

Research Article

Assessing the Healthiness of Physical Environment and Food Business at the Female Section of King Abdulaziz University

Elham Aljaaly

Department of Clinical Nutrition, King Abdulaziz University, Jeddah, Saudi Arabia

Abstract

Background: Research has demonstrated that eating patterns are strongly influenced by the physical environment and students are more likely to eat foods that are available and easily accessible. Taking the responsibility for running university meals should be based on a healthy foundation. **Methods:** In this study, we conducted a survey on the physical environment and food business at the King Abdulaziz University's Female Section in Saudi Arabia (KAU). We visited 11 food premises "including the main cafeteria" at the female section **aiming** to assess its equipment, hygiene status and the healthiness' of food/beverage options available and served during the academic year 2013-2014 using a Nutrient Profiling (NP) model. **Results:** Of the analysed food and beverage items (n = 191), 74.3% (n = 142) were classified as high in saturated fat, salt or sugar (HFSS) with a low rate of fruit and vegetable' items. Some food items did not meet the criteria for the NP analysis and they were considered as unclassified items. All food premises were adequately equipped and some food premises did not achieve the general requirements for food hygiene that is internationally recognized, while the main cafeteria of the KAU's Female Section achieved the requirements of food hygiene. **Conclusion:** A novel aspect of the study is the objective assessment of the available and served food and drink items at KAU using the UK FSA NP system (UK FSA NP System: A Nutrient Profiling Model that was developed for the United Kingdom Food Standards Agency). It is anticipated that the findings of this research will serve as an impetus for providing appropriate nutrition services for female students at KAU.

Keywords: Physical Environment, Food Premises, Nutrient Profiling, Food Hygiene, HFSS Food

1. Introduction

Healthy eating or the consumption of a healthy diet plan consists of foods that are varied and at the same time provides energy and nutrients to cover all the body

Corresponding Author: Elham Aljaaly; email: ealjaaly@kau.edu.sa

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requirements. This is in order to maintain good nutritional status. It is well established nowadays that healthy eating and physical activity are the key components in the promotion and maintenance of good health and disease prevention. The type of food we consume, the place where we access food, the structure of food, the type and number of meals per day and places where we shop food may affect our eating patterns [18, 20, 23]. Similarly, physical activities performed at work, universities or schools can affect food patterns. Work environment, study places for students, availability of shopping centres, leisure, and travel have an impact on food patterns [19]. World Health Organization (WHO) documented that physical inactivity is a worldwide problem that negatively affects the population's health. WHO's recommended goals and priority actions for countries to improve active living and National Saudi studies confirmed this recommendations (Al-Hazzaa, 2002).

In university (UNI), students become more independent and make their own decisions about food choice. They live a self-governing life after they pass their adolescence stage [15]. Studies have demonstrated that students' eating patterns are strongly influenced by both the physical and the social environment. They mostly eat food that are available and easily accessible at the food stores in their UNIs. The meals available at UNIs are mostly fast food meals that have superior energy and oversized portions of food than home-based meals. These food lead to affect the total energy intake and subsequently the weight status of individuals [20]. College students who age 19 to 25 years consume mostly fast food and the topmost causes described for its consumption were suitability and price [16]. Overweight and obesity were also found to be present in 25% of female students of those (74.5%) who were consuming fast food in a frequent of 1-2 times per week [1]. Meals are habitually skipped by college students, mainly breakfast [25]. Saudi male students at a vocational institution in Riyadh city, regularly skip dinner, lunch, and breakfast in a percentage of 28%, 20%, and 15% respectively, and 72.4% of them regularly eats between meals [9]. Fried food are consumed by almost half (46.8%) of Saudi college students at least three times a week [8].

Concerning physical environment, previous research found positive associations between closeness to food provisions and individuals' dietary patterns and weight grade [20]. Physical environment for high school Saudi female students, including places where they can access food and drinks, performing physical activities could cause students to promote unhealthy eating behaviours and lifestyle [5]. This behaviours could continue after the move from high schools to universities [12]. It

also emphasize the crucial role and commitment of decision makers in caring about student consumers through given healthy environment in universities.

Educational institutes are vital settings for modelling healthier eating choices amongst students. It is particularly important to consider meals and snacks provided to UNI students and their nutritional standards in addition to factors affecting the quality of these meals such as the quality of the UNI catering, cost and type of nutrients provided by each caterer. It is also important to know if there is any supervision on these meals or snacks considered by the UNI administration [12].

