



FOOD ENVIRONMENT AND THE IMPACT ON FOOD CONSUMPTION

Our obesogenic environment is tempting us to perform unhealthy behaviors, leading to overweight and obesity. This environment is a complex system of interactions between multiple environmental characteristics. As the level of urbanization is increasing, more individuals will be exposed to the same environment. This further endorses the relevance to better understand the relationship between the environment and health behaviors. In this current issue, the first article written by Jean-Michel Lecerf provides a comprehensive overview of several types of environments and their impact on metabolism with respect of obesity.

The impact of the food environment on obesity is, among others, influenced by economic welfare and sociocultural differences. Most studies are conducted in high-income countries, but Raquel de Deus Mendonça *et al.* did a study in a middle-to-high income country, Brazil. They

found that the availability of a greater diversity of fruits and high-quality vegetables in shops and markets positively influences the diversity as well as the quantity of fruit and vegetables intake.

Further, Evangelia Mylona *et al.* emphasize the importance of accessibility to fast food restaurants and green space areas in the living environment. This study clearly illustrates that obesity is clustered in neighborhoods with high accessibility to fast food restaurants. In contrast, the lowest obesity rates were found in neighborhood with the highest accessibility to green space areas.

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Environment and obesity

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In this literature review, the word 'environment' is meant to be understood in its broad sense, as referring to everything that comes from the exterior, i.e. the surroundings of humans. This definition takes into account the multiple determinants that act either by influencing the content of food intake or physical activity, or via other mechanisms (epigenetic, for example). This approach focuses on the reasons motivating what people eat, not just the end result. The authors classify the various determinants into:

- factors related to housing and transport,
- factors related to screens,
- factors of agri-food origin,
- factors related to marketing, advertising and the media,
- factors related to the neighbourhood,
- educational factors, etc.

Some other minor factors are also considered, such as exposure to light, although their impact is not truly assessed. Others, such as stress, mode of delivery and breastfeeding, sleep loss and weight-loss programmes, are not mentioned.

Factors related to screens

Of the most documented new factors, screens were found to play an extremely negative role. In subjects who watch three hours of television per day, the prevalence of overweight is practically doubled. The use of screens is accompanied by snacking and sleep loss, while being responsible for a 5% to 15% increase in body weight. In these conditions, snacking on junk food increases calorie intake by more than 20%. Servings' sizes and the consumption of sugar-sweetened beverages also play a role.

Socio-family environment

The socio-family environment is a major contributor to the risk of obesity: low incomes, place of residence and family habits all play a role. For example, twins adopted by different families will tend to gain weight if the adoptive parents (father and mother) are overweight. This does not rule out the role of genetics or epigenetics, in particular exposure to exogenous environmental contaminants, especially during the prenatal period.

Possible mechanisms of action

The author discusses the potential mechanisms of action of environmental factors. Of course, he mentions the microbiota and its numerous modulators. It is known that its composition depends on the mode of delivery, breastfeeding, diet, medications, etc. However, there are significant similarities between people living in the same household, which can interfere with family nutritional or genetic factors. The microbiota influences the expression of anti-obesity factors such as brain-derived neurotrophic factor (BDNF) and glucagon-like peptide-1 (GLP1), as well as the production of bacterial peptide metabolites having an anorectic effect similar to that of α MSH.

The author also draws attention to emerging factors such as the role of stress and its involvement in insulin resistance and therefore in metabolic syndrome.

In conclusion, this work had the merit of demonstrating the complex and multi-factorial nature of the determinants of obesity. It also identified drivers for action that go much further than requiring nutritional labelling!



Based on: Nicolaidis S. Environment and obesity. Metab. Clin. Experim. 2019, 100 (153942).

Food environment and fruit and vegetable consumption

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The inadequate intake of fruit and vegetables (F&V) is one of the ten major factors in the determination of the global burden of diseases and is characterized by the insufficient quantity or lack of variety, with consequent reduction of the food repertoire and low intake of nutrients¹. It is of eminent importance the need to propose evidence-based health policies around the world aimed at expanding the access to and intake of F&V. However, the studies are limited to stimulate and assess the intake according to recommendations (5 servings/day). Overall, they do not consider the importance of diversity in food and have little coverage of the role of food environment on food intake, especially in collective contexts, such as health services², and in developing countries.

