

CHALLENGES FOR THE CONSUMPTION OF FRUITS AND VEGETABLES

DESAFÍOS PARA EL CONSUMO DE FRUTAS Y VERDURAS

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ABSTRACT

Objective: Identify the problems to improve the low consumption of fruits and vegetables in Colombia. **Methods:** Documentary, descriptive and exploratory research carried out in 2016 and 2017. It was based on the search, selection, and revision of bibliographic references to analyze and reflect on the indicators of consumption and production of fruit and vegetable consumption. Also to identify the process to reach the WHO recommendations based on scientific evidence. **Results:** It states the nutritional contribution of fruits and vegetables and their benefits for human health, followed by production and consumption indicators as a topic of public health interest. The rules and guidelines of public policy that promote the consumption of a healthy diet as a lifestyle are being reviewed. The most significant challenges that sectors such as the food industry, the gastronomy, the government, the public social and sectoral policies in health, education, agriculture, social promotion, communication, as well as educators are to define effective strategies that increase the consumption indicators of fruits and vegetables. The goal is also to achieve a minimum per capita consumption of 5 servings or 400 g per day proposed by the World Health Organization (WHO). **Conclusion:** Several countries have been providing technical guidelines to encourage the consumption of fruits and vegetables; However, it is advisable to monitor the indicators periodically, perform outcome, impact evaluations, and research aimed at identifying the causes of low consumption and designing effective strategies appropriate to the context of the populations.

Key words: Fruits; Vegetables; Lifestyle; Healthy nutrition. (source: MeSH NLM)

RESUMEN

Objetivo: Identificar los desafíos a enfrentar para mejorar el bajo consumo de frutas y verduras en Colombia. **Métodos:** Investigación de tipo documental, descriptivo, exploratorio realizada en los años 2016 y 2017, a partir de la búsqueda, selección y revisión de referencias bibliográficas para analizar y reflexionar acerca de los indicadores de consumo y producción de consumo de frutas y verduras e identificar los desafíos para alcanzar las recomendaciones de la OMS a partir de la evidencia científica. **Resultados:** Se reafirma el aporte nutricional de las frutas y verduras y sus beneficios para la salud humana, seguida por los indicadores de producción y de consumo como un tema de interés en salud pública; se revisan las normas y lineamientos de política pública que promueven el consumo de una alimentación saludable como estilo de vida y se identifican los mayores desafíos que deben asumir sectores como la industria de alimentos, la gastronomía, el gobierno, las políticas públicas sociales y sectoriales en salud, educación, agricultura, promoción social, comunicación, así como la academia; para definir estrategias efectivas que incrementen los indicadores de consumo de frutas y verduras y permitan alcanzar las metas de un consumo per- cápita mínimo de 5 porciones ó 400 g diarios propuestas por la Organización Mundial de la Salud (OMS). **Conclusión:** Diversos países han venido impartiendo lineamientos técnicos para fomentar el consumo de frutas y verduras; sin embargo, es recomendable realizar seguimiento periódico a los indicadores, realizar evaluaciones de resultado e impacto e investigación orientada a identificar las causas de bajo consumo y diseñar estrategias efectivas adecuadas al contexto de las poblaciones.

Palabras clave: Frutas; Verduras; Estilo de vida; Alimentación saludable. (fuente: DeCS BIREME)

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INTRODUCTION

Reaching the recommendation of the World Health Organization (WHO) of a minimum per-capita consumption of 5 servings or 400 g of fruits and vegetables per day¹, as a lifestyle. This recommendation is a challenge for health policies in Colombia and other countries of the world. The following is a summary of documentary research aimed at demonstrating the difficulties that Colombia faces to achieve the optimum consumption of fruits and vegetables based on the scientific evidence, its nutritional contribution and the benefits for human health are recognized, followed by production and consumption indicators as a topic of interest in Public Health.

The rules and guidelines of public policy for the promotion of fruit and vegetable consumption in Colombia are identified. These rules are a fundamental element of the systems that promote healthy eating as a way of life and recognize the most significant challenges to achieve the goals of WHO.

METHODS

The documentary, descriptive and exploratory research was carried out in 2016 and 2017. These researches were based on the search, selection, and revision of bibliographical references on databases dialnet, scielo, redalyc, ovid, web pages of specific organizations and government from 2012 to 2017 with the search criteria consumption of fruits and vegetables, benefits consumption, relationship with health, chemical composition, and nutrient intake. Also, normative documents and technical reports were reviewed.

