction under the AGREEMENT (Table I) (de Silva-Sanigorski et al., 2011; Wolfenden et al., 2014):

- i. Foods or beverages ('red') restricted for sale according to the AGREEMENT. These canteen items are very low in nutritional value and are high in saturated fat and/or added sugar and/or added salt. Some of these foods can be sold on Fridays only if they meet specific nutritional criteria of the AGREEMENT.

Table I. Food classification for school canteens, using the traffic light system, according to the 2014 AGREEMENT.

	Everyday foods (Green) - can be sold on any day of the week	Select carefully (Amber) - is recommended 2 or less days per week	Occasional foods (Red) - can be sold only on Fridays if they meet specific criteria <i>** kilocalories allowed per serving</i>
Nutritional quality	<ul style="list-style-type: none"> • High in nutrients and fiber • Low in saturated fat and/or added sugar and/or salt 	<ul style="list-style-type: none"> • Moderate in added fat and/or sugar • Contribute to excessive kilocalories if consumed in large serving size 	<ul style="list-style-type: none"> • Very low in nutritional value • High in saturated fat and/or added sugar and/or salt
Foods	<ul style="list-style-type: none"> • Simple water • Fresh fruits and vegetables • Whole grain cereals (amaranth, oats or granola) without added sugar • Oilseeds (peanuts, pistachios, sunflower seeds or nuts) without added salt • Legumes (beans or chickpeas) dried without added salt 	<ul style="list-style-type: none"> • 100% natural fruit/vegetable juices with no added sugar • Regular milk with non-caloric sweeteners • Low-fat or skim milk with non-caloric sweeteners • Soy beverages with non-caloric sweeteners 	<ul style="list-style-type: none"> • Fruit/vegetable juices with added sugar <i>**70kcal</i> • Nectars and processed juices <i>**70kcal</i> • Nectars and processed juices with non-caloric sweeteners <i>**70kcal</i> • Teas, sodas and other sweetened non-dairy beverages <i>**Can't be sold</i> • Oilseeds (peanuts, pistachios, sunflower seeds or nuts) with added salt <i>**130kcal</i>

Table I. Food classification for school canteens, using the traffic light system, according to the 2014 AGREEMENT (Continuation).

<ul style="list-style-type: none"> ● Regular milk without added sugar ● Low-fat or skim milk without added sugar ● Soy beverages without added sugar ● Low-fat and low-salt snack cheeses 	<ul style="list-style-type: none"> ● Legumes (beans or chickpeas) dried with added salt **130kcal ● Regular milk with added sugar **125 kcal/250 ml ● Low-fat or skim milk with added sugar **125 kcal/250 ml ● Soy beverages with added sugar **60kcal ● Snacks (potato chips and other processed salty foods) **130kcal ● Cookies, pastries, candies and desserts **130kcal ● High in salt/fat snack cheeses **80kcal
<ul style="list-style-type: none"> ● Sandwich with vegetables on wholegrain bread ● Quesadilla with corn tortilla ● Homemade soup with vegetables 	<ul style="list-style-type: none"> ● Horchata, jamaica and other "aguas frescas" with added sugar ● Sandwich with no vegetables included on white bread ● Quesadilla with flour tortillas ● Instant soup

* Adapted from: de Silva-Sanigorski et al. 2011

- ii. Foods or beverages ('amber') that should be selected carefully. These canteen items are moderate in added fat and/or sugar and contribute to excessive calorie intake and, according to the AGREEMENT, this food could be sold occasionally i.e. no more than 2 times per week.
- iii. Foods or beverages ('green') recommended by the AGREEMENT. These canteen items are high in nutrients and fiber and are low in saturated fat and/or added sugar and/or salt. These foods can be sold any day of the week.

An instrument for the collection of information in school canteens was developed (Appendix 4). The instrument included a list of items that are regularly available in school canteens in Sonora (Quizán P. T. et al., 2012), separated into three categories for the analysis of compliance with the AGREEMENT. The completion of this instrument was based on observation and by using information proportioned by the vendors.

School Breakfasts

Information was collected from the breakfast menu in those schools that were participating in the SBP operated by the National System for the Integral Development of the Family (DIF) or other private or social programs that provide breakfast or lunch to the students. Schools that provided an official copy of the menu to the data collectors were included in the data analysis — only two schools did not provide the copy and were not consider for the data analysis.

The menus from the SBP are provided by DIF. These menus can be either “cold breakfasts” or “hot breakfasts”. Cold breakfasts do not need any preparation or heating, and are appropriate for schools that do not have a kitchen. Schools that participate in the cold breakfast program, receive the food ready to be delivered to the children. The foods that make up the cold breakfast menu are:

milk, whole grain cookies with seeds, and on some days of the week dried fruits are added.

The hot breakfast menu includes hot meals for the children (e.g. scrambled eggs, sandwiches, pasta, etc.). Compared with the cold breakfast, the hot breakfast requires a kitchen and volunteers to prepare and serve the foods to the students.

There is a third classification of SBP menus, in which some of the schools receive a combination of hot and cold breakfasts, known as “Mixed breakfasts”. As previously mentioned, schools offering another breakfast or meal program (private/social) to the students were also considered.

In addition to the information compiled from the menu, the data collectors spoke with the person responsible for the breakfast program (including the cook, if possible) to obtain extra data regarding food preparation (i.e. changes of ingredients, addition of sugar, etc.) to complement the information from the menu.

An instrument was developed to collect information about the school breakfasts and meals (Appendix 5). The instrument included a list of food and beverages that are allowed or prohibited by the AGREEMENT. The data collectors marked all the items that were included in the menu or were used for the food preparation. This instrument was developed according to the same color classification as the school canteens instrument.

Structural Evaluation

During the last part of the school visit, the data collectors conducted a tour of the school to collect complementary information about the school food environment.

An instrument called “Structural evaluation based on observation” (Appendix 6) was developed. This instrument was used to collect information

about the availability of water, the number and status of water fountains, the number of mobile food vendors that were observed and other relevant aspects.

Non-participation Survey

In those schools that did not accept to participate, the data collectors sought answers to three of the principal questions from the interview instrument to allow a comparison of responders and non-responders to check for possible selection bias. This short questionnaire was called a “Non-participation survey” (Appendix 7).

Data Collection

Data were collected through a scheduled visit to each school. These visits were conducted in pairs by a team of four Nutritionists (YHA and three social service students). Prior to data collection, YHA trained all 3 students, considering the following main aspects: 1) General understanding of the INFORMAS methodology and its food provision module, 2) Review of previous studies of the food environment in Mexican schools and, 3) Review and practice in the use of the instruments for the study.

Following a schedule, data was collected between November 2018 and April 2019. The schedule considered both morning and afternoon shifts and assigned pairs of data collectors to visit each school. To harmonize the data collection, school visits in the first week were made by all four data collectors together. From the second week onwards, YHA participated in the visits of both shifts as a supervisor (for approximately one month) until the data collectors were sufficiently prepared to work in pairs without supervision. The data collectors used a checklist (Appendix 8) that included the step by step instructions for the visit to

the school. The checklist had to be fully completed at the end of the visit to guarantee that the visit was complete.

During the visit, an interview with a school authority was conducted, the data collectors observed and registered (using written and photographic evidence) what foods and beverages were for sale and distributed in the schools, and the availability of water fountains. The data collection was limited to Monday to Thursday as these are the days when all the restrictions apply under the AGREEMENT. The restrictions are more liberal on Fridays and full implementation of the AGREEMENT would be much more complex to evaluate on this day.

Pilot Study

Prior to data collection the procedure and instruments were tested in a small group of schools (n = 5) to assess the need for adjustments in the tools. However, no adjustments were needed so the data collection for the definitive study was continued and data from these 5 schools were included in the sample.

Indicators

The main indicators for this study were based on the INFORMAS framework (L'Abbé et al., 2013) and include:

- Percentage (%) of schools that implemented the AGREEMENT
- Percentage (%) of schools complying with the AGREEMENT

The concept “implementation” was defined as the practices related to putting the healthy school food policy (the AGREEMENT) into practice – as reported by the school authority in the interview. The concept “compliance” was

defined as the level to which the sale and distribution of foods within schools match the specifications in the AGREEMENT – based on observation by the researchers, categorization and overall assessment of the percent of products in each category in the school canteens and breakfast menus at the time of the visit.

The main question used to evaluate the implementation of the AGREEMENT was, “Do you consider your school has implemented the content of the Agreement?” The possible answers were: "no", "yes, we are initiating the implementation", "yes, we have been working on the implementation but it's not complete yet", and "yes, the implementation is almost complete (or totally complete)".

The AGREEMENT was categorized as fully implemented when the answer was: "Yes, the implementation is almost complete (or totally complete)" and partially implemented when the answer was: "Yes, we are initiating the implementation" or "Yes, we have been working on the implementation but it's not complete yet." For these schools, the interviewer asked: “from which date?”

For the evaluation of the compliance indicator, the schools were categorized as showing "full compliance" when 100% (or close to 100%) of the school canteen items or menu items were from the 'green' or 'amber' classification. The schools were categorized as showing “partial compliance” when at least 50% of the school canteen items or the menu items were from the 'green' or 'amber' classification (Wolfenden et al., 2017). This classification was measured through observation by the researchers of all products available in the school canteens and breakfast menus at the time of the visit.

Sample Selection

A random sample of elementary schools (both public and private) in the urban area of Hermosillo was selected using a list of random numbers generated in Excel. The list of schools was provided by the Ministry of Public Education.

Sample Size Calculation

For the sample size calculation the formula cited by Aguilar-Barojas, corresponding to descriptive studies with finite populations was used (Aguilar-Barojas, 2005), where n = sample size, N = population size, Z = critical value calculated in the tables of the area of the normal curve, d = level of absolute precision of the confidence interval, p = approximate proportion of the phenomenon under study in the reference population, and q = proportion of the reference population that does not present the phenomenon under study ($1 - p$). In this case, the proportions of interest are implementation and compliance.

In the urban area of Hermosillo, there were $N = 310$ elementary schools at the time of data collection. However, in relation to the expected prevalence of our key indicators, there is no data available. Therefore, for the calculation of sample size, a confidence level of 95% ($Z = 1.96$), a 25% expected prevalence ($p = 0.25$, $q = 0.75$) and an accuracy of 5% were used, which corresponds to a confidence interval around the prevalence of compliance of $\pm 5\%$, i.e. between 20 and 30%. This gave a sample size of 150 schools. A lower sample size than this would reduce the accuracy of the study, i.e. widen the confidence interval. However, a lower than 25% prevalence for the key indicators would reduce the sample size needed or, for the same sample size, result in a narrower confidence interval.

$$n = \frac{N Z^2 pq}{d^2 (N-1) + Z^2 pq}$$

Data Analysis

The collected data were entered into Microsoft Office Excel 2013, using a separate spreadsheet for each instrument. YHA entered the data, while the rest of the data collectors (CZM, DARR and EAGP) double-checked them. All the data collected from the schools were verified by two researchers for both data collection and data entry. The data analysis was conducted using the software StataSE® version 14 for Windows. Prevalence and 95% confidence intervals were calculated for each of the different variables. The 95% confidence intervals were calculated using the exact method because one main indicator had a prevalence of less than 5%, which precludes the use of other readily available approximations (Peat J. et al., 2008).