Universities and colleges should commit to achieve high standards of food safety and quality. For food premises that are located in UNIs to provide high standards of food and drink items, they should equip their premises very well, employ a well-trained staff, operate clean hygienic premises and have strong policies to apply in this matter. Moreover, all University premises or under the control of the University, whether run by the University or by external Catering Providers should have their own polices to control services of these premises [11].

Despite growing correlational and measurement research about environments and physical activity, few resourceful (unpublished) studies have evaluated the KAU's Female Section's environment based on population physical activity levels and the nature of food and beverages available at the section. Moreover, using the FSA's Nutrient Profiling system for food analysis among Saudi universities was not reported. Therefore, understanding the actual physical environment for one of the leader universities in Saudi Arabia, which might have an impact on UNI students' nutrition, and health status was the aim of this study. In addition and as part of this study, the characteristics of food premises and their provided and served food and beverage items were examined using objective data.

2. Methods

2.1. Settings, Data Collection & Evaluation Tools

This cross-sectional survey used a screening and evaluating approaches, intended to screen the physical environment and analyse food and beverage items available and provided by (all available) 10 food premises (Pizza Now, Cristy's Bakery & Restaurant, Panino's, Joffreys, Al Anab Cafeteria, Rhaps Restaurant, Movenpick, Kwalitty Ice-cream, Mochachino & KNZ Restaurant) and the main cafeteria at the King Abdulaziz University (KAU's UNI) Female Section in Jeddah City, Saudi Arabia. The study tools were onsite

visits to the KAU's Female Section & Sports' Tent (Sports' Tent at KAU was opened by the King Khalid bin Abdul Aziz in 1980. The area is about 100 × 80 m and holds 2000 chairs and suggests many sports events, including several stadiums: Basketball, handball, volleyball, badminton, table tennis, Judo, Karate and free training. Available at: https://sports-tent.kau.edu.sa/Default.aspx?Site_ID = 806&Lng=AR) and an actual one-day sample menus or self-observed and recorded food and drink items for 3 whole academic days. All provided food and drink items were then analysed using the NP scoring system that was developed by the UK FSA for assessing processed foods in schools [17] following the NP recommended guidelines [14]. The model was used previously to assess meals and snack food options at Saudi schools [2].

The screening of hygiene and safety status of each food store was carried out by using simple general requirements that was adapted from Cambridge University Food Safety Policy [11] and modified for a screening purpose only in the present study. Screening included the availability of written and practiced policies for food production, handling, storage and transportation using a simple check list. This included the design of the food store, tidying away of garbage and recyclable stuff, ventilation, lighting and floors walls and ceilings.

The research team also screened all equipment used to serve food items. Screening included list of availability of some equipment such as freezers, fridges, toasters, microwaves, blenders, fryers, coffee machines, ventilators, burger machines and crepe machines as recommended by Southern Nevada Health District for equipment [22] and facilities general requirements (<http://www.southernnevadahealthdistrict.org/food-establishments/food-establishment.php>) and guidelines for [10], which was used with modification to the present study.

In addition, personal contacts with all principal providers in all canteens and KAU supervisors for all contracts were the other sources of information about equipment, food hygiene and students' meals and snacks provided in the female section. Other information about physical environment such as Sports' Tent was obtained from the responsible female section's administrators. The study was carried out in the academic year 2013/2014.

2.1.1. Statistical analysis

All statistical analysis was conducted & calculated using Excel sheets.

2.1.2. Permission for Conducting the Research

The study protocol was approved by the Research Ethics Committee at the Faculty for Medical Applied Sciences, King Abdulaziz University in Jeddah City, Saudi Arabia. Permissions to administer this survey at the KAU's Female Section was granted by the Dean of the Women Section. Then, the permission of all food providers at the female section to collect data from their food premises, were taken personally by the main investigator before gathering data.

2.2. Research Objectives

The methods approach used to fulfil the principal aim and the objectives of this study as follows:

- To assess the physical environment at the KAU' Female Section based on accessible food and places for possible physical activities.
- To assess equipment and hygiene of the UNI's food stores and main cafeteria at the KAU' Female Section.
- To analyse the food options prepared and served by all caterers and the main cafeteria at the KAU' Female Section.