In the case of the original articles of research, the articles with the fixed period were selected. When the search found no information in the chosen period, sources before the fixed period were used. These sources helped to obtain scientific evidence to analyze and reflect on consumption and production indicators of fruit and vegetable consumption and identify the challenges to reach the recommendations of the WHO.

RESULTS

The consumption of fruits and vegetables is closely related to a lifestyle, defined by WHO as a general way of life. This way of life is based on the interaction between living conditions and individual patterns of behavior, incorporating a set of values, norms, attitudes, habits, and behaviors including healthy eating².

The healthy diet allows reaching the growth and development of the child, the maintenance of the health, the activity of the adult and the survival and

well-being of the elderly. A healthy diet favors and enables a good state of health and reduces the risk of chronic related diseases³. It incorporates a variety of foods including many fruits and vegetables that contribute to raising the index of the quality of the diet and protect against the development of diseases.

Nutritional characteristics of fruits and vegetables

Fruits and vegetables are a significant source of water and nutrients such as vitamins, minerals, and fiber. They have components that give them nourishing properties, appearance, texture, and color specific to this group of foods¹¹, table 1.

Benefits for human health from the consumption of fruits and vegetables

There is ample scientific evidence about the human health benefits of fruit and vegetable consumption due to the properties derived from its composition and combinations of nutrients; as well as the presence of chemical compounds that intervene in the metabolism and release of energy in the human organism⁴, table 2.

Production of fruits and vegetables in Colombia

Colombia has different forms of ecosystems, due to its geographical, climatic and biological diversity. All these combinations of the cultural richness and its equatorial location allows you to produce a great variety of plant species throughout the year; in an area close to 14 million ha for the production of food and human capital for work the dirt. The National Agricultural Census in Colombia - 2014, showed that the dispersed rural area of 111.5 million Ha; 14.6% (998,097 Ha) planted fruits and 4.2% (233,703) in vegetables, and legumes, producing 7,746,235 t. in a variety of fruit and 1,433,022 t. of vegetables¹⁸. See table 3.

Consumption of fruits and vegetables

In Europe the average consumption of vegetables, legumes, and nuts is 220 g per day and fruit is 166 g per day, which means an average consumption between fruits and vegetables of 386 g per day¹⁹. The prospective study of urban-rural epidemiology (PURE) in 18 countries carried out in 143.305 people ranked by income level showed average intake of 2.19 servings of vegetables with a range of 2.13 - 2.25 and fruits 1.62, with a range of 1.53 - 1.62. It was observed that low-income countries have lower total fruit consumption and vegetables: 2.14 portions (1.93 - 2.36), while in the medium-high income was 4.31 portions (4.09- 4.53) in the medium-low income 3.17 proportions (2.99 - 3.35)²⁰.

In Mexico, 34.4% of children between 6 and 12 years old, complied with the daily recommendations of

Table 1. Nutritional characteristics of fruits and vegetables.

NUTRIENT	CONTENT IN FRUITS AND VEGETABLES
Water	They constitute between 60 and 95% of the fresh weight of the edible portion ¹⁶ .
Fiber	It is present in the form of soluble fiber (pectins) and insoluble fiber (cellulose and hemicellulose) in variable proportions according to the vegetable, with a general value between 2 and 9% ¹⁷ .
Vitamins	They are part of phytochemicals or biologically active natural chemical compounds that act as antioxidants, such as vitamins A, C and E, B vitamins such as thiamine, niacin, vitamin B6 ¹¹ .
Minerals	Magnesium, potassium and zinc are found in significant quantities in some fruits and vegetables ¹⁵ .
Energy	Fruits and vegetables have a relatively low caloric content due to their low intake of fats and carbohydrates ¹⁶ .
Lípidos	The content is less than 1%, except for fruits such as coconut, and avocado. Some have fat content in the form of significant mono and polyunsaturated fatty acids such as chontaduro (25.7 gr / 100 g), coconut (27.0 gr / 100gr) and avocado (13.3g / 100g). The fraction of lipid content of fruits corresponds to acylglycerides, glycolipids, phospholipids, carotenoids, triterpenoids and waxes ¹¹ .
Carbohydrates	They are in the form of fructose in a proportion of 1-8% in fruits, being higher in ripe fruits; in vegetables it is between 1-6%. Beet contains sugar (10.4g / 100g). Some fruits contain starches, such as soursop (11.9g / 100g) and banana (20.45 g / 100g) ¹⁶ .
Proteins	Fruits contain 0.1-1.5% nitrogen compounds and vegetables contain 1-5%, proteins constitute 35-75% in fruits and 35-80% in vegetables ¹¹ .