The degree of marginalization of the participant schools was calculated according to their addresses, with support of the National Institute of Statistics and Geography (INEGI). Marginalization is a population level measure of socioeconomic status and is associated with the lack of social opportunities and the inaccessibility to goods and services fundamental to wellness (such as education, place of residence, distribution of population and income) (CONAPO, 2013). The degree of marginalization was categorized into one of five levels, with the most marginalized schools of the sample categorized in the "very high" group and the least marginalized in the "very low" group.

The significance of differences in prevalence between groups (e.g. participating vs non-participating schools) were compared using Fisher's exact tests due to small frequencies in some cells.

RESULTS

During the data collection the first 142 schools randomly selected from the list of all elementary schools in Hermosillo, Sonora were approached to participate in the study. Six of these schools were no longer in operation so were removed from the sample. Data was collected from 119 schools, giving a response rate of 87.5% (119/136) (Figure 1). The response rate in private schools (66.7%) was considerably lower than that in public schools (97.8%). Characteristics of the participating schools, including their degree of marginalization are shown in Table II. The median number of students per school was 237 (interquartile range 140 – 347, minimum 8 and maximum 756).

Implementation of the AGREEMENT

The data collectors interviewed a school authority of 119 schools. In most cases (89.9%) it was the school principal who participated in the interview, while the remaining interviewees were teachers (4.2%) or other members of the administrative staff (5.9%). It is important to mention that, despite being very busy, all of the school authorities were cooperative and helpful during the data collection.

Only 15.1% (95%CI 9.2–22.8) of schools reported having fully implemented the AGREEMENT and 55.5% (95%CI 46.1-64.6) reported having partially implemented it. Despite the fact that the first version of the AGREEMENT was published in 2010, the interview with the school authorities showed that a considerable proportion of schools (29.3%) had not started the implementation of the AGREEMENT at the time of the interview (Figure 2).

Figure 1. School selection flow diagram.

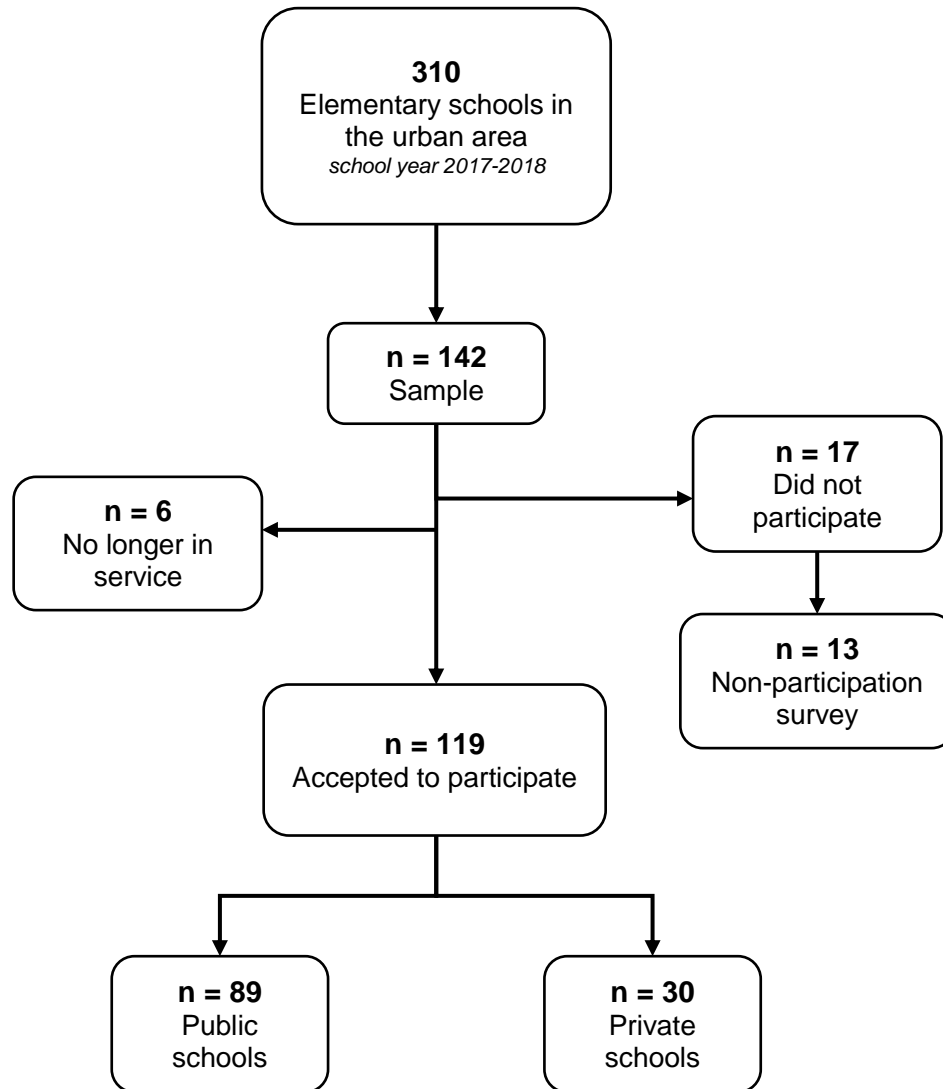
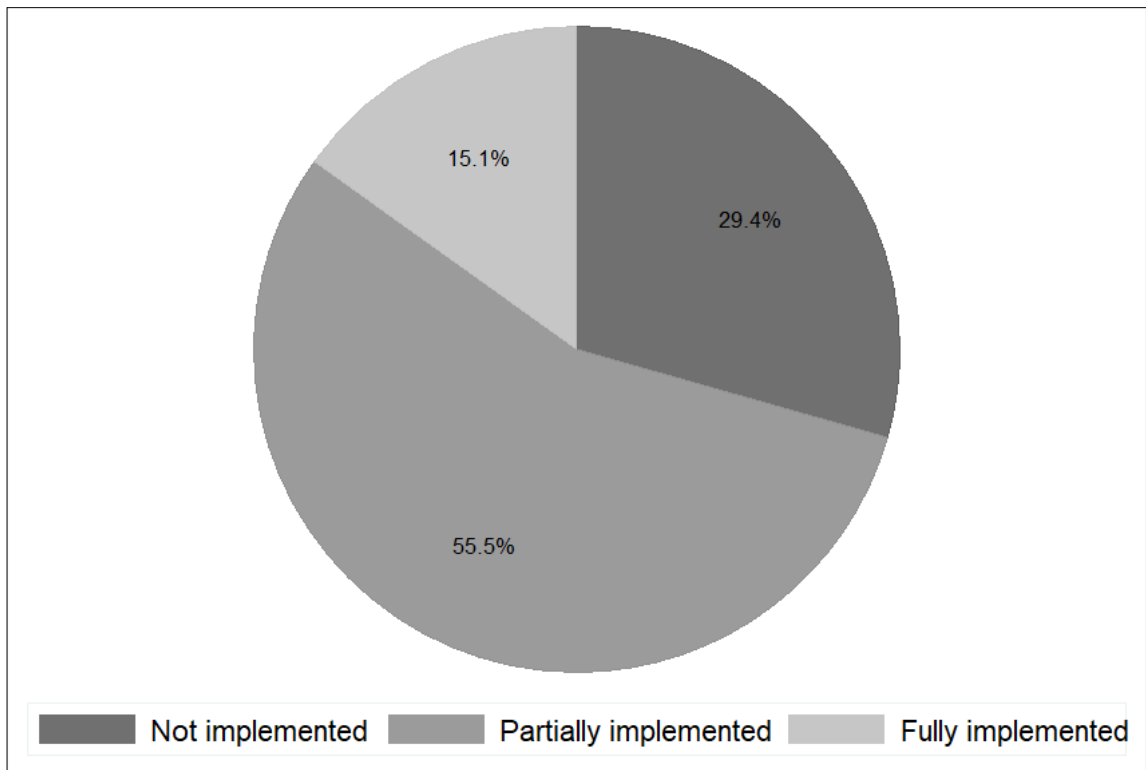


Table II. General characteristics of the participating schools and their classification of degree of marginalization (n=119).

Characteristic	Percentage (%)	Number of schools
School sector		
Public	74.8	89
Private	25.2	30
School shift		
Morning	69.8	83
Afternoon	30.3	36
Degree of marginalization*		
Very High	2.6	3
High	4.3	5
Medium	20	23
Low	25	29
Very Low	48.3	56

* Data on degree of marginalization were not available for 3 of the 119 participating schools – all of which were public schools.

Figure 2. Self-reported implementation of the AGREEMENT (n = 119).



Not implemented: the AGREEMENT has not been implemented in the school

Partially implemented: implementation of the AGREEMENT has already begun

Fully implemented: implementation of the AGREEMENT is completed or almost completed

Compliance with the AGREEMENT

Visits were made to 103 school canteens in 102 schools (one school had two canteens). Only 1% (95%CI 0–5.3) of the school canteens fully complied with the AGREEMENT (Figure 3). A further 3.9% (95%CI 1.1-9.6) partially complied in that at least half of the items available complied with the AGREEMENT. Most schools (95.2%, 95%CI 89.1-98.4) did not comply with the AGREEMENT.

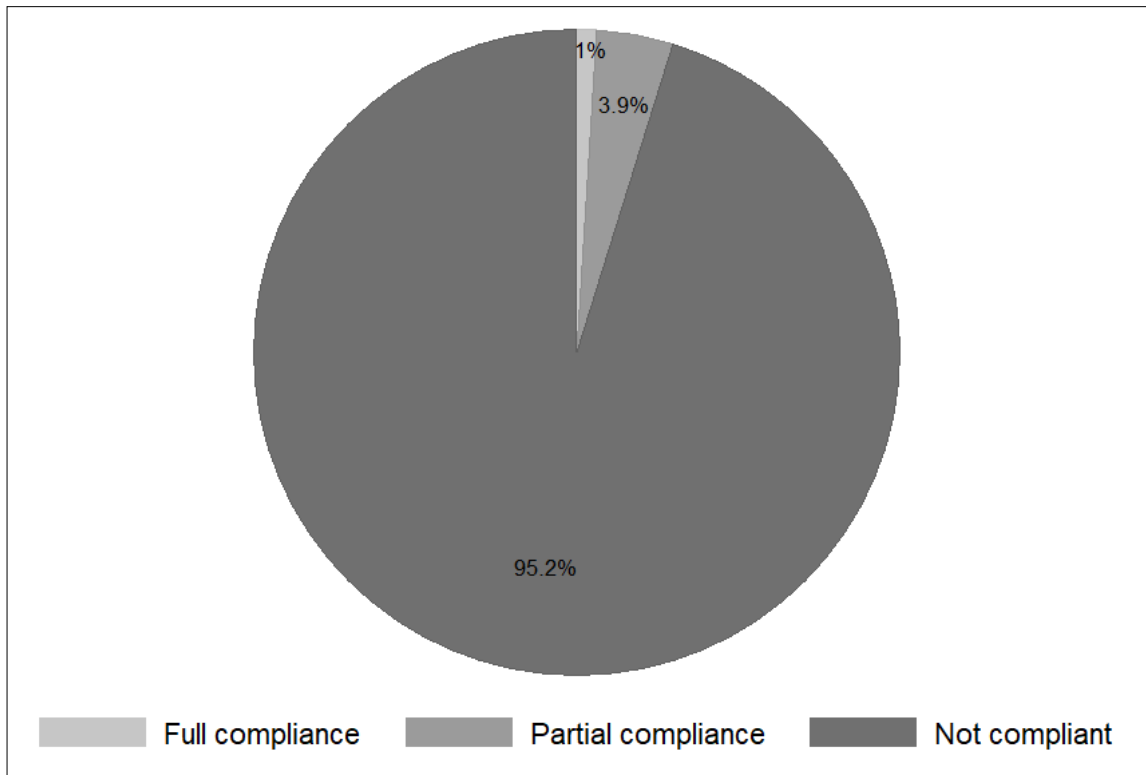
There were 16 schools that did not have a school canteen or any other formal/informal food establishment inside the premises. During the data collection it was possible to observe in some of these cases that both students and teachers left the school at recess or lunchtime to buy food and drinks in establishments outside of the school (e.g. bakeries, grocery stores, convenience stores, etc.).