3. Results

3.1. Physical Environment at the KAU's Female Section

Concerning physical activities, and based on personal observation & personal contacts with the female section's administrator of the Sports' Tent, students at female section has an access to the KAU Sports' Tent. Students can participate in variety of sports such as football, volley ball, basketball, and tennis. The Sports' Tent is also prepared for sports events, and a number of competitions between colleges and different departments are carried out throughout the academic year. The Sports' Tent is fans fully air conditioned and has a big stadium for public. Morning times are assigned for female students to access the Sports' Tent and the afternoon time is allocated for the female academic staff. For all females, they need to get a membership to access the Sports' Tent. In order to be a member, they need to fill out a specific form that include a number of questions concerning their personal & family health history and the level of physical activity they perform and the type of sports they practice at home. Moreover, the female section is considered a very big area that has open spaces between buildings, which facilitates walking for long distances inside the campus.

3.1.1. Equipment & Hygiene of Food Stores at KAU's Female Section

Private caterers were operating, their own food premises, while the KAU main cafeteria was operated by Knight's Strong Company (ALFARES ALGAWI), which was well equipped according to the defined check list for equipment for the surveyed food premises in this study. The list of equipment included Freezers, Fridges, Toasters, Microwave, Blenders, Fryers, Coffee Machines, Burger Machines, Crepe Machines and a Ventilation System.

Table 1 presents the available equipment at the ten surveyed food premises excluding the main cafeteria. All premises are equipped with freezers & fridges except Al' Anab cafeteria that has no freezer. Toasters were available in 40% of the stores. Only Rhaps Restaurant had burger machine and Al' Anab cafeteria had crepe machines. Eight of the premises were equipped with microwaves and six of them had coffee machines and blenders. Fryers were available in three food premises. Ventilators systems were existed in 70% of the food premises.

Based on the study's general screening check lists for equipment and primary standards for food safety and hygiene of KAU's food premises, **Table 2** lists some observation to be considered for some of the surveyed food premises.

3.1.2. Meal and Snack Food Options Prepared and Served by the Caterers in the Female Section

Among the internationally known food premises and the Main Restaurant at the KAU's Female Section, 208 food and drink items were available for analysis. However, only 92% (n = 191) items were analysed because of the availability of nutrition information for these items. **Table 3** presents the results of analysis for all food and drink items. About 90.8% of the items were classified to either HFSS or Non-HFSS, while the rest of items were unclassified due to the unavailability of the item's nutrition information in the local market or the mother company. Of the analysed food and drink items (n = 191), 142 (74.3%) were HFSS, 36 (18.8%) items were non-HFSS and the rest of items (6.8%, n = 13) did not meet the criteria for the NP analysis. Therefore, they were considered as unclassified items.

4. Discussion

The overall objective of the study was to look at the physical environment & food business at KAU's Female Section in Saudi Arabia. In her review that aimed to present a theoretical structure that could guide researchers to understand factors that have an impact on eating behaviours in 2002, Mary Story has considered that the physical environment within the community 'particularly educational institutes' influences accessibility and availability of foods, and they are considered the most influential in affecting food choice of individuals. Moreover, the UNIs' students spend most of their time in UNIs, which might bound their food choices from the available brands in these UNIs. As a result, the physical environment is considered as an external context that has an effect on the students making decisions [20]. Saudi medical students (n = 194) at Taibah University in Madinah reported to consume high intakes of carbohydrates (72.1%) and lower intake of fats (19.4%) and proteins (8.4%) with low intake of fibres [7]. The observed KAU environment concluded that female students have an access to the Sport' Tent irrespective of their non-access to sports services when they were at high school [2]. KAU's female students also have wide areas to practice walking while travelling from one building to another to take lectures. In addition, food and

	Freezer	Fridge	Toaster	Microwave	Blender	Fryer	Coffee Machine	Ventilation	Burger Machine	Crepe Machines
1. Pizza Now	Available	Available	Unavailable	Available	Available	Available	Available	Available	Unavailable	Unavailable
2. Al Anab Cafeteria	Unavailable	Available	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Available
3. Panino's	Available	Available	Available	Available	Unavailable	Available	Unavailable	Available	Unavailable	Unavailable
4. Joffreys	Available	Available	Unavailable	Available	Available	Unavailable	Available	Available	Unavailable	Unavailable
5. Movenpick	Available	Available	Unavailable	Unavailable	Available	Unavailable	Unavailable	Available	Unavailable	Unavailable
6. Kwaliti Ice-cream	Available	Available	Unavailable	Available	Available	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable
7. Rhaps Restaurant	Available	Available	Unavailable	Available	Unavailable	Available	Available	Available	Available	Unavailable
8. Cristy's Bakery & Restaurant	Available	Available	Available	Available	Available	Unavailable	Available	Available	Unavailable	Unavailable
9. Knz Restaurant	Available	Available	Available	Available	Unavailable	Unavailable	Available	Available	Unavailable	Unavailable
10. Mochachino food stores	Available	Available	Available	Available	Available	Available	Available	Available	Unavailable	Unavailable

TABLE 1: Availability of equipment in food premises.