Source: Own elaboration based on the authors.

Table 2. Human health benefits from fruit and vegetable consumption.

BENEFIT	SCIENTIFIC EVIDENCE
Quality of the diet	Increase the quality index of the diet ⁴ .
Overweight and obesity	They diminish the fatty tissue, and control the excess weight ⁵ .
Ischemic disease	Reduce the risk of fatal ischemic disease by 4% for every 80 g of additional fruits and vegetables consumed ⁶ .
Blood lipid levels	The concentration of triglycerides and LDL cholesterol in blood is lower in adolescents who consume fruits and vegetables, compared with those who have low intake ⁷ .
Protection against adenoma	They present a significant protective effect for colorectal adenoma ⁸ .
Decrease in the effects of oxidative stress	They minimize the effect of free radicals on the alteration of the macromolecules and cellular processes that cause cancer, diabetes and rheumatoid diseases ⁹ .
Antioxidant power	The higher the fruit and vegetable content, the greater the antioxidant power of the diet ^{10,11,12} .
Antritrombotic effect	They give antithrombotic and anticoagulant effect to the diet ¹³ .
Protection against hypertension	They exert protective effect against both systolic and diastolic hypertension from the consumption of at least 400 g daily ¹⁴ .

Source: Own elaboration based on the authors.

consumption of fruits and vegetables, the remaining 65.6% did not²¹. While in Argentina, the consumption per-capita of fruits and vegetables in the population does not reach 200gr per day²².

It has been shown that Colombia has a variety of products in the domestic fruit market. According to the Colombia Internacional Corporation, in 2012, 42 types of fruits and 30 different vegetables were offered in local markets; the regularity of the offer depends on the farmers' decisions determined by the price, the supply and the sanitary status of the crops. Regarding consumption, the National Profile of the Consumption of fruits, and vegetables of the year 2012, showed that the Colombian population consumes on average 50g of vegetables and 94g of fruit per day, compared with the recommendation established by WHO, correspond to a percentage of adequacy of 36%, the highest rate

was occupied by Bogotá, DC with 44%; figure that is still significantly below what is desired²³.

About the daily consumption of fruits and vegetables in the Colombian population from 5 to 64 years old, 35.3% of the people did not consume any fruit in their daily diet, and 27.9% did not intake any vegetables, a similar behavior for all population groups older than two years old²⁴. There was a higher preference for fruits, with a consumption of 66.8%, who registered a daily intake of three or more times a day in 20.5%. Regarding vegetables, 28.1% of the population of the same age group consumed them daily, 21.7% once per day, 5.0% twice a day and 1.4% three or more times a day²⁵. Table 4 shows the percentage of people who consume fruits and vegetables preferred by the Colombian population and grams per capita consumed by each of them²³.

Table 4. Consumption of fruits and vegetables in Colombia.

FOODS	PEOPLE THAT COMSUMED (%)	Grams PER CAPITA COSUMED
Fruits		
Lemon	45	18
Banana	99,6	15
Mango	123,4	15
Guava	95,3	14
Tree tomato	66,2	14
Blackberry	60,6	9
Pineapple	77,7	8
Passion fruit	59,7	8
Orange	154,4	7
Coconut	51,2	5
Avocado	138,2	5
Papaya	89,4	5
Apple	127,1	4
Vegetables		
Tomato	33,2	59
Buld Onion	23,21	48
Carrot	26,54	46
Scallion	7,75	28
Green pea	33,03	20
Bean	30,45	18
Cabbage	23,09	13
Lettuce	18,16	8
Cucumber	18,16	8
Pumpkin	12,06	4

Source: Own elaboration based on the National Profile of fruit and vegetable consumption.

Norms, guidelines, and policies for the promotion of the consumption of fruits and vegetables in Colombia

international standards and national public policies that legislate the promotion of fruit consumption and vegetables. See table 5.