Of the 119 participating schools, 56 (47.9%) had a breakfast or meal program for the students. Compliance of the menus with the AGREEMENT was higher than that found for the school canteens, with 71.4% (95%CI 57.8–82.7) of the breakfast menus fully complying with the AGREEMENT (Figure 4). An additional 19.6% (95%CI 10.2-32.4) of the menus were partially compliant.

Interview with School Authorities

While 73.1% of the school authorities at participating schools had heard about the AGREEMENT before the interview and 68.9% had received information about it, a much smaller proportion had access to a printed or digital copy of it (Table III).

Figure 3. Compliance of the school canteen with the AGREEMENT – verified by the evaluators (n = 103).

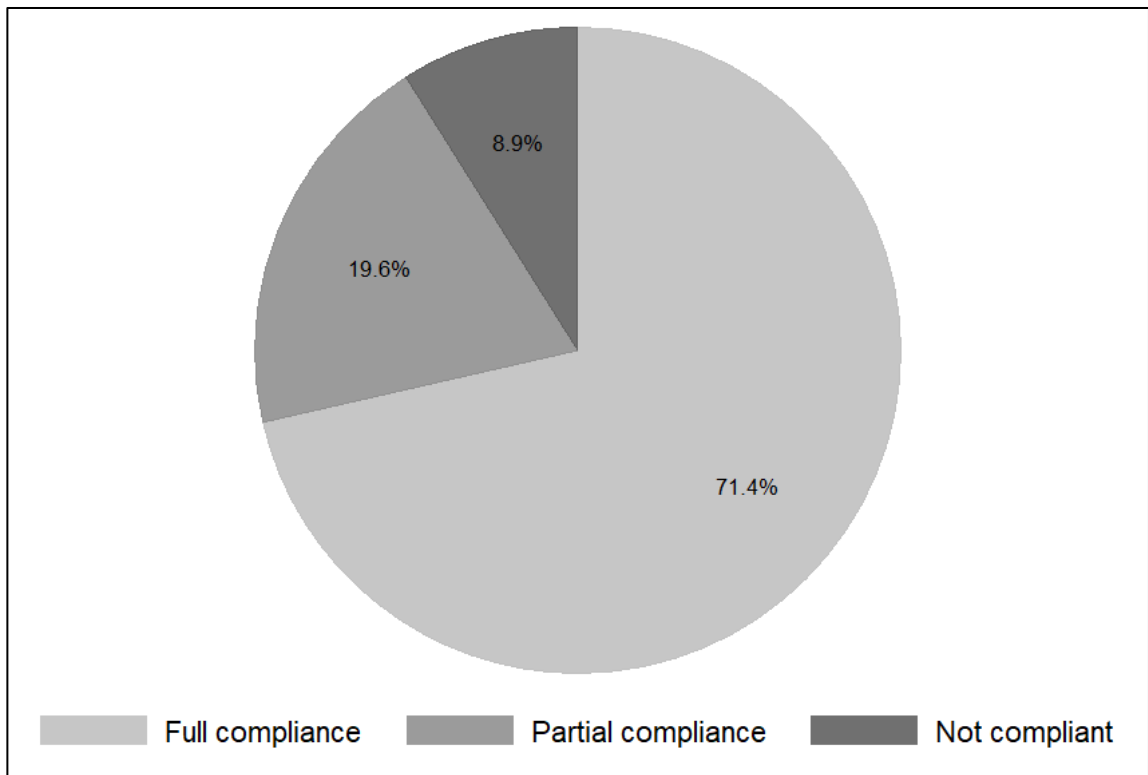


Not compliant: The items in the school canteen do not comply with the AGREEMENT

Partial compliance: At least 50% of the items in the school canteen are in the green or amber category

Full compliance: 100% (or close to 100%) of the items in the school canteen are in the green or amber category

Figure 4. Compliance of the school breakfast menu with the AGREEMENT – verified by the evaluators (n = 56).



Not compliant: The items on the menu do not comply with the Agreement

Partial compliance: At least 50% of the items on the menu are in the green or amber category

Full compliance: 100% (or close to 100%) of the items in the menu are in the green or amber category

Table III. Results of the interview with the school authorities (n = 119).

<i>Indicator</i>	<i>Prevalence % (95% CI)</i>	
Schools where the school authorities had heard about the AGREEMENT before the interview (Q21)	73.1	(64.2 - 80.8)
Schools where the school authorities had received information about the AGREEMENT (Q14)	68.9	(59.8 - 77.1)
Schools where principals had access to a copy (printed or digital) of the AGREEMENT (Q22)	11.8	(6.6 - 19.0)
Schools where it was verified that principals had a copy (printed or digital) of the AGREEMENT	1.7	(0.2 - 5.9)
Schools where the teachers had access to a copy (printed or digital) of the AGREEMENT (Q24)	16.0	(10.0 - 23.8)
Schools where the school authorities had received formal training related to the AGREEMENT (Q15):	24.4	(16.8 - 33.2)
From SEC	22.6	(15.3 - 31.3)
From their boss or superior	1.7	(0.2 - 6.1)
Schools that had a committee that regulates the sale and distribution of food and beverages (Q27)	36.1	(15.5 - 31.3)
Schools where the parents received information related to the AGREEMENT (Q26)	28.6	(20.7-37.6)
Schools where there are dissemination materials related to the AGREEMENT (e.g. good eating habits, fruit consumption, etc.) (Q28)	20.2	(13.7 - 29.2)
Schools that have policies related to junk food or sugar sweetened beverages (Q10)	47.9	(38.7 - 57.2)
Schools that allow junk food or sugar sweetened beverages at festivals or fetes	31.1	(22.9 - 40.2)
Schools that allow junk food or sugar sweetened beverages at birthday parties	19.3	(12.7 - 27.6)
Schools that allow junk food or sugar sweetened beverages on festive or special days	39.5	(30.7 - 48.9)
Schools that allow junk food or sugar sweetened beverages every day	0.8	(0.0 - 04.6)

Table III. Results of the interview with the school authorities (n = 119)
(Continuation).

Schools that have received verification visits to the school canteen from an external authority (Q13):	65.0	(55.6 - 73.5)
From SS	29.1	(21.0 - 38.2)
From SEC	46.2	(36.9 - 55.6)
From both SS and SEC	12.8	(7.4 - 20.3)
Schools that have raised funds by selling food and/or beverages (Q5):	74.8	(66.0 - 82.3)
Chocolate bars	10.9	(5.9 - 18.0)
Cakes, pies or cookies	33.6	(25.2 - 42.8)
Potato or corn chips	36.1	(27.5 - 45.4)
Prepared food (i.e. mexican food*)	68.1	(58.9 - 76.3)
Schools that receive a percentage of the income from the sale of foods and drinks (Q12)	97.2	(92.0 - 99.4)
Schools where there was at least one place (inside or outside the school) where children regularly buy food or beverages (Q4):	89.1	(82.0 - 94.1)
The school dining room	21.8	(14.8 - 30.4)
The school canteen	85.7	(78.1 - 91.5)
A vending machine	0.8	(0.0 - 4.6)
From mobile food vendors	60.5	(51.1 - 69.3)
From teachers or administrative staff	0.8	(0.0 - 4.6)
School authorities that reported that the school has some kind of control of mobile food vendors outside of the school (Q6)	46.2	(37.0-55.6)
School authorities that consider that the school does not have enough water fountains (Q9), because:	30.3	(22.2 - 39.3)
The students have to buy bottled water	16.8	(10.6 - 24.8)

Table III. Results of the interview with the school authorities (n = 119)
(Continuation).

The water fountains are not within reach of the students	2.5	(0.5 - 7.2)
The water fountains are dirty or do not function very well	16.0	(10.0 - 23.8)

CI – confidence interval; Q – question number; SS - Ministry of Health; SEC - Ministry of Public Education

*Mexican food: Among the staples of traditional Mexican food are beans, chili and corn. Fried and stewed food predominates in many of its dishes.

Note: The specific wording (in Spanish) for each question number can be found in Appendix 3.

While the AGREEMENT requires that schools have a Committee for School Food Consumption that includes parents to regulate the sale and distribution of food and beverages (Secretaría de Educación Pública et al., 2014), only 37.1% of the schools were reported to have a committee.

While 65% of schools had received verification visits from SS, SEC or both to check the compliance of their school canteen with the AGREEMENT only 24.4% of the school authorities had received formal training in relation to the AGREEMENT. This training was mostly conducted by SEC (92.9%). Interestingly, the proportion of public schools that reported having had a verification visit was significantly higher than in private schools (73.0 vs 39.9%, $p=0.003$, Fisher's exact test).

Given that the visits to the schools were scheduled before recess to enable a more accurate assessment of the school canteen items, the presence of mobile food vendors outside of the schools could not be corroborated. Despite this, a large proportion (60.5%) of school authorities reported that their students regularly buy food from them (Table III). Though not part of the questionnaire, the general opinion of the school authorities was that schools are frequently visited by mobile food vendors, especially between 12:00 to 2:00pm (which is the departure time for students from the morning shift and the entry time for the afternoon shift).

The school authorities reported that the sale of food and beverages has been used for fundraising in 74.8% of schools. The most used items included prepared food (68.1% of schools), followed by potato or corn chips (36.1% of schools) and cakes, pies or cookies (33.6% of schools).

During the interview, it was found that many schools (all schools with a school canteen supervised by SEC) received monthly a percentage of the income from the school canteens. The school authorities commented that the main expenses for which this income is used are: administrative necessities (e.g.