Food Premises	Observations to be considered on Equipment and Food Safety & Hygiene for food premises
1. Pizza Now	The design and construction of the premises was inappropriate for the activities needed for the food business to be conducted as the used space was very strict. This is was clearly affecting the fittings for equipment used for those activities and could not permit effective cleaning and sanitation. The floor was wet and inappropriately cleaned. There was only one small ventilator machine, which could not allow effective removal of smokes, condensation and vapors from the food building.
2. Al Anab Cafeteria	No enough containers to keep the garbage of the food store, which could not allow for easy and effective cleaning. The place of preparing food was very small for conducting activities of food preparation and services.
3. Panino's	No observations to be considered
4. Joffreys	According to international Standards, food premises are obligated to be equipped with a light system that provides necessary natural or artificial light for the activities to be conducted on the food premises. However, the lighting system in the store was insufficient for necessary food services for students
5. Movenpick	No observations to be considered
6. Kwaliti Ice-cream	No observations to be considered
7. Rhaps Restaurant	The floor was wet and transiently cleared, the ventilation system was insufficient to remove, smoke, steam and vapours effectively.
8. Cristy's Bakery & Restaurant	No observations to be considered
9. Knz Restaurant	No observations to be considered
10. Mochachino food stores	The lighting system was insufficient for the activities to be conducted
The Main Cafeteria	No observations to be considered.

TABLE 2: Show observed notes for each premises.

drink items available in the female medical Centre at KAU includes both healthy and unhealthy choices. Therefore, the environment of the Female Section at King Abdulaziz University could play an important role in students' food choice and lifestyle.

The food premises at universities should achieve the maximum standards of food safety and quality by including a highly trained staff, working in clean sanitized

Values per 100 g for foods and 100 ml for beverages			
	Food & drink items (n = 208)	HFSS% (n = 142)	Non- HFSS% (n = 36)
Pizza now	59	89.8%	10.2%
Al'Anab	7	71.4%	28.6%
Movenpick	11	90.9%	9.1%
Rhapis	17	88.2%	11.8%
KNZ Restaurant	17	82.4%	17.6%
Joffreys	17	70.6%	29.4%
Panino's	17	Unclassified	Unclassified
Cristy's Restaurant	15	80%	20%
Mochachino food stores	20	75%	25%
Kwality Ice-cream	11	90.9%	9.1%
Main Cafeteria	17	52.9%	47.1%

TABLE 3: The Percentage of HFSS and NON HFSS for all Surveyed Restaurants. Note: The total no. for the analyzed food & drink items (191 items), ** The total no. for HFSS food & drink items = 142 (74.3%) items, ** The total no. for Non-HFSS food & drink items = 36 (18.8%) items, ** The total no. for unclassified items = 13 (6.8%) items.

premises. They should also need to have clear policies related to catering providers "those are either self-operating their services or have their services run by the university [11]. Results of the present study showed clearly that all food premises at the KAU's Female Section are fairly well equipped with the basic equipment that is needed for food premises to serve a pre-prepared food or food that need preparation such as those served in the Main cafeteria. Hygiene status of the food provisions at the female section was evaluated and comparisons were made with international criteria for food hygiene status. However, comparison to national guidelines 'if available' is needed. Results showed that some basic guidelines that are needed to have a good hygiene status were not followed in some food premises. This include wet floors, inappropriate cleaning and insufficient ventilation system.

In order to evaluate the healthiness' of food/drink items at KAU food premises, the study analysis looked at different categorization of foods/drinks based on saturated fat, sugar and salt. This was done by using the developed nutrient profile model for the UK Food Standards Agency that powered the analysis and allowed for food/drink items

to be assessed objectively rather than relying on value results regarding the relative 'healthiness' of different foods within groups [21]. The model was also evidenced to classify foods in agreement with the views of health professionals, particularly nutrition practitioners [21]. The study involved the collection of original data focusing on the nature of meals and snacks served by food premises at the KAU's Female Section. Analysed data using the UK NP concluded that the served food and drink items were mainly (74%) high in saturated fat, sugar and salt (HFSS) with a low rate of fruit and vegetables. Similar results found previously when meals and snack options at Jeddah schools for girls (high & intermediate) were analysed in the academic year 2008-2009. The study revealed that 67.5% of the analysed food/drink items were HFSS [2]. The same school girls were exposed to food advertising "on the most watched TV channels" that was (70%) HFSS foods [4, 6].