Colombia accepts and adapts to the guidelines,

Table 5. Standards, guidelines, and policies for the promotion of fruit and vegetable consumption in Colombia.

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NORMS, GUIDELINES, POLICIES	DATA OF INTEREST
Declaration of the World Food Summit, FAO 1996.	Reaffirms "Every person has the right of to have access to healthy and nutritious foods" and the promotion of the production of fruits and vegetables ²⁶ .
Global strategy on diet, physical activity and health, WHO 2004.	Include measures that increase the consumption of fruits and vegetables, given the global problem of low consumption ²⁷ .
National Food and Nutritional Security Policy, CONPES 113, DNP 2008.	"Promote healthy habits and lifestyles that allow improving the state of health and nutrition of the population and prevent the appearance of diseases associated with diet" ²⁸ .
National Plan of Food and Nutrition Security for Colombia 2012-2019; Ministry of health 2012.	"Contribute to the improvement of health and nutrition conditions in the country by increasing the production and consumption of safe fruits and vegetables" ²⁹ .
Decenal Plan for Public Health of Colombia 2012-2021, Ministry of Health 2013.	It contemplates the dimension of ways of life and conditions that establish the goal of "increasing the daily consumption of fruits and vegetables in the general population" ³⁰ .
Law 1355 of 2009: obesity law in Colombia, Colombia Congress 2009.	It establishes the promotion of the consumption of fruits and vegetables in public and private Educational Institutions and the guarantee of their availability ³¹ .
National technical guidelines for the promotion of fruits and vegetables, Ministry of Health and Social Protection of Colombia and FAO 2012.	It is a frame of reference for the definition and implementation of strategies that promote conditions of availability and favorable supply for the consumption of fruits, and vegetables at the national, regional and local levels. It establishes actions of regulation, research, information, communication, education and social mobilization ³² .
Food guide for the Colombian population, ICBF 2015.	It recommends including whole fruits and vegetables preferably raw, in each of the meals, to improve digestion, skin and body weight ³³ .

Source: Rodríguez LM, Sánchez ML. Consumption of fruits and vegetables, benefits and challenges. *Food Today*. 2017; 25 (42): 30-55³⁴.

Challenges for the consumption of fruits and vegetables in Colombia

assuming significant obstacles to achieve goals regarding the consumption of fruits and vegetables, but different sectors still face great challenges³⁴.

The existence of regulatory frameworks demonstrates that in Colombia, government authorities have been

Table 6. Challenges to achieving the consumption of fruits and vegetables.

CONTRIBUTORS	CHALLENGES
Industry and Gastronomy	<p>The higher fiber content³⁵⁻³⁶ gives it a low palatability flavor profile, especially for vegetables, mainly because it is low in fat³⁰. Therefore, the formulation of good tasting foods with a high content of nutrients should be promoted, which are sensory-appealing to the population. They are contributing to improve their intake without deteriorating their nutritional composition.</p> <p>The industry has the challenge of balancing the supply of unhealthy foods such as sweetened beverages and processed foods that are used as substitutes for fruits and vegetables, making attractive alternatives available to consumers and with a high cost-benefit ratio³⁷.</p>
The Government and public policies	<p>Evaluate the results of the norms, policies and strategies to promote the consumption of fruits and vegetables. To verify their cost-effectiveness and design policies applicable in the different links of the agrifood chain, to avoid their losses and waste.</p>
Health, education, agriculture, social promotion, communication	<p>Transform the behaviors related to the consumption of fruits and vegetables in people³⁷⁻³⁸⁻⁴⁰⁻⁴¹.</p> <p>Generate healthy environments in markets, educational institutions of all levels and work environments⁴²⁻⁴³⁻⁴⁴⁻⁴⁵⁻⁴⁶.</p> <p>Educational interventions with participation and community empowerment for the promotion of healthy eating have shown effectiveness, accompanied by strategies to increase the availability of fruits and vegetables⁴⁷⁻⁴⁸⁻⁴⁹⁻⁵⁰.</p>
Academia	<p>Provide scientific evidence for the development and innovation of products that include fruits and vegetables as an ingredient; perform analytical and experimental studies to test strategies to promote the consumption of fruits and vegetables.</p>

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Source: self made.