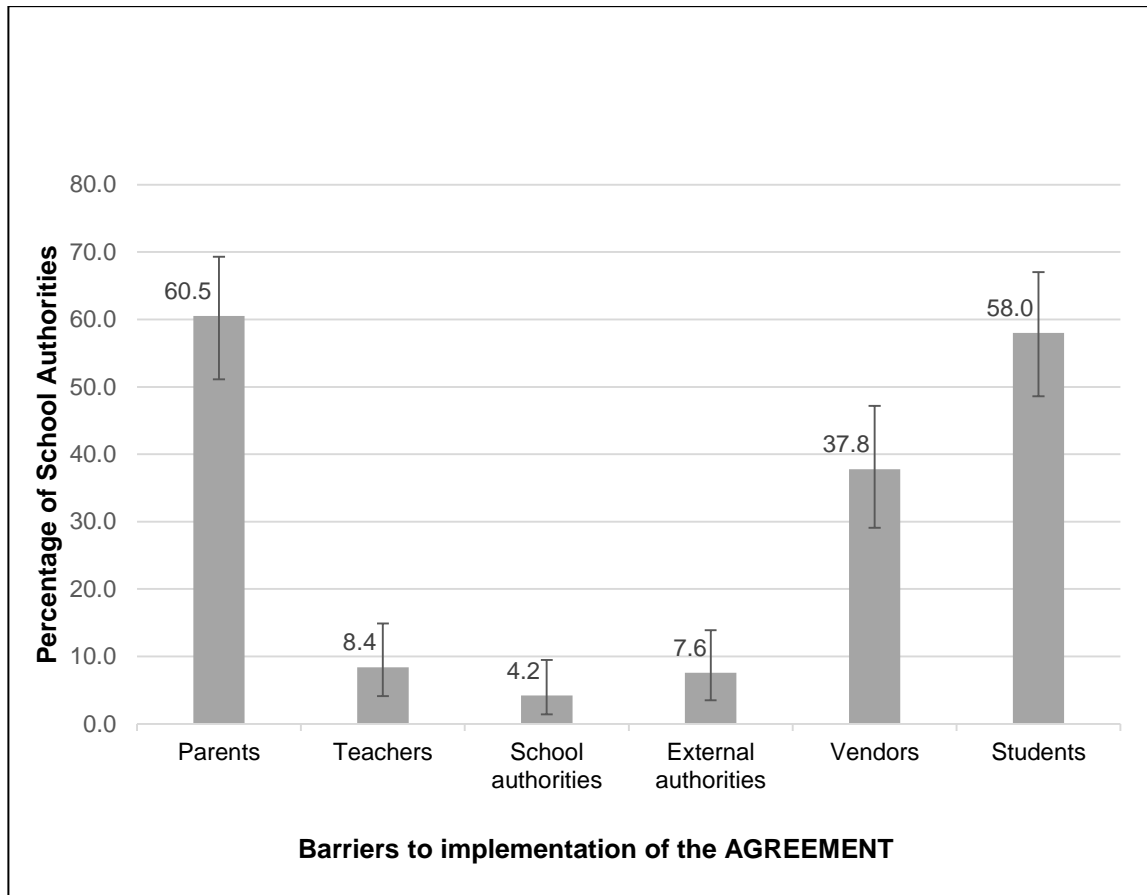
stationery articles), services (e.g. photocopies, internet service), and school maintenance (e.g. cleaning supplies, minor school repairs). According to the school authorities, this is the only income available for public schools to cover these expenses.

In relation to barriers to the implementation of the AGREEMENT in schools, the school authorities considered that parents and students are the principal barriers to its application, followed by food vendors (Figure 5). Though, not measured as part of the study, the general opinion of the school authorities was that many parents provide SSBs and EDNP foods for children's lunch. Of the authorities that selected parents and/or students as a barrier, the most common reason was lack of knowledge about the AGREEMENT (70.5%, 95%CI 59.8-79.7), followed by lack of interest (69.3%, 95%CI 58.6-78.7).

In relation to facilitators, teachers and school authorities were reported as the main facilitators of the AGREEMENT, followed very closely by external authorities (such as municipal government, education (SEC) and health (SS) authorities) (Figure 6).

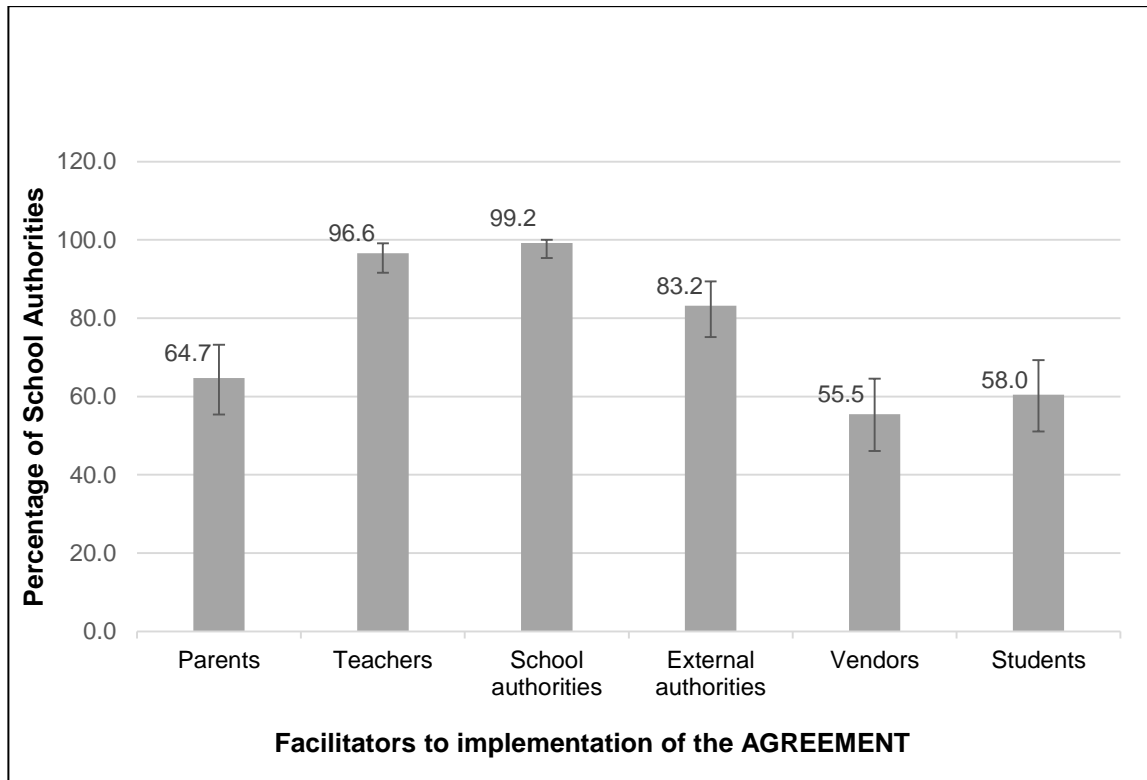
Contrary to that expected, both parents and students were identified as facilitators to implementation of the AGREEMENT. Many school authorities verbally commented that they selected parents as facilitators because, with the appropriate orientation and support, parents could be facilitators rather than barriers to its implementation. Of the authorities that selected teachers and school authorities as a facilitator, the most common reasons were that they have/could have an interest in the AGREEMENT (95.8%, 95%CI 90.4-98.6) and that they are/could be available to disseminate information about the AGREEMENT (95.8%, 95%CI 90.4-98.6), followed by that they are/could be available to give or receive training related to the AGREEMENT (83.1%, 95%CI 75.0-89.3).

Figure 5. Groups or individuals that are barriers to implementation of the AGREEMENT – reported by the school authorities (n = 119).



Error bars are 95% confidence intervals

Figure 6. Groups or individuals that are facilitators to implementation of the AGREEMENT – reported by the school authorities (n = 119).



Error bars are 95% confidence intervals

Non-participation Survey

Of the 17 schools that did not accept to participate in the study, 13 completed the non-participation survey (Appendix 6) – 92.3% were private schools. Only four schools refused to answer the non-participation survey. When the results of the 13 non-participant schools were compared to the 119 schools that participated in the study it was difficult to assess the possibility of selection bias in our results (Table IV). While the participating and non-participating schools were not significantly different in relation to reporting having healthy food policies, the participating schools were more likely to report not having enough water fountains and more likely to report having received information about the AGREEMENT. These differences could be partly explained by the characteristics of the non-participant group, in which most (92.3%) were private schools.

School Canteens

A variety of foods and beverages were found in the school canteens. The most frequent items available were: cookies, cakes, candies and sweets (found in 98% of the school canteen); bottled water (92.2%); tacos and “burritos” using a wheat flour tortilla (91.3%); processed juices and nectars (91.3%); fresh fruit and vegetables (87.4%); and dried legumes with added salt (87.4%) (Table V). Apart from the water and fruit and vegetables, the remaining four items were all classified as red items, which are prohibited under the AGREEMENT. Among the least stocked items were: low fat and low salt cheeses, milk or soy-based beverages with added artificial sweeteners, and instant soup (each found in 1% of the school canteens).

Table IV. Comparison of participating and non-participating schools on key questions.

<i>Indicator</i>	<i>Participating schools (n=119)</i>	<i>Non-participating schools (n=13)</i>	<i>P*</i>
Schools that have policies related to junk food or sugar sweetened beverages (Q10)	47.9	53.8	0.063
School authorities that consider that the school does not have enough water fountains (Q9)	30.3	0	0.011
Schools where the school authorities had received information about the AGREEMENT (Q14)	68.9	30.8	0.009

Figures are prevalence (%); Q – question number.

*Fisher's exact test was used to compare proportions.

Note: The specific wording (in Spanish) for each question number can be found in Appendix 3.

School Canteens

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In relation to prepared foods (Table V), a variety of foods high in saturated fats, sodium and/or sugar were found. Apart from whole grain sandwiches with vegetables (green category), which were available in 70.9% of schools, the most frequently available options for prepared foods were from the red category, including “quesadillas” using a wheat flour tortilla (87.4% of schools) and tacos and “burritos” using a wheat flour tortilla (91.3% of schools). While, this study did not include collection of data regarding children’s food preferences, the general opinion of the school canteen vendors was that the children prefer food without vegetables and prepared with a wheat flour tortilla rather than corn tortilla (i.e. for tacos and burritos). The data collectors also observed children throwing away the vegetables from their sandwich before eating it in some schools.

It is important to mention that, on several occasions, the data collectors observed parents bringing lunch to the students during lunch time and that some of these lunches included SSBs or EDNP foods. Since parents are usually not able to enter the school at this time, they gave the lunch to their children through the school fence.

Table V. Foods and beverages available for sale in the school canteens (n = 103).

<i>Indicator</i>	<i>Prevalence % (95% CI)</i>	
Green classification		
Bottled water	92.2	(85.3 - 96.6)
Fresh fruit and vegetables – whole or chopped	87.4	(79.4 - 93.1)
Whole grain cereals without added sugar (amaranth, oats or granola)	3.9	(1.1 - 9.6)
Seeds and nuts without added salt	1.9	(0.2-6.8)
Dried legumes without added salt (e.g. chickpeas, broad beans)	1.9	(0.2-6.8)
Whole or low-fat milk without added sugar	18.4	(11.5 - 27.3)
Milk-based beverages without added sugar (e.g. smoothies, hot chocolate)	1.9	(0.2 - 6.8)
Soy drinks without added sugar	0	
Low fat and low salt cheeses	1.0	(0 - 5.3)
Prepared foods		
Whole grain sandwiches with vegetables	70.9	(61.1 - 79.4)
“Quesadilla” - corn tortilla with melted cheese	28.2	(19.7 - 37.9)
Tacos and “burritos” using a corn tortilla	20.4	(13.1 - 29.5)
Homemade soup with vegetables	26.2	(18.0 - 35.8)
Amber classification		
Natural fruit juices (100% juice) without added sugar	2.9	(0.6 - 8.3)
Whole or low-fat milk with artificial sweetener	0	
Milk-based beverages with added artificial sweetener	1.0	(0 - 5.3)
Soy-based beverages with added artificial sweetener	1.0	(0 - 5.3)
Red classification		
Natural fruit juices with added sugar	38.8	(29.4 - 48.9)
Whole grain cereals with added sugar	50.5	(40.5 - 60.5)

Seeds and nuts with added salt	7.8	(3.4 - 14.7)
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Table V. Foods and beverages available for sale in the school canteens (n = 103)
(Continuation).