In this context, this study explored the relation between the quantity and the diversity of F&V consumed and food environment.

A community-based trial to encourage fruit and vegetable consumption

A randomized controlled community-based trial was carried out to encourage F&V consumption in a representative sample of the healthcare service named Health Academy Program (HAP) of Belo Horizonte, MG, Brazil. The project was developed in both environmental and individual domains, and consists of three stages:

1. Evaluation of F&V consumption and the factors associated with such consumption, considering the individual and environmental domains (Figure 1);
2. Development of an intervention to promote F&V consumption;
3. Evaluation of the effect of the intervention on F&V intake and on body weight.

In the first stage, 3,414 HAP users were interviewed. They answered a questionnaire about sociodemographic and economic characteristics, health aspects, acquisition profile, nutritional status and F&V consumption.

The evaluation of the consumer's food environment, in relation to the

environmental domain, was carried out through an audit in food stores, including convenience stores, municipal market, grocery stores, F&V markets, local or neighborhood markets, supermarkets, hypermarkets and bakeries. Diversity was assessed by the number of F&V available in stores whereas variety was verified by the number of different types of a same species (for example green apple, Fuji apple and Gala apple). Quality was classified as "good" or "bad" from a subjective evaluation, considering the presence of blemishes and bruises or the appearance of "rotten" or "too ripe"³.

Fruit and vegetable consumption and food environment

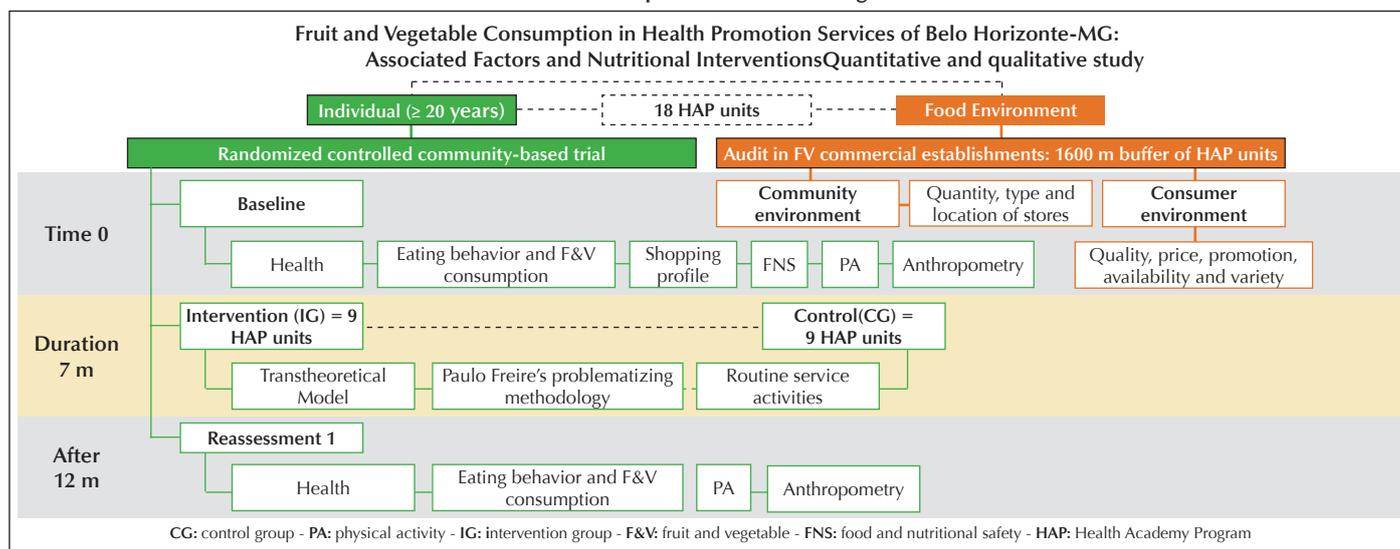
Participants of Brazilian Primary Health Care services had adequate quantitative consumption of F&V (5.4 servings/day), but monotonous with average daily intake of two different types. The main fruits consumed were banana and orange, whereas vegetables were tomato and lettuce.

In the food stores audited, good diversity (77.7% and 85.0%) and variety (74.5% and 81.4%) of F&V was observed, together with a correct quality (75.5% for fruits and 60.4% for vegetables).