This means that Saudi girls are exposed to HFSS food and drink items at school and university levels, without enough intake of fruit and vegetables.

5. Strength & Limitation of the Study

It is vital to highlight some **limitations** to this study as follows:

1. The study did not evaluate in depth the role and policies of KAU administration in supervising and controlling the food business and services provided by contractors. Therefore, further investigation is needed.
2. The study used a quick and general screening check lists that were primarily adapted from other sources to evaluate equipment and food safety and hygiene of KAU's food premises. However, further studies is needed to evaluate in depth the compliance of KAU's food premises with a defined national and international standards and policies. They also need to evaluate how well the staff are trained to handle and serve food and operate a clean hygienic premises. In spite of its limitations, the study has highlighted the need to periodically assess university's meals and snacks options and to encourage all caterers to provide healthier food items that are served in a clean hygiene environment that is in accordance with national and international standards

5.1. Strength

“To our knowledge”, there is no published research examining the characteristics of food and beverage items at KAU’s Female Section. As part of this study, we were interested to examine and determine the characteristics of food and beverage items provided and served at KAU’s Female Section, using the FSA Nutrient Profiling system and on an objective data from actual sample menus for meals and snacks, or from a list of an observed and recorded food and beverage items from all food suppliers at the section.

6. Conclusion, Recommendations & Implications

- This cross-sectional survey is the first to determine the nature, characteristics and the content of food and beverages items provided and served at Female Section at KAU.
- There are big facilities for physical activities to be performed such as the Sports’ Tent and the wide areas to walk while travelling from one building to another.
- Results confirmed that there is a considerable amount of food and beverages that are HFSS at the KAU’s Female Section.
- Food premises at the section are satisfactorily equipped. Fifty percent of the international premises did not achieve the general requirements of food hygiene that is internationally recognized while the Centre Restaurant of KAU’s Female Section achieved the requirements of food hygiene.
- In order to improve KAU’s Female Section’s levels of physical activity, a further national research work on improving the evidence-base interventions on physical activity of female university students is vital. Establishing national expenses to promote projects and policies for the development of conditions for the physical activities in university life is also needed.
- Polices “if not available” to control services of food premises are needed to be applied. Moreover, all university premises or under the control of the university, whether run by the university or by external catering providers should have their own polices to control services of these premises.
- A periodic evaluation and supervision on all foods available at the female section should be conducted continuously for these premises using a standard methods of evaluation such as nutrient profiles.

7. Some Terms and Definitions Used in the Study

7.1. The Environment

Environments such as physical and social are playing main parts in the health and nutrition of persons and societies. The air, water, and soil are the main components of **physical environment** through, which exposure to chemical, biological, and physical agents may occur.

7.2. Beverages

Is a liquid substance which is specifically prepared for human consumption (drinking).

7.3. Nutrient Profiling Used in this Study

Nutrient profiling (NP) developed by the UK Food Standards Agency (FSA) was suggested to be imposed in secondary schools in 2009 (Simpson et al., 2006). The nutrient profiling model was developed by FSA in 2003 for use in relation to the promotion of foods to children. Moreover, the model was used in relation to provision of foods through vending machines and for school lunches (Rayner et al., 2004).

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9. Competing Interests

The authors have declared that no competing interests exist.