Dried legumes with added salt (e.g. chickpeas, broad beans)	87.4	(79.4 - 93.1)
Milk with added sugar	12.6	(6.9 - 20.6)
Milk-based beverages with added sugar (e.g. chocolate milk, drinkable yogurt, milkshakes)	65.0	(55.0 - 74.2)
Sport drinks	11.7	(6.2 - 19.5)
Soy-based beverages with added sugar	13.6	(7.6 - 21.8)
Cheeses high in fat and sodium	71.8	(62.1 - 80.3)
Processed juices and nectars	91.3	(84.1 - 95.9)
Iced tea, sodas and other sugar sweetened beverages	26.2	(18.0 - 35.8)
Snacks (potato chips and other salty processed foods)	72.8	(63.2 - 81.1)
Cookies, cakes, candies and sweets	98.1	(93.2 - 99.8)
Prepared foods		
White bread sandwiches without vegetables	38.8	(29.4 - 48.9)
“Quesadilla” – wheat flour tortilla with cheese	87.4	(79.4 - 93.1)
Tacos and “burritos” using wheat flour tortilla	91.3	(84.1 - 95.9)
Instant soup	1.0	(0 - 5.3)
Ice creams, popsicles and similar	83.5	(74.9 - 90.1)
Corn chips	26.2	(18.0 - 35.8)
Pizza and similar	33.0	(24.1 - 43.0)
“Molletes” – bread rolls with cheese and ham	72.8	(63.2 - 81.1)
“Pepihuates” – coated peanuts and cucumber in a tomato-based juice (includes salt, chili, sugar and lemon)	79.6	(70.5 - 86.9)
“Tamales” – a traditional dish made of masa (nixtamalized corn, lard) with a variety of fillings (e.g. meat or cheese), steamed in a corn husk	21.4	(13.9 - 30.5)

Table V. Foods and beverages available for sale in the school canteens (n = 103)
(Continuation).

"Tortas" – bread rolls filled with a variety of meats, cheese, vegetables	76.7	(67.3 - 84.5)
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CI – confidence interval

Note: data was collected by the data collectors through observation and classification of the items available in the school canteen. All visits were made from Monday to Thursday due to more liberal restrictions applying on Fridays.

School Breakfast Menus

Data was collected from 56 school breakfast menus. Of all the breakfast menus, 53.6% were cold breakfasts, 14.3% were hot breakfasts, 14.3% were mixed breakfasts, and 17.9% were from programs other than DIF. Given that the cold breakfasts represent the greatest proportion of the menus analyzed, it is expected that their components would be the most popular items (Table VI).

Structural Evaluation

At the end of each visit, data collectors asked for permission to walk around the school and to register aspects relevant to the AGREEMENT. In order to not interrupt classes, no data was collected inside the classrooms.

It was only possible to observe mobile food vendors outside of the school in 15 schools. This is not a true indication of the number of mobile food vendors due to the time of day where the visits were made, which did not often coincide with the time of entry or exit. In the 15 schools where they were observed, the foods available for sale were classified according to their nutritional content.

One hundred percent of the observed mobile food vendors had the greatest proportion of their items classified in the red category.

Based on the interview questions, 69.8% of the school authorities considered that their school had sufficient water fountains for all students. On inspection of the school, water fountains were observed in 93.3% of schools (Table VII). However, in only 16.2% of these 111 schools were all the water fountains both clean and functional.

Table VI. Foods and beverages included in the school breakfast menus (n = 56).

<i>Indicator</i>	<i>Prevalence % (95% CI)</i>	
<i>Green classification</i>		
Vegetables	46.4	(33.0-60.3)
Whole grain cereals	89.3	(78.1-96.0)
Legumes and products of animal origin (e.g. eggs, meat, chicken)	46.4	(33.0-60.3)
Fruits	50.0	(36.3-63.7)
Water	5.4	(1.1-14.9)
Atole (whole grain cereal-based hot beverage with milk)	14.3	(6.4-26.2)
Dried fruit	66.1	(52.2-78.2)
Nuts and seeds	67.9	(54.0-79.7)
Low fat and low salt cheese	7.1	(2.0-17.3)
Milk without added sugar	75.0	(61.6-85.6)
Soy-based beverages without added sugar	1.8	(0-9.6)
<i>Amber classification</i>		
Natural fruit juice (100% juice) without added sugar	1.8	(0-9.6)
Milk with added artificial sweetener	1.8	(0-9.6)
Soy-based beverages with added artificial sweetener	0	
<i>Red classification</i>		
Non whole grain cereals	37.5	(24.9-51.5)
Cold cuts and sausages high in salt	17.9	(8.9-30.4)
Cream and butter	5.4	(1.1-14.9)
Natural fruit juices with added sugar	8.9	(3.0-19.6)
Processed juices and nectars	1.8	(0-9.6)
Juices and nectars with added artificial sweetener	1.8	(0-9.6)
Iced tea, sodas and other sugar sweetened beverages	5.4	(1.1-14.9)

Table VI. Foods and beverages included in the school breakfast menus (n = 56)
(Continuation).

Iced tea, sodas and other beverages with added artificial sweetener	0	
Cheeses high in fat and/or salt	28.6	(18.0-42.1)
Milk with added sugar	14.3	(6.4-26.2)
Soy-based beverages with added sugar	0	
Snacks (chips and other salty processed foods)	0	
Cookies, cakes and other sweets	5.4	(1.1-14.9)

CI – confidence interval

Note: data was collected by the data collectors through observation and classification of the items available on the breakfast menu (and conversation with the person responsible for the breakfast program to identify changes to the menu).

An analysis of the actual number of water fountains observed in the schools showed that there is an average of 37 children per water fountain. The mean number of water fountains per school was 10.8 (95%CI 8.7-13.1), and 43.7% (95%CI 36.8-50.6) of them were functional and 23.4% (95%CI 16.1-30.7) were clean.

It is important to mention that some schools have water dispensers inside the classrooms, but it was not possible to verify this – thus the numbers reported in Table VII may be an underestimation.

In relation to promotional material within the school, more advertisements of SSBs and EDNP foods were observed than publications referring to the practices promoted by the AGREEMENT, e.g. healthy food habits (Table VII). This publicity was located in places such as the school canteen, the walls and the playground.

Table VII. Results of the structural evaluation (n = 119).

<i>Indicator</i>	<i>Prevalence % (95% CI)</i>	
Schools where data collectors observed the existence of water fountains or water dispensers	93.3	(87.2-97.1)
Schools where all the water fountains were all functional*	20.7	(13.6-29.5)
Schools where all the water fountains were clean*	18.0	(11.4 - 26.4)
Schools where the water fountains were all functional and clean*	16.2	(9.9-24.4)
Schools with advertising of processed foods and/or beverages	16.0	(9.9-23.8)
Schools with publications referring to the practices promoted by the AGREEMENT, e.g. healthy food habits	12.6	(7.2-19.9)

CI – confidence interval

*Only schools with water fountains (n = 111)

Note: data was collected by the data collectors through observation. The data collectors did not enter the classrooms.

DISCUSSION

The 2014 AGREEMENT that establishes the general guidelines for the sale and distribution of prepared and processed foods and beverages in schools of the National Education System was published over five years ago (Secretaría de Educación Pública et al., 2014). However, data collected in a random sample of schools in Hermosillo, Sonora between November 2018 and April 2019 show that its implementation in schools is limited.

Only 15.1% (95%CI 9.2–22.8) of the interviewed school authorities considered that their school had fully implemented the AGREEMENT and only 1% (95%CI 0–5.3) of the school canteens were fully compliant with the requirements of the AGREEMENT. Compliance of the school breakfast programs that were present in 48% of schools was much higher at 71.4% (95%CI 57.8–82.7). To our knowledge, apart from the small but in-depth study conducted by El Poder del Consumidor in 2017 (El poder del Consumidor, 2018b), this is the only evaluation of the level of implementation of the 2014 AGREEMENT in Mexican schools.

Despite the fact that the AGREEMENT prohibits the sale of EDNP foods and SSBs from Monday to Thursday, a large proportion of school canteens were observed selling foods and beverages prohibited under the AGREEMENT. At least one type of SSBs (e.g. iced tea, sodas, milk with added sugar, nectars and juices) was observed in 100% of the school canteens. According to the AGREEMENT none of these are allowed from Monday to Thursday and only some nectars and juices are allowed on Fridays.

Further, while the AGREEMENT requires that education authorities (SEC) ensure that the children have access to potable water, less than half of the water fountains observed in the school yard were actually functional. However, the

percentage of schools that had functional water fountains is higher than that found by El Poder del Consumidor (11%) in nine schools in the center of Mexico (El poder del Consumidor, 2018b).

Proper implementation of the AGREEMENT requires that both the school authorities and parents and guardians of the children attending the school know that it exists and are familiar with its contents. However, when the school authorities were asked if they were aware of the AGREEMENT, only 68.9% could recall having received information about it and only 1.7% were able to locate a printed or digital copy of the AGREEMENT. This percentage is lower than that found by Theodore and colleagues in Mexican schools in 2012, where they reported that 24.4% of school principals actually had a copy of the applicable version of the AGREEMENT for 2010 (Theodore et al., 2018).

While the 2014 AGREEMENT assigns responsibility for its implementation to the school authorities with help from the Committee of School Food Consumption Establishments (made up of parents and guardians) only 36.1% of schools actually had a committee and only 24.4% of the school authorities had received formal training related to the AGREEMENT. Further, in only 28.6% of schools did parents receive information related to the AGREEMENT.

It was surprising that compliance of the school canteens with the AGREEMENT was so low, given that 65% of schools had received verification visits from SS, SEC, or both. The general opinion of the school authorities is that these inspections do not correct some foods that should not be sold. A possible explanation for this is that the inspection visits from SEC use secondary documents rather than the AGREEMENT itself as the principal guideline for the school canteens (both for inspections and for training of the canteen proprietors).

Data collectors were able to view some of these secondary documents during the interview with the school authorities when they asked to see a copy of

the AGREEMENT. While these documents were created (and distributed) by SEC Sonora, their content is more flexible than the AGREEMENT. Clearly, more work is required by SEC Sonora to ensure that the canteen proprietors are properly trained and monitored. It is not known if the same problem exists in other states but, without uniform technical guidelines, it is likely that it does.