CONCLUSION

The scientific evidence broadly reflects that fruits and vegetables constitute a group of healthy foods for human beings, due to their high content of nutrients.

Colombia has good production and significant availability, but little variety selection that is reflected in the low preference and consumption of fruits and vegetables as demonstrated in the study of the consumption profile. Indicators of moderate consumption of fruits and vegetables are coherent with the health situation and the double burden of malnutrition in the country^{45,46}.

Colombia has been issuing technical guidelines as a way to take on the challenge of improving fruit and vegetable consumption; However, these normative frameworks are not sufficient to guarantee the effectiveness of the interventions, which must be evaluated, strengthened, adjusted and/or renewed.

It is necessary to design effective strategies appropriate to the social, cultural and economic context of the

populations. This should be done to periodically monitor the indicators, result and impact evaluations to develop research aimed at identifying the causes of low consumption, identify and intervene the barriers and restrictions, considering the high supply of food consumed as substitutes.

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BIBLIOGRAPHIC REFERENCES

1. Organización Mundial de la salud. Estrategia mundial sobre régimen alimentario, actividad física y salud. [Internet] Ginebra (Suiza): OMS, 2004 [citado 10 de octubre de 2018]. Recuperado a partir de: <http://who.int/dietphysicalactivity/strategy/eb11344/>
2. World Health Organization. Life styles and Health. *Rv.Social Science and Medicine*, 1986. 22 (2): 117-124
3. Calañas-Continente AJ., Bellido D. Bases científicas de una alimentación saludable. *Rev Med Univ Navarra*. 2006; 50(4): 7-14
4. Gil A, Martínez de Victoria E and Olza. Indicators for the evaluation of diet quality. *Nutr Hosp*. 2015; 31(3):128-44.
5. Arribas H, Battistini T, Rodríguez M, Ortiz A. Asociación entre obesidad y consumo de frutas y verduras: un estudio de base poblacional en Perú. *Rev. chil. Nutr*. 2015; 42(3): 241-7.
6. Crowe F, Roddam A, Key T, Appleby P, Overvad K, Norat T. Fruit and vegetable intake and mortality from ischaemic heart disease: results from the European Prospective Investigation into Cancer and Nutrition (EPIC)-Heart study. *European Heart Journal*. 2011; 32(10): 1235-43.
7. Parra B, Manjarrés L, Velásquez C, Agudelo G, Estrada A, Uscátegui R et al. Perfil lipídico y consumo de frutas y verduras en un grupo de jóvenes de 10 a 19 años, según el índice de masa corporal. *Rev Col Card*. 2015; 22(2): 72-80.
8. Ben Q, Zhong J, Liu J, Wang L, Sun y, Yv L, et al. Association Between Consumption of Fruits and Vegetables and Risk of Colorectal Adenoma: A PRISMA-Compliant Meta-Analysis of Observational Studies. *Medicine* [Internet]. 2015 [citado 10 de octubre de 2018]; 94(42): 1- 12 Recuperado a partir de: <https://ncbi.nlm.nih.gov/pmc/articles/PMC4620815/>.
9. Araya L, Clavijo R, Herrera C. Capacidad antioxidante de frutas y verduras cultivados en Chile. *ALAN*. 2006; 56 (4), 361-5.
10. Messina D, Pérez R, Soto C, Uvilla A, López J, López C. El consumo elevado de licopeno sumado a una ingestión reducida de carnes rojas aumenta el poder antioxidante total. *ALAN*. 2012; 62 (1) 6-14.
11. Morillas J., Delgado J. Análisis nutricional de alimentos vegetales con diferentes orígenes: Evaluación de capacidad antioxidante y compuestos fenólicos totales. *Revista nutrición clínica y dietética hospitalaria*. 2012; 32 (2): 8-20.
12. Cruz M, González J, Sánchez P. Propiedades funcionales y beneficios para la salud del licopeno. *Nutr. Hosp*. 2013; 28(1): 6-15.
13. Torres C, Guzmán L, Moore R, Palomo G. Efecto antitrombótico, una característica poco conocida de las frutas y hortalizas. *Rev. chil. nutr*. 2008; 35 (1): 10-7.
14. Pienovi L, Lara M, Bustos P, Amigo H. Consumo de frutas, verduras y presión arterial. Un estudio poblacional. *ALAN*. 2015; 65 (1): 21- 6.
15. Yahia EM, Irigoyen LE. Frutas y hortalizas en la nutrición humana. *Revista Horticultura* 161. 2002.
