



# SOCIODEMOGRAPHIC CHARACTERISTICS AND BONE HEALTH IN ARGENTINE ADULTS WITH A PLANT-BASED DIET

CARACTERÍSTICAS SOCIODEMOGRÁFICAS Y SALUD ÓSEA EN ADULTOS ARGENTINOS CON ALIMENTACIÓN BASADA EN PLANTAS

Paula Taboada <sup>1,a</sup>, Marcela Manuzza <sup>2,a</sup>, Silvina Mastaglia <sup>1,b</sup>

## ABSTRACT

**Objective:** To analyze the sociodemographic characteristics and bone health among adult consumers of plant-based diets (PBD). **Methods:** Individuals aged 18 to 75 were invited to complete a self-administered survey via a digital platform. **Results:** A total of 1151 participants completed the survey; the majority were women [n=958 (83.2%)], young [age (years): 18-25: 35.8%; 26-35: 39.8%, and 36-45: 17.4%] and single (67.1%). The pattern of PBD consumption was mainly represented by veganism (54.0%), followed by lacto-ovo-vegetarianism (27.7%). The primary reason for their dietary choice was animal welfare (83.5%). Adherence to PBD, based on duration (years), was <1: 12.3%; 1-5: 67.4%; 10-15: 14.8%, and >15: 5.5%. 16% of vegans reported having experienced fractures, and 5.1% reported undergoing bone densitometry. Of these, 88.1% reported normal results, and 11.8% presented osteopenia. No cases of osteoporosis were recorded in the survey. Vitamin B12 was the predominant supplement among PBD consumers (61.4%). **Conclusions:** PBD consumers constitute a significant minority in our country, predominantly composed of women under 35 years old, with a projected increase in the coming years.

**Keywords:** Plant-based nutrition; Socio-demographic characteristics; Bone health. (Source: MESH-NLM)

## RESUMEN

**Objetivo:** Analizar las características sociodemográficas y salud ósea en consumidores adultos de alimentación basada en plantas (ABP). **Métodos:** Se invitó a individuos entre 18 a 75 años a realizar una encuesta autoadministrada a través de una plataforma digital. **Resultados:** Un total de 1151 participantes completaron la encuesta; la mayoría fueron mujeres [n=958 (83,2%)], jóvenes [edad (años): 18-25: 35,8%; 26-35:39,8% y 36-45:17,4%] y solteras (67,1%). El patrón de consumo de ABP estuvo representado, principalmente, por vegano (54,0%) seguido por lacto-ovo-vegetariano (27,7%), la principal razón de su elección alimentaria fue el cuidado de la vida animal (83,5%). La adherencia a la ABP, en función del tiempo (años), fue <1: 12,3%; 1-5: 67,4%; 10-15:14,8% y >15:5,5%. 16 % de los veganos refirió haber sufrido fracturas y el 5,1 % refirió haberse realizado una densitometría. De ellos el 88,1 % respondió resultados normales y el 11,8 % presentó osteopenia. No se registró en la encuesta ningún caso de osteoporosis. La vitamina B12 fue el suplemento predominante entre los consumidores de ABP (61,4%). **Conclusiones:** Los consumidores de ABP constituyen una minoría importante en nuestro país, compuesta predominantemente por mujeres menores de 35 años, con proyección a aumentar en los próximos años.

**Palabras clave:** Alimentación basada en plantas; Características socioeconómicas; Salud ósea. (Fuente: DeCS-BIREME)

<sup>1</sup> Universidad de Buenos Aires, Faculty of Human Medicine. Hospital de Clínicas. Osteoporosis and Bone Metabolic Diseases Laboratory. National Scientific and Technical Research Council (CONICET). Buenos Aires, Argentina.

<sup>2</sup> Universidad de Buenos Aires, Faculty of Human Medicine, School of Nutrition. Buenos Aires, Argentina.

<sup>a</sup> Licensed Nutritionist.

<sup>b</sup> Medical Doctor.

Cite as: Taboada P, Manuzza M, Mastaglia S. Sociodemographic characteristics and bone health in Argentine adults with a plant-based diet. Rev Fac Med Hum. 2024;24(1):20-25. doi 10.25176/RFMH.v24i1.5764

Journal home page: <http://revistas.urp.edu.pe/index.php/RFMH>

Article published by the Journal of the Faculty of Human Medicine of the Ricardo Palma University. It is an open access article, distributed under the terms of the Creative Commons License: Creative Commons Attribution 4.0 International, CC BY 4.0 (<https://creativecommons.org/licenses/by/4.0/>), which allows non-commercial use, distribution and reproduction in any medium, provided that the original work is duly cited. For commercial use, please contact [revista.medicina@urp.edu.pe](mailto:revista.medicina@urp.edu.pe)





## INTRODUCTION

Nutrition is a fundamental component of human health. Plant-based diets have existed for centuries throughout human history, adopted for various reasons including religious beliefs, ethical motivations, environmental concerns, lifestyle philosophies, and health-related factors<sup>(1)</sup>. In recent decades, there has been a growing number of individuals opting for plant-based diets (PBD). Although there is no national survey from the Ministry of Health estimating the number of PBD consumers in our country, epidemiological data provided by private consulting firms estimated that in Argentina, in 2019, there were 4,005,000 million out of a population of 44,500,000 who chose this type of diet. It is estimated that 9% identified themselves as vegans and vegetarians<sup>(2)</sup>, rising to 12% in 2020<sup>(3)</sup>. These numbers clearly show that the vegan and vegetarian population constitutes a significant minority in our country.