According to the school authorities, each school (with a school canteen in which the manager was assigned by SEC) receives approximately 7 to 10 Mexican pesos per student. For public schools, the income provided by school canteens represents their only monthly income and principals have to manage it carefully to cover all scheduled and unscheduled school necessities, such as repair of a broken window or purchase of stationery supplies.

Thus, the education authorities may be reluctant to make changes that affect the profitability or survival of the canteen, e.g. by removing EDNP foods and SSBs from sale. This was also noted by “El Poder del Consumidor” as a finding of their study (El poder del Consumidor, 2018b). They also mention there is a possible conflict of interest because the food industry provide resources or infrastructure for the schools and the school canteens in exchange for advertising within the schools (El Poder del Consumidor, 2018a).

Of the schools that had water fountains (93%) only 43.7% of them were functional and 23.4% were clean. In some schools the water fountains did not have a filtration system to make the water drinkable, had insufficient water pressure or missing water pipes. A few of the school authorities commented that this was due to robberies and others that some of the water fountains left by previous governments had never been properly installed.

Although the AGREEMENT establishes that the education authorities must work in coordination with the municipal authorities to regulate mobile food vendors near schools, the school authorities reported that children regularly buy foods and

drinks from them in 60.5% of schools. According to the school authorities, sometimes children prefer to keep their money for the time of departure and buy food that they cannot find in the school canteen from the mobile vendors. This reduces the income of the school canteens and could encourage them to increase the sale of unhealthy foods to compensate for their losses.

The above coincides with that reported by the El Poder del Consumidor, where the school canteen vendors were against changing the offering to healthy foods given the fact children would stop buying from them (El poder del Consumidor, 2018b). It is also general knowledge that, while the local government may not issue new licenses for mobile food vendors in places near schools, they do renew existing licenses. Clearly more work is needed in relation to this aspect of the AGREEMENT.

When the school authorities were questioned about possible barriers to the implementation of the AGREEMENT in schools, they considered that parents (60.5%) and students (58%) were the principal groups that acted (or could act) as barriers to its implementation. The most common reasons given for this was lack of knowledge about the AGREEMENT (70.5%) and lack of interest (69.3%). A possible explanation is that both parents often need to engage in paid work to support the family and don't have the time (or interest) to prepare a healthy lunch for them.

Further, in general, parents are not receiving information from the school or education authorities to encourage an understanding of, or interest in, the intent of the AGREEMENT. Some of the school authorities commented that it is difficult to prohibit specific foods in schools and that they cannot take the children's lunch away as it would leave them to go hungry (also considering that many children go to school without having eaten breakfast).

While there are various barriers to the implementation of the AGREEMENT, the school authorities also agreed on some facilitators. Both the school authorities and teachers were classified as the main groups that acted (or could act) as facilitators for the implementation of the AGREEMENT in schools, with a proportion of 99.2% and 96.6%, respectively; followed very closely by external authorities (such as municipal government, education (SEC) and health (SS) authorities). However, given the issues previously discussed, such as the lack of training of school authorities and parents, issues with secondary documents, lack of control of mobile food vendors, etc., clearly further work is needed to translate this into better implementation of, and compliance with, the AGREEMENT.

Intervention is needed in the Ministries of Health and Education to improve implementation of the AGREEMENT, including appropriate monitoring and follow-up of compliance. Schools also require further training and support to facilitate implementation of the AGREEMENT. They should also be involved in decisions relating to their school canteen.

Among the strengths of this study are that it includes a large, representative sample of all primary schools in Hermosillo; and had an excellent response rate, which minimizes the risk of selection bias. Further, the data collectors used direct observation of the school canteens and school yard to measure compliance rather than relying on self-reported data, which is likely to lead to an overestimation of compliance. The tools developed for this study could be used at a larger scale to determine the level of implementation of, and compliance with, the AGREEMENT at a national level. These measures could also serve as a baseline to inform the development and evaluation of the effect of interventions designed to improve implementation of the AGREEMENT.

A limitation of the study was that only schools in Hermosillo could be included in the sample due to time and resource constraints. However, we expect that similar results would be found in other parts of Sonora and in other states, given the results of the only other evaluation of the 2014 AGREEMENT (El poder del Consumidor, 2018b), as well as previous evaluations of the 2010 version (Theodore et al., 2018). Future studies should consider a random sample of all elementary schools in Mexico. Another limitation of the study was a lower response rate in private schools, despite frequent follow-up from the data collectors. It was not possible to observe mobile food vendors outside of the schools due to limitations in human resources. More data collectors would allow a second visit to each school at the time of departure. A final limitation was the lack of a specific item for soda on the canteen tool. This is important because they are specifically banned by the AGREEMENT.

CONCLUSIONS

The 2014 AGREEMENT is the principal guideline in Mexico that regulates the school food environment. However, the level of implementation of, and compliance with, the AGREEMENT is very low in elementary schools in Hermosillo, Sonora. A wide variety of processed foods and beverages are available in school canteens and some type of SSB was found for sale in 100% of school canteens. The availability of drinkable water is not sufficient for all students. In addition, children regularly purchase foods and drinks from mobile food vendors outside of schools that sell foods and beverages that are not allowed in the AGREEMENT. Further, knowledge of the AGREEMENT by the school authorities is limited and in less than a quarter of the schools have they received formal training regarding its contents. Although parents (and students) were identified as the main barriers to the implementation of the AGREEMENT in elementary schools, they are not generally receiving information related to its contents. Thus, further work is required to better support the full implementation of, and compliance with, the AGREEMENT of 2014.

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APPENDICES

Appendix 1: Informed Consent

Hermosillo, Son. a ____ de _____.

**Carta de consentimiento informado del proyecto de investigación:
“Descripción del Entorno Alimentario en Escuelas Primarias de Hermosillo Sonora”**

Integrantes del proyecto:

Dra. Michelle Maree Haby de Sosa – Universidad de Sonora
Dr. Rolando Giovanni Díaz Zavala – Universidad de Sonora
Dra. Trinidad Quizán Plata – Universidad de Sonora
Dra. Camila Corvalán Aguilar – Universidad de Chile
LCN. Yazmín Hugues Ayala – Universidad de Sonora

Buen día, el motivo de la presente es invitarle a que su escuela forme parte del proyecto de investigación “Descripción del Entorno Alimentario en Escuelas Primarias de Hermosillo Sonora”. Dicho proyecto se prevé tenga una duración de 9 meses a partir de agosto de 2018. Se ha seleccionado previamente una muestra totalmente aleatoria de escuelas primarias de Hermosillo para su participación.

A continuación, se presenta, de manera breve, el propósito del presente proyecto de investigación y otros datos de interés que le permitirán tener un panorama general del mismo. Una vez que usted haya leído el presente documento, tendrá oportunidad de aclarar sus dudas y tomar la decisión respecto a su participación voluntaria.

Introducción/ Propósito

El propósito del presente proyecto es describir el entorno alimentario de las escuelas primarias de Hermosillo, Sonora, con base a las políticas públicas aplicables a nivel nacional.

Procedimientos/intervenciones que se llevarán a cabo

Para realizar la descripción del entorno alimentario en las escuelas, es necesario obtener información mediante entrevista y la observación directa. Es por ello que, la información será recopilada mediante listas de chequeo que han sido elaboradas conforme a las políticas públicas vigentes. También se realizará la aplicación de preguntas abiertas para la identificación de barreras y facilitadores de las mismas políticas.

Es importante mencionar, que se tomarán todas las precauciones éticas y profesionales necesarias para la realización del trabajo, cuidando en todo momento el prestigio de cada escuela participante y excluyendo (por la naturaleza propia del estudio) la participación de los estudiantes de las mismas.

Si usted así lo decide, podrá retirar a su escuela del proyecto en cualquier momento, sin ser obligado a dar explicación de los motivos y sin consecuencia alguna. Por lo anterior, hemos de señalar lo valiosa que es su participación voluntaria. En todo momento estaremos dispuestos a atender sus dudas o sugerencias, y daremos solución de acuerdo a lo que esté a nuestro alcance.

Por lo anterior, le sugerimos considere aceptar la participación de su escuela en el presente proyecto. Debe saber que, si por algún motivo existen cambios en el mismo, se le notificará en tiempo y forma, así, usted podrá valorar si continúa su participación.

Beneficios previsible para participantes o a nivel de la comunidad

Los resultados que se obtengan de la presente investigación, permitirán conocer la condición actual del entorno alimentario de las escuelas primarias de Hermosillo, Sonora. Lo anterior, facilitará la observación de áreas de mejora respecto a los entornos alimentarios de las escuelas.

La información que se genere podría llegar a ser de utilidad para el desarrollo/reestructuración de políticas públicas relacionadas con la creación de entornos alimentarios adecuados en las escuelas y para identificar aquellos aspectos que requieran más apoyo.

Además, podrá servir como una línea base que posibilite la creación de intervenciones que mejoren la calidad de vida de los niños en edad escolar.

Compensación

Al final de la investigación se hará envío vía correo electrónico, a cada institución participante, un informe en el que se detallarán los resultados generales del proyecto.

Confidencialidad de la información

Es muy importante resaltar la confidencialidad de la información que se recabe, tanto de la entrevista como de las listas de chequeo, en ningún momento se utilizará para hacer mención de particularidades de las escuelas o de los entrevistados. Toda la información que se genere y se publique se utilizará para hablar en general de las escuelas primarias de la ciudad de Hermosillo Sonora. Solamente los integrantes del equipo de investigación tendrán acceso a la información que se recabe.

A quien recurrir en caso de problemas o preguntas

En caso de requerir mayor información, externar quejas o sugerencias, puede ponerse en contacto con la coordinadora de la investigación Dra. Michelle Maree Haby de Sosa al correo electrónico: haby@unimelb.edu.au o con la LCN. Yazmín Hugues Ayala al correo electrónico: yazhugues@hotmail.com y/o al número celular (662) 359 78 40. En lo que respecta a las cuestiones referentes a los derechos de los participantes con el Dr. Gerardo Álvarez Hernández al correo electrónico: galvarez@guayacan.uson.mx

Consentimiento/ participación voluntaria

He leído la información antes mencionada y he aclarado todas mis dudas respecto al proyecto de investigación al que la institución a mi cargo está siendo invitada a participar. Con base en la información que he leído y de acuerdo a mi criterio autorizo y doy mi consentimiento para que la institución a mi cargo participe en el proyecto de investigación anteriormente mencionado


Si No .