16. Instituto Colombiano de Bienestar Familiar, ICBF. Tabla de Composición de Alimentos Colombianos. Bogotá; 2015.
17. Escudero E, González P. La fibra dietética. *Nutrición Hospitalaria* 2006; 21(Supl. 2): 61-72.
18. Departamento Administrativo Nacional de Estadística. Tercer Censo Nacional Agropecuario tomo 2: Resultados. [Internet]. Bogotá (Colombia): DANE, 2016 [citado 10 de octubre de 2018]. Recuperado a partir de: <https://dane.gov.co/>.
19. Revistas Enfoque Alimentación. Consumo de frutas y verduras en Europa: ¿Toman suficiente los europeos? [Internet]. México: 2012 [citado el 10 de octubre de 2018]. Recuperado a partir de: <http://alimentacion.enfoque.com/articulos/>
20. Miller V, Yusuf S, Chow CK, Dehghan M, Corsi DJ, Lock K, et al. Availability, affordability, and consumption of fruits and vegetables in 18 countries across income levels: findings from the Prospective Urban Rural Epidemiology (PURE) study. *The Lancet Global Health* 2016; 4 (10): e695 - e703.
21. Jiménez A, Gaona E, Mejía F, Gómez L, Méndez H y Flores M. Consumption of fruits and vegetables and health status of Mexican children from the National Health and Nutrition Survey. 2014; 56 Supl. 2: 103-12.
22. Montañ GN y Balaban DM. Consumo de frutas y hortalizas en la actualidad. [Internet]. Rosario (Argentina). Universidad Nacional del Rosario; 2014; [citado 10 de octubre de 2018] 39:30-32. Recuperado a partir de: <http://fcagr.unr.edu.ar/?p=5327>.
23. Instituto Colombiano de Bienestar Familiar. Encuesta Nacional de la Situación Nutricional en Colombia - ENSIN 2005-.-[Internet]. Bogotá (Colombia): ICBF; 2006; 466 p. [citado 10 de octubre de 2018]. Recuperado a partir de: <http://www.icbf.gov.co>
24. Instituto Colombiano de Bienestar Familiar. Encuesta Nacional de la Situación Nutricional en Colombia - ENSIN 2010-.-[Internet]. Bogotá (Colombia): ICBF; 2010; 513 p. [citado 10 de octubre de 2018]. Recuperado a partir de: <http://www.icbf.gov.co>
25. Ministerio de salud y protección social - Organización de las Naciones Unidas la agricultura y la alimentación. Perfil Nacional de consumo de Frutas y Verduras. Bogotá: FAO, Febrero de 2013.
26. Food and Agriculture Organization of the United Nations. Informe de la Cumbre Mundial sobre la Alimentación. [Internet]. Roma (Italia): FAO; 1996 [citado 10 de octubre de 2018]. Recuperado a partir de: <http://fao.org/docrep/003/w3548s/>.
27. World Health Organization. WHO. Estrategia mundial sobre régimen alimentario, actividad física y salud, Fomento del consumo mundial de frutas y verduras. [Internet] Ginebra (Suiza): [citado 10 de octubre de 2018]. Recuperado a partir de: <http://who.int/dietphysicalactivity/fruit/es/>.
28. Departamento Nacional de Planeación. Política Nacional de Seguridad Alimentaria y Nutricional, Documento Conpes Social 113 de Marzo 31 de 2008.
29. Ministerio de Salud y Protección Social, Gobierno de Colombia. Plan Nacional de Seguridad Alimentaria y Nutricional (PNSAN) 2012-2019. Bogotá D.C.; Diciembre 17 de 2012.
30. Ministerio de Salud y Protección Social, Gobierno de Colombia. Plan Decenal de Salud Pública, 2012-2021. Bogotá D.C., Cundinamarca; Marzo 13 de 2013.
31. Congreso de la República de Colombia. Ley 1355 de 2009: por medio de la cual se define la obesidad y las enfermedades crónicas no transmisibles asociadas a esta como una prioridad de salud pública y se adoptan medidas para su control, atención y prevención. Bogotá D.C.; Diario Oficial 47502; Octubre 14 de 2009 [citado 10 de octubre de 2018].. Recuperado a partir de: <http://docs.colombiajustia.com/nacionales/leyes/ley-1355-de-2009>
32. Ministerio de Salud y Protección Social, Gobierno de Colombia y Organización de las Naciones Unidas para la Agricultura y la Alimentación, FAO, Bogotá; acuerdo No. 389 de 2012: Lineamiento técnico nacional para la promoción de frutas y verduras. [citado 10 de octubre de 2018]. Recuperado a partir de: <http://osacolombia.gov.co/doc/>
33. Instituto Colombiano de Bienestar Familiar. Documento Técnico Guías Alimentarias basadas en Alimentos para la población Colombiana Mayor de 2 años. Bogotá D.C., Noviembre de 2015.
34. Rodríguez LM, Sánchez ML. Consumo de frutas y verduras beneficios y retos. *Alimentos Hoy*. 2017; 25(42): 30-55.