Despite this, there is limited information on the sociodemographic characteristics of PBD consumers in our country. The scarce information available currently comes from a study conducted at the Institute of Food and Nutrition Science of the Universidad Adventista del Plata, within the context of a healthy lifestyle adopted from religious convictions<sup>(4)</sup>. The objective of this study was to analyze the sociodemographic factors, consumption patterns, and bone health in Argentine adults who consume plant-based diets.

## METHODS

### Population

Between October 2020 and April 2021, participants were invited to take part in this descriptive study through social media. Participants were aged between 18 and 75, PBD consumers, residents of Argentina with internet access, and users of digital devices, to complete a self-administered survey via a digital platform.

### Survey characteristics

The survey was structured into five domains: demographic, socioeconomic, specific aspects of dietary consumption, healthy habits, and bone health. The sampling method used was probabilistic random

selection. The variables analyzed in each of the constituent domains of the survey were: a) demographic: gender, age, and marital status, b) socioeconomic: level of education and occupational category, c) consumption pattern: adherence time, information sources, purchasing behavior, accessibility, online shopping, and d) bone health: intake of vitamin supplements, history of fractures, and densitometric evaluation. Each domain included closed questions, a range of responses, and open-ended items.

### Ethical considerations

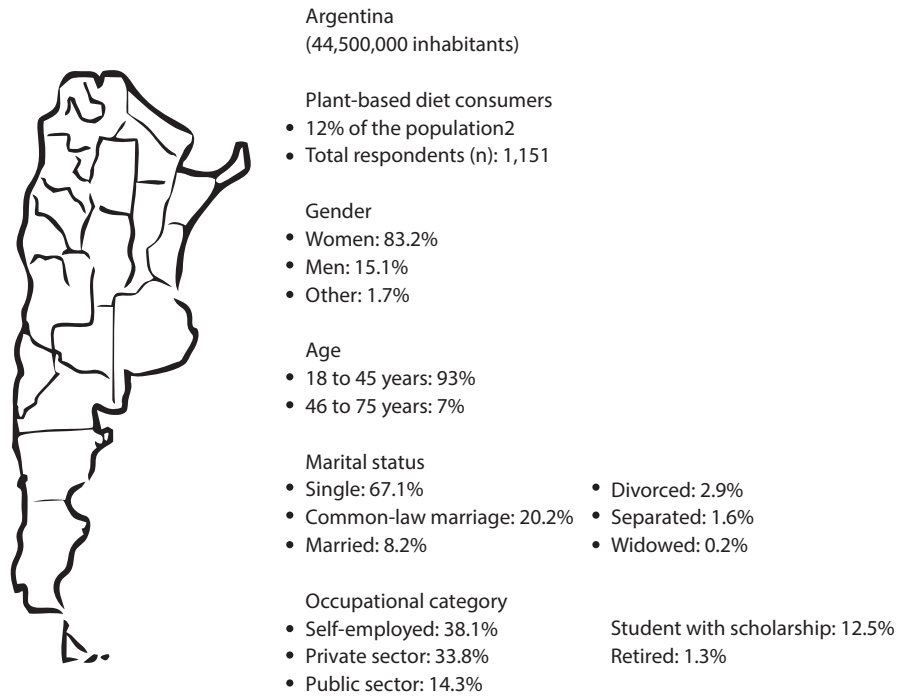
This study was conducted following ethical principles emerging from international guidelines such as the Declaration of Helsinki, ethical guidelines (Council for International Organizations of Medical Sciences [CIOMS], International Council for Harmonisation [ICH], and Good Clinical Practices [GCP]), and local laws on personal data protection. The study was reviewed and approved by the Ethics Committee of the Hospital de Clínicas, Faculty of Medicine, Universidad de Buenos Aires. All participants provided consent, which was provided electronically along with the study participation invitation. Participants were enrolled only after expressing their willingness to participate in the study by clicking the "accept" icon.

### Statistical analysis

SPSS 13.0 for Windows (SPSS, Inc, Chicago, IL, USA) was used for statistical analysis. The structured elements of the survey underwent descriptive analysis using frequency tables to report the number of individuals who responded to the data collection instrument and the relative frequency expressed in absolute number and percentage.

## RESULTS