Nombre y firma
del responsable de la escuela

Dra. Michelle M. Haby de Sosa
Coordinadora de
Investigación

Nombre y firma
del testigo

Appendix 2: General Data

 UNIVERSIDAD DE SONORA DEPARTAMENTO EN CS. QUÍMICO BIOLÓGICAS Y DE LA SALUD MAESTRÍA EN CIENCIAS DE LA SALUD	
DATOS DE LA ESCUELA	
NOMBRE:	
CLAVE:	
DIRECCIÓN:	
TURNO:	
PÚBLICA <input type="checkbox"/> PRIVADA <input type="checkbox"/>	
NÚMERO DE ALUMNOS:	
DATOS DE CONTACTO	
NOMBRE:	
PUESTO/RESPONSABILIDAD:	
CORREO ELECTRÓNICO:	
TELÉFONO:	
DATOS DE LA VISITA	
FECHA:	
HORA DE LLEGADA:	
TIEMPO EN EL QUE SE RECOPIARON LOS DATOS:	<input type="checkbox"/> ANTES DEL RECREO <input type="checkbox"/> DURANTE EL RECREO <input type="checkbox"/> DESPUÉS DEL RECREO
NOMBRE DEL EVALUADOR/ES:	

Appendix 3: Interview with School Authorities

Entrevista con Directivos	
Reactivo	Respuesta
<p>1. ¿Actualmente su escuela participa en algún programa de desayunos o comidas escolares? ¿El programa de alimentos es dirigido por el DIF (Sist. de Desarrollo Integral de la Familia)?</p>	<p><input type="checkbox"/> No (0) * <input type="checkbox"/> Si (1) <i>Si la respuesta es "No", pasar a pregunta 4. Si la respuesta es "Si"...</i> <input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <input type="checkbox"/> Otra(2): _____</p>
<p>2. Para la elaboración de alimentos, ¿La escuela cuenta con cocina propia? ¿La cocina está dentro de la escuela?</p>	<p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <i>Si la respuesta es "No", pasar a la pregunta siguiente, si la respuesta es "Si"...</i> <input type="checkbox"/> No (0) <input type="checkbox"/> Si (1)</p>
<p>3. ¿Tiene a la mano alguna copia del menú de desayunos o comidas escolares?</p>	<p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <i>Si la respuesta es "Si", solicitar copia y responda: ¿Existe copia?</i> _____</p>
<p>* 4. ¿Hay algún lugar dentro o fuera de la escuela donde los alumnos compren normalmente sus alimentos? A continuación voy a mencionarle algunos lugares donde se venden alimentos, ¿Podría indicarme en cuáles de estos los alumnos normalmente compran su comida?</p>	<p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <i>Si la respuesta es "No", pasar a la pregunta siguiente, si la respuesta es "Si"...</i> <input type="checkbox"/> Comedor escolar <input type="checkbox"/> Tienda escolar/ expendedora <input type="checkbox"/> Maquina ambulantes <input type="checkbox"/> Los maestros o administrativos <input type="checkbox"/> Otros/s: _____</p>
<p>5. Para la recaudación de fondos ¿La escuela ha utilizado la venta de alimentos o bebidas? Ej. Barras de chocolate. A continuación voy a mencionarle algunos alimentos que normalmente se utilizan para esta actividad, ¿Podría indicarme cuál o cuáles de estos se han utilizado?</p>	<p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <i>Si la respuesta es "No", pasar a la pregunta siguiente, si la respuesta es "Si"...</i> <input type="checkbox"/> Barras de chocolate <input type="checkbox"/> Pasteles, pays o galletas <input type="checkbox"/> Frituras de papa o maiz preparados <input type="checkbox"/> Otro/s: _____</p>

<p>6. ¿Sabe si existe algún tipo de control hacia los vendedores ambulantes que se colocan fuera de la escuela?</p> <p>De las siguientes opciones, ¿Podría indicarme de dónde proviene este reglamento o regulación?</p>	<p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <input type="checkbox"/> No sabe (2)</p> <p><i>Si la respuesta es "No" o "No sabe", pasar a la pregunta siguiente, si la respuesta es "Si",...</i></p> <p><input type="checkbox"/> Políticas internas, es decir, elaboradas por la propia escuela (0) <input type="checkbox"/> Políticas externas, es decir, promovidas por instituciones de gobierno (1) <input type="checkbox"/> Otro(2): _____ <input type="checkbox"/> No sabe (3)</p>
<p>7. ¿Su escuela cuenta con bebederos o enfriadores para el agua?</p> <p>¿Cuántas de estas fuentes de agua pueden utilizar los alumnos?</p>	<p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1)</p> <p><input type="checkbox"/> Solo un bebedero (0) <input type="checkbox"/> Dos a tres bebederos (1) <input type="checkbox"/> Cuatro o cinco bebederos (2) <input type="checkbox"/> Seis bebederos o más (3) <input type="checkbox"/> No sabe (2)</p>
<p>8. ¿El agua de estas fuentes está disponible durante todo el año?</p>	<p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <input type="checkbox"/> No sabe (2)</p>
<p>9. ¿Considera que las fuentes de agua disponibles son suficientes para los alumnos de esta escuela?</p> <p>A continuación voy a mencionarle diferentes situaciones sobre el agua, ¿Podría indicarme cuál o cuáles suceden en esta escuela?</p>	<p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <input type="checkbox"/> No sabe (2)</p> <p><i>Si la respuesta es "Si", pasar a la pregunta siguiente, si la respuesta es "No",...</i></p> <p><input type="checkbox"/> Los alumnos tienen que comprar el agua <input type="checkbox"/> No hay bebederos al alcance de los alumnos <input type="checkbox"/> Los bebederos están sucios o no funcionan bien <input type="checkbox"/> Otra: _____</p>
<p>10. ¿El reglamento escolar incluye políticas relacionadas con comida chatarra o bebidas azucaradas?</p> <p>A continuación voy a mencionarle algunas situaciones o eventos especiales, indique en cuál o cuáles se permite que los alumnos consuman estos alimentos (comida chatarra y bebidas azucaradas).</p>	<p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <input type="checkbox"/> No sabe (2)</p> <p><i>Si la respuesta es "No" o "No sabe", pasar a la pregunta 12, si la respuesta es "Si",...</i></p> <p><input type="checkbox"/> Festivos o kermeses <input type="checkbox"/> Fiestas de cumpleaños <input type="checkbox"/> Días festivos o especiales <input type="checkbox"/> Todos los días <input type="checkbox"/> Otro/s: _____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>11. ¿El reglamento de la escuela prohíbe la venta o preparación de ciertos alimento y bebidas en el comedor, tienda o cualquier otro lugar de la escuela al que tengan acceso los alumnos?</p>	<p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <input type="checkbox"/> No sabe (2)</p> <p><i>Si la respuesta es "No" o "No sabe", pasar a la pregunta siguiente, si la respuesta es "Si",...</i></p>

<p>¿Estas reglas varían los diferentes días de la semana?</p> <p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <input type="checkbox"/> No sabe (2)</p> <p>Si la respuesta es "Si", especifique qué días y cuáles son las diferencias:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	
<p>12. ¿Algún porcentaje de las ventas de alimentos se destina a la escuela?</p> <p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1)</p> <p><i>Si la respuesta es "No", pasar a la pregunta siguiente, si la respuesta es "Si", ...</i></p> <p>¿Podría decirme que tipo de necesidades se cubren con este apoyo económico?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	
<p>13. ¿La escuela ha recibido visitas de autoridades que verifiquen la elaboración, venta y distribución de alimentos en la escuela?</p> <p>Indique por favor qué grupo o dependencia visitó la escuela</p> <p><input type="checkbox"/> Secretaría de Salud <input type="checkbox"/> Secretaría de Educación <input type="checkbox"/> Otra: _____</p>	
<p>14. En México existe una Norma que se llama "Acuerdo mediante el cual se establecen los lineamientos generales para el expendio y distribución de alimentos y bebidas preparados y procesados en las escuelas del Sistema Educativo Nacional" ¿Ha recibido información relacionada con este Acuerdo?</p> <p>A continuación voy a mencionarle diferentes personas e instituciones, indique cuál o cuáles de ellas le proporcionaron información respecto al Acuerdo.</p> <p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1)</p> <p><i>Si la respuesta es "No", pasar a la pregunta 16 y explicar con apoyo del resumen que está a continuación, si la respuesta es "Si" ...</i></p> <p><small>Resumen: El Acuerdo se creó el año 2010, su versión más actual es del año 2014. Incluye las características de los alimentos y bebidas que pueden o no estar disponibles en las escuelas, ya sea en el menú del comedor o lo que se vende en las cafeterías o tiendas. Recomienda y prohíbe ciertos alimentos de acuerdo a su calidad nutricional y para algunos de ellos especifica el tamaño límite de la porción por envase.</small></p> <p><input type="checkbox"/> Compañeros de trabajo <input type="checkbox"/> Medios de comunicación <input type="checkbox"/> Jefe o Superior gobierno <input type="checkbox"/> Autoridades de gobierno <input type="checkbox"/> Otro/s: _____</p>	
<p>15. ¿Ha recibido capacitación formal relacionada con el acuerdo anteriormente mencionado?</p> <p><input type="checkbox"/> No (0) <input type="checkbox"/> Si (1)</p> <p><i>Si la respuesta es "No", pasar a la siguiente pregunta, si la respuesta es "Si" ...</i></p>	

<p>A continuación, voy a mencionarle diferentes personas e instituciones, indique cuál o cuáles le proporcionaron capacitación relacionada al Acuerdo.</p>	<input type="checkbox"/> Secretaría de Educación <input type="checkbox"/> Secretaría de Salud <input type="checkbox"/> Compañeros de trabajo <input type="checkbox"/> Jefe o Superior Otro/s: _____
<p>16. De los siguientes grupos o personas, indique todos aquellos que considera pueden dificultar la aplicación del Acuerdo en esta escuela.</p>	<input type="checkbox"/> Padres de familia <input type="checkbox"/> Maestros de la escuela <input type="checkbox"/> Proveedores y vendedores <input type="checkbox"/> Autoridades de la escuela <input type="checkbox"/> Los alumnos <input type="checkbox"/> Otro/s: _____ <input type="checkbox"/> Autoridades e instituciones externas <i>Si no se selecciona alguna opción, pasar a la pregunta 19.</i>
<p>17. ¿De que forma cree que pueden dificultar la aplicación del Acuerdo los grupos o personas que indicó anteriormente?</p>	<input type="checkbox"/> Falta de apoyo económico <input type="checkbox"/> No están dispuestos a dar o recibir capacitación <input type="checkbox"/> Falta de interés humano <input type="checkbox"/> Falta de recurso humano <input type="checkbox"/> No conocen el Acuerdo Otro/s: _____
<p>18. ¿Qué cree que se puede hacer para mejorar lo anterior?</p>	_____ _____ _____ _____ _____ _____ _____
<p>19. A continuación voy a mencionarle algunas opciones, indique las que cree que pueden favorecer a la aplicación del Acuerdo.</p>	<input type="checkbox"/> Padres de familia <input type="checkbox"/> Proveedores y vendedores <input type="checkbox"/> Maestros de la escuela <input type="checkbox"/> Los alumnos <input type="checkbox"/> Otro/s: _____ <input type="checkbox"/> Autoridades de la escuela <input type="checkbox"/> Otro/s: _____ <input type="checkbox"/> Autoridades e instituciones externas <i>Si no se selecciona alguna opción, pasar a la pregunta 21.</i>