35. Ham E, kim J. Evaluation of fruit intake and its relation to body mass index of adolescents. *Clinical nutrition Research*. 2014; 3(2): 126-33.
36. Almeida AS, Aguilar AS, Hervert HD. La fibra y sus beneficios a la salud. *An Venez Nutr*. 27(1): 73-76. 2014.
37. Cobiac L, Theo V, Veerman L. Cost-effectiveness of interventions to promote fruit and vegetable consumption. *Plos One*. 5(8): p. 1- 8. 2010.
38. Herrera S, Panader A, Cárdenas LM, Agudelo N. Promoción de una alimentación saludable: experiencia en Tunja, Colombia. *Av Enferm*. 2012; 30(1): 55-63.
39. Gamboa D, López B, Prada G, Franco C, Landínez N. Factores asociados al consumo de frutas y verduras en Bucaramanga, Colombia. *ALAN*. 2010; 60(3): 247-53.
40. Arboleda LM, Duque M, Urrea J. Significados del consumo de frutas y hortalizas. *Saúde Soc. São Paulo*. 2013; 22(4): 1247-56.
41. Araneda F, Ruiz N, Vallejos V, Oliva M. Consumo de frutas y verduras por escolares adolescentes de la ciudad de Chillán. Chile. *Rev chil nutr*. 2015; 42(3): 248-53.
42. Bigio RS, Verly E, De Castro M, Galvão C, Fisberg RM, Lobo D. Determinants of fruit and vegetable intake in adolescents using quantile regression. *Rev Saúde Pública* 2011;45(3): 1-8
43. Cleyton A, Marciniak A, Dos Santos, L, Barretta C, Nesello N, Nottar L Â. Factors associated with consumption of fruits and vegetables by teenagers in Penha, Brazil. *ActaScientiarum. Health Sciences*. 2015; 37(2): 197-203.
44. Díaz-Beltrán MP. Factores influyentes en el comportamiento alimentario infantil. *Rev Fac Med*. 2014; 62(2): 237-45.
45. Chaffee B. Fatores nos primeiros anos de vida que influenciam o consumo de frutas e verduras entre crianças. *J Pediatr*. 2014; 90(5): 437-39.
46. Restrepo B, Urango M, Deossa R. Consumo de vegetales y factores relacionados en estudiantes universitarios de la ciudad de Medellín, Colombia. *Perspectivas en Nutrición Humana*. 2013; 15(2): 171-83.
47. Meléndez L, Olivares S, Lera M, Mediano S. Etapas del cambio, motivaciones y barreras relacionadas con el consumo de frutas y verduras y la actividad física en madres de preescolares atendidas en centros de atención primaria de salud. *Rev Chi Nut*. 2011; 38(4): 466-75.
48. Vitolo R y Valmórbida J. Factors associated with low consumption of fruits and vegetables by preschoolers of low socio-economic. *J Pediatr*. 2014; 90(5): 464- 71
49. Costa B, Oliveira D and Lopes A. Food environment of fruits and vegetables in the territory of the Health Academy Program. *Cad. Saúde Pública*. 2015; 13 (suppl.1): 159-69.
50. González C, Zacarías I, Domper, Fonseca M, Lera M, Vio del R. F. Evaluación de un programa de entrega de frutas con educación nutricional en escuelas públicas rurales de la Región Metropolitana, Chile. *Rev Chil Nutr*. 2014; 41(3): p. 228-35.

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