References

- [1] Alfawaz H. The relationship between fast food consumption and BMI among university female students. *Pak J Nutr*, 2012; 11, pp.406-10.
- [2] Aljaaly E (a). Physical Activities of Young Girls in Jeddah, Saudi Arabia. *Arab Journal of Nutrition and Exercise* 2016 -ISSN: 2518-6590, 1(3), 174-186.
- [3] Aljaaly EA, Khalifa NA & Badreldin AM. Assessing girls' school meals and snack food options in Saudi Arabia using the UK food standards agency nutrient-profiling model'. *International Journal of Food, Nutrition and Public Health* 2016; 8(1).
- [4] Aljaaly, E (b). The impact of media and advertising of food on the eating behaviour of adolescent girls in Jeddah, Saudi Arabia/Impact des médias et de la publicité pour les produits alimentaires sur les comportements alimentaires des adolescentes à Djeddah (Arabie saoudite). *Eastern Mediterranean Health Journal* 2016; 22(9), 662. http://applications.emro.who.int/emhj/v22/09/EMHJ_2016_22_09_662_667.pdf
- [5] Aljaaly E. Eating patterns and nutritional behaviours of Saudi young girls: influences and contributing factors'. *International Journal of Food, Nutrition and Public Health* 2015; 7(2).
- [6] Aljaaly E. Advertising watched by adolescent girls in Saudi Arabia', *International Journal of Food, Nutrition and Public Health (IJFNPH)* 2012; Vol. 5, No. 4, pp.249-263.
- [7] Allam AR, Taha IM, Al-Nozha OM & Sultan IE. Nutritional and health status of medical students at a university in Northwestern Saudi Arabia. *Saudi Med J* 2012; 33(12), 1296-303.
- [8] Al-Rethaiaa AS, Fahmy AEA & Al-Shwaiyat N. Obesity and eating habits among college students in Saudi Arabia: a cross sectional study. *Nutrition journal* 2010; 9(1), 39.
- [9] Al-Sudairy A and Howard K. Dietary habits of technical and vocational students in Riyadh, Saudi Arabia-I Meal skipping. *Journal of the Royal Society of Health* 1992; 112 (5): pp.217-218
- [10] Australia New Zealand Food Authority. Safe food Australia: a guide to the food safety standards/ Australia New Zealand Food Authority Canberra. Standard 3.2.3 "Food Premises and Equipment 2001. http://www.foodstandards.gov.au/_srcfiles/complete_safefood.pdf

- [11] Cambridge University. University Food Safety Policy, Food Safety Series 2012. Available at: http://www.unicen.cam.ac.uk/files/university_food_safety_policy_sep12.pdf.
- [12] Deliens T, Clarys P, De Bourdeaudhuij I. and Deforche B. Determinants of eating behaviour in university students: a qualitative study using focus group discussions. *BMC public health* 2014; 14(1): p.53. <http://doi.org/10.1186/1471-2458-14-53>.
- [13] Department of Health, The nutrient profiling model. 14 January 2011. Available at: <https://www.gov.uk/government/publications/the-nutrient-profiling-model>
- [14] Department of Health. The public health responsibility deal.UK (2011) Available at: ["http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_125237.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_125237.pdf).
- [15] Deshpande S., Basil MD and Basil DZ. Factors influencing healthy eating habits among college students: An application of the health belief model. *Health marketing quarterly* 2009; 26(2): pp.145-164.
- [16] Driskell JA, Kim YN and Goebel KJ. Few differences found in the typical eating and physical activity habits of lower-level and upper-level university students. *Journal of the American Dietetic Association* 2005; 105(5): pp.798-801.
- [17] FSA. Review of the Agency Nutrient Profiling Model: Executive Summary, 25 March 2009, Food Standard Agency, UK, Available at: <http://collections.europarchive.org/tna/20100927130941/http://food.gov.uk/>
- [18] Livingstone S and Helsper E. Advertising foods to children: Understanding promotion in the context of children's daily lives. A review of the literature prepared for the Research Department of the Office of Communications (OFCOM), 2004.
- [19] Morton KL, Atkin AJ, Corder K, Suhrcke M and Sluijs EMF. The school environment and adolescent physical activity and sedentary behaviour: a mixed-studies systematic review. *Obesity reviews* 2016; 17(2): pp.142-158. <http://doi.org/10.1111/obr.12352>
- [20] Popkin BM, Duffey K and Gordon-Larsen P. Environmental influences on food choice, physical activity and energy balance. *Physiology & behavior* 2005; 86(5): pp.603-613.
- [21] Scarborough P, Boxer A, Rayner M and Stockley L. Testing nutrient profile models using data from a survey of nutrition professionals. *Public health nutrition* 2007; 10(4): pp.337-345.
- [22] Southern Nevada Health District (SNHD) for equipment and facilities (2017). Equipment and Facilities General Requirements available at: http://www.southernnevadahealthdistrict.org/download/eh/plan_review/food-establishment.pdf

- [23] Story M, Kaphingst KM, Robinson-O'Brien R and Glanz K. Creating healthy food and eating environments: policy and environmental approaches. *Annu. Rev. Public Health* 2008; 29: pp.253-272.
- [24] Story M, Neumark-Sztainer D and French S. Individual and environmental influences on adolescent eating behaviors. *Journal of the American Dietetic Association* 2002; 102(3): pp.S40-S51.
- [25] Trockel MT, Barnes MD and Egget DL. Health-related variables and academic performance among first-year college students: implications for sleep and other behaviors. *Journal of American college health* 2000; 49(3): pp.125-131.