<p>20. ¿De qué manera cree que pueden favorecer ayudar a la aplicación del Acuerdo en la escuela los grupos y personas que indicó anteriormente?</p>	<input type="checkbox"/> Brindando apoyo <input type="checkbox"/> Mostrando interés <input type="checkbox"/> Estando dispuestos a dar o recibir capacitación	<input type="checkbox"/> Apoyando con recurso humano <input type="checkbox"/> Otro/s: _____	<input type="checkbox"/> Difundiendo información	
<p>21. Hasta antes de esta entrevista, ¿Había escuchado sobre este Acuerdo?</p>	<input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <i>Si la respuesta es "No", pasar a pregunta 27.</i>			
<p>22. ¿Cuenta con una copia impresa o digital del Acuerdo?</p>	<input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <i>Si la respuesta es "Si", solicitar copia y responda: ¿Existe copia? _____</i>			
<p>23. ¿Cree que la escuela está implementando lo contenido en el Acuerdo?</p>	<input type="checkbox"/> No (0)	<input type="checkbox"/> Si, apenas estamos iniciando trabajos para implementar (1)	<input type="checkbox"/> Si, llevamos tiempo trabajando en su implementación (1)	<input type="checkbox"/> Ya está completamente implementado o casi por completo (3)
<p>¿Desde qué fecha se han realizado trabajos para la implementación del Acuerdo?</p>	<i>Si la respuesta es "No", pasar a la pregunta siguiente, si la respuesta es "Si"...</i> Día _____ Mes _____ Año _____			
<p>24. ¿ Los maestros de la escuela tienen acceso a una copia impresa o digital del Acuerdo?</p>	<input type="checkbox"/> No (0)	<input type="checkbox"/> Si (1)	<input type="checkbox"/> No sabe (2)	
<p>25. ¿ Las personas responsables de la tienda o cafetería escolar tienen acceso a una copia impresa o digital del Acuerdo?</p>	<input type="checkbox"/> No (0)	<input type="checkbox"/> Si (1)	<input type="checkbox"/> No sabe (2)	
<p>26. ¿ Los padres de familia reciben algún tipo de información respecto al Acuerdo?</p>	<input type="checkbox"/> No (0)	<input type="checkbox"/> Si (1)	<input type="checkbox"/> No sabe (2)	
<p>27. ¿ Existe algún comité que regule la venta y distribución de alimentos y bebidas dentro de la escuela?</p>	<input type="checkbox"/> No (0)	<input type="checkbox"/> Si (1)	<input type="checkbox"/> No sabe (2)	
<p>28. Dentro de la escuela, ¿ Existe algún tipo de material de divulgación relacionado con el Acuerdo que hablamos?</p>	<input type="checkbox"/> No (0)	<input type="checkbox"/> Si (1)	<input type="checkbox"/> No sabe (2)	
<p>Comentarios: _____</p> <p>_____</p> <p>_____</p>				

Appendix 4: School Canteen Instrument

Alimentos Disponibles en la Tienda Escolar

Antes de llenar el cuestionario responda lo siguiente:

Este instrumento fue aplicado a: Tienda/Cooperativa Máquina expendedora Otro:

Alimento/Bebida	Categoría		
	Verde	Ambar	Rojo
Agua	<input type="checkbox"/>		
Frutas y verduras	<input type="checkbox"/>		
Jugo natural de frutas o verduras	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cereales integrales (amaranto, avena o granola)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Semillas y nueces	<input type="checkbox"/>		
Leguminosas secas (cacahuates, habas)	<input type="checkbox"/>		
Leche	<input type="checkbox"/>		
Bebidas a base de leche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bebidas deportivas o energéticas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bebidas de soya	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quesos de refrigerio	<input type="checkbox"/>		
Néctares y jugos procesados			
Tés, refrescos y otras bebidas azucaradas			
Botanas (papas fritas y otros alimentos procesados salados)			
Galletas, pastelitos, dulces y postres			

Alimento/Bebida	Categoría		
	Verde	Ambar	Rojo
Sándwich	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quesadillas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tacos y burritos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sopa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bolis, nieve o paletas de hielo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Duros (fritura de maíz)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pizza	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Molletes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pepihuates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tamales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Torta	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Otros:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

100% (o cerca del 100%) de los artículos disponibles en la tienda escolar están clasificados en verde o ámbar SI NO

Al menos 50% de los artículos disponibles en la tienda escolar están clasificados como verde o ámbar SI NO

Appendix 5: Breakfast Menu Instrument

Contenido del Menú de Desayunos/Comidas Escolares		
Verde	Ambar	Rojo
Alimentos utilizados para la elaboración de platillos		
Verduras <input type="checkbox"/>		
Cereales integrales o de grano entero <input type="checkbox"/>		Cereales que no son integrales o de grano entero (tortilla de harina, pasta, etc.) <input type="checkbox"/>
Leguminosas o Productos de origen animal (carne de res, pollo, cerdo, etc.) <input type="checkbox"/>		Embutidos y otros productos de origen animal con alto contenido de sodio <input type="checkbox"/>
Frutas <input type="checkbox"/>		
Agua simple <input type="checkbox"/>		
Atoles a base de cereales integrales (avena, amaranto, cebada, arroz) <input type="checkbox"/>		Atoles a base de cereales NO integrales (fécula de maíz, galleta, etc.) <input type="checkbox"/>
Fruta deshidratada <input type="checkbox"/>		Mantequilla o Crema <input type="checkbox"/>
Semillas y nueces <input type="checkbox"/>		

Otros alimentos agregados al menú	
Verde	Ámbar
	<input type="checkbox"/> Jugos de fruta/verduras 100% natural y sin azúcar añadida
	<input type="checkbox"/> Néctares y jugos procesados
	<input type="checkbox"/> Néctares y jugos procesados con edulcorantes
	<input type="checkbox"/> Tés, refrescos y otras bebidas azucaradas no lácteas
	<input type="checkbox"/> Tés, refrescos y otras bebidas azucaradas no lácteas con edulcorantes
	<input type="checkbox"/> Quesos para refrigerio altos en grasas y/o sodio
<input type="checkbox"/> Quesos para refrigerio bajos en grasas y sodio	<input type="checkbox"/> Leche entera, semi o descremada con edulcorantes artificiales
<input type="checkbox"/> Leche entera, semi o descremada sin azúcar añadida	<input type="checkbox"/> Bebidas de soya con edulcorantes artificiales
<input type="checkbox"/> Bebidas de soya sin azúcar añadida	<input type="checkbox"/> Bebidas de soya con azúcar añadida
	<input type="checkbox"/> Botanas (papas fritas y otros alimentos procesados salados)
	<input type="checkbox"/> Galletas, pastelitos, confites y postres
Otros:	<input type="checkbox"/>

<p>100% (o cerca del 100%) de los alimentos incluidos en el menú escolar están clasificados en verde o ámbar</p> <p style="text-align: center;">↑</p>	<input type="checkbox"/> SI	<input type="checkbox"/> NO
<p>Al menos 50% de los alimentos incluidos en el menú escolar están clasificados como verde o ámbar</p> <p style="text-align: center;">↑</p>	<input type="checkbox"/> SI	<input type="checkbox"/> NO

Appendix 6: Structural Evaluation Based on Observation

Evaluación Estructural en Base a la Observación	
Reactivo	Respuesta
1. ¿Se observa publicidad dirigida a bebidas y/o alimentos procesados en la escuela?	<input type="checkbox"/> No (0) <input type="checkbox"/> Si (1)
2. ¿Se observan publicaciones referentes a lo que indica el Acuerdo dentro de la escuela?	<input type="checkbox"/> No (0) <input type="checkbox"/> Si (1)
3. ¿Se observan vendedores ambulantes al exterior de la escuela? <i>Considerar solo aquellos puestos/vendedores ambulantes en la misma calle frente a la escuela</i>	<input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <i>Si la respuesta es "No", pasar a la pregunta 4, si la respuesta es "Si" ...</i>
Número de puestos/vendedores ambulantes al exterior de la escuela: _____	
Categoría en la que se encuentran la mayoría de los alimentos en los puestos ambulantes al exterior de la escuela:	<input type="checkbox"/> Rojo SSBs y HSFAS (0) <input type="checkbox"/> Ámbar Jugos de fruta s/azúcar (1) <input type="checkbox"/> Verde Vegetales, Cereales enteros (2)
4. ¿Existen bebederos o algún tipo de acceso al agua potable gratuita en la escuela?	<input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <i>Si la respuesta es "No", omita el resto de las preguntas, si la respuesta es "Si" ...</i>
Especifique cuántos bebederos o fuentes de agua potable observó: _____	
¿Todos los bebederos o fuentes son funcionales?	<input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <i>Si la respuesta es "No", Especifique cuántos son funcionales: _____</i>
¿Todos los bebederos o fuentes están limpios?	<input type="checkbox"/> No (0) <input type="checkbox"/> Si (1) <i>Si la respuesta es "No", Especifique cuántos están limpios: _____</i>
FOTOGRAFÍAS INCLUIDAS EN EL REGISTRO:	
2 Fotografías del exterior (vendedores ambulantes)	<input type="checkbox"/> Si <input type="checkbox"/> No Comentarios:
2 Fotografías de la tienda escolar	<input type="checkbox"/> Si <input type="checkbox"/> No
2 Fotografías de publicidad (SSBs o HSFAS)	<input type="checkbox"/> Si <input type="checkbox"/> No
2 Fotografías de publicaciones que promuevan hábitos saludables	<input type="checkbox"/> Si <input type="checkbox"/> No

Appendix 7: Non-Participation Survey

Instrucciones: En el dado caso que las autoridades responsables de la escuela rechacen su participación en el estudio, solicitar de la manera más amable la siguiente información:

ENCUESTA DE NO PARTICIPACIÓN

"Gracias por su tiempo, antes de irnos quisieramos que nos ayude a responder 3 preguntas rápidas, nos sería de mucha ayuda"

1. ¿El reglamento escolar incluye políticas que regulen el consumo de comida chatarra y bebidas azucaradas?
 No (0) Si (1) No sabe (2)

2. ¿Considera que las fuentes de agua disponibles son suficientes para los alumnos de esta escuela?
 No (0) Si (1) No sabe (2)

3. En México existe una Norma que se llama "Acuerdo mediante el cual se establecen los lineamientos generales para el expendio y distribución de alimentos y bebidas preparados y procesados en las escuelas del Sistema Educativo Nacional"
¿Ha recibido información relacionada con este Acuerdo?
 No (0) Si (1)

Appendix 8: Checklist

CHECK LIST DE VISITA

PASO 1 (Antes de la visita):

- Materiales (7)
- Hoja de identificación (sección 1)
- Asignar folios
- Portar gafete

PASO 2 (Al llegar):

- Hoja de identificación (sección 3)
- Entrar a la escuela (buscar director)
- Acceso negado

PASO 3 (Al entrar):

- Presentarse
- Beneficios del estudio
- Consentimiento informado
- Firma o Encuesta de no participación
- Hoja de identificación (sección 2)

PASO 4 (Entrevista):

- Anonimato
- Explicar dinámica

PASO 5 (Menú escolar):

- Formato de Menú
- Canalizar con responsable
- Vía correo (anotar)

PASO 6 (Tiendita escolar):

- Ir a la/s tiendita/s
- Fotos de tiendita
- Formato de tienditas
- ¿Existe otro lugar?

PASO 7 (Evaluación estructural):

- Evaluación estructural
- Fotos de publicidad y del Acuerdo

PASO 8 (Despedida):

- Agradecimiento
- Envío de informe
- Formatos completos
- Salir
- Fotos de vendedores ambulantes