After adjusting for sociodemographic variables, we identified that individual knowledge on food crops increased the monthly availability of fruit at households. In addition, a greater variety of fruits and quality of vegetables in food stores could improve the quantitative intake of F&V, whereas a greater variety of fruits in food stores would increase diversity.

The participants of the health promotion program consumed the recommended amount of F&V but monotonously, despite the diversity, variety and reasonable quality of F&V in the food stores around the healthcare service territories. Therefore, educative actions must go beyond recommending the proper quantities of foods, by rescuing the food culture, culinary skills and the importance of the diversified intake of foods, as recommended by the dietary guidelines for the Brazilian population.

Figure 1⁴. Conceptual model of the relationship between individual and environmental factors food with the consumption of fruits and vegetables.



Based on: Mendonça, R.D.; Lopes, M.S.; Freitas, P. P.; Campos, S.F.; Menezes, M. C.; Lopes, A.C.S. Monotony in the consumption of fruits and vegetables and food environment characteristics. Rev. Saúde Pública 2019, 53: 63.

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Correlation between obesity and the built environment

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Obesity is linked to various health issues, such as hypertension and type 2 diabetes, and can also affect one's mental health. Over the last decade, obesity has become an epidemic, as more than 70% of Americans are considered either overweight or obese¹. Both biological and social factors influence eating preferences, thus making obesity a complex issue. The built environment may drastically affect nutritional choices and facilitate a calorie neutral or deficit through green spaces, the use of stairs and effective public transportation.

Data was collected and analyzed from 20,927 persons

In this recent study, we used spatial analysis to demonstrate that there is a positive correlation between accessibility to fast food restaurants and obesity. For this study, we extracted the body mass index (BMI) of 20,927 individuals living in the state of Rhode Island, USA. Data regarding sex, age and race were collected and analyzed, and spatial data included a mapping of green space areas and fast food restaurants. In order to avoid selection bias and over-representing participants who are seeking medical care, we included participants who visited health services for examinations. Mean income was also taken into account.

Accessibility to fast food restaurants is positively associated with obesity, while access to green space areas is associated with decreased obesity

The study found that participants who were closer to green areas had lower prevalence of obesity, while accessibility to fast food restaurants was linked to higher prevalence of obesity. It is important to note that low-accessibility group had a mean nearest distance of 1650 m to fast food and 1220 m to green space; 510 m and 370 m, respectively, for the medium-accessibility group; and 410 m and 220 m, respectively, for the high-accessibility group. Certain limitations should be considered in the interpretation of

these findings. BMI is an easy, but not always accurate way to evaluate obesity. For example, BMI does not take into account the location of fat in the body and does not account for muscle mass. Also, the study was cross-sectional and thus no direct "cause and effect" relationship can be established.

Fast food can be seen as an easier option than healthy food

Mehta & Chang also found a positive association between high access to fast food restaurants and obesity². The reason for this association could be based on the conception that healthy food is expensive and fast food is seen as an easier and less expensive option. However, cooking healthy food is actually cheaper and the feeling of satiety requires smaller portions. This is particularly important because healthy eating and weight loss is associated with portion sizes and portion sizes have almost doubled since the 1960s. It is important to state that it is almost impossible to overeat by consuming healthy foods, as due to their fiber content which provides better absorption of nutrients and facilitates the feeling of satiety. On the contrary, foods that are low in density and high in calories need larger amounts in order to provide the same feeling of satiety. Also, obesity could be linked to sedentary lifestyle. People who live closer to green areas might live in suburbs. In larger cities supermarkets, social events and stores are further apart making it difficult to walk. Food choices are also affected by emotional state and individuals living in cities can be isolating, compared to living closer to green areas and parks where one can relax, walk, exercise and socialize.

To conclude, the built environment and the food options available affect obesity at a neighborhood level. In order to combat the obesity epidemic, local prevention and intervention measures should focus on increasing access to green space areas and providing a number of balanced food options.



"Cooking healthy food is actually cheaper and the feeling of satiety requires smaller portions."

Based on: Mylona EK, Shehadeh F, Fleury E, Kalligeros M, Mylonakis E. Neighborhood-level analysis on the impact of accessibility to fast food and open green spaces on the prevalence of obesity. *Am J Med.* 2019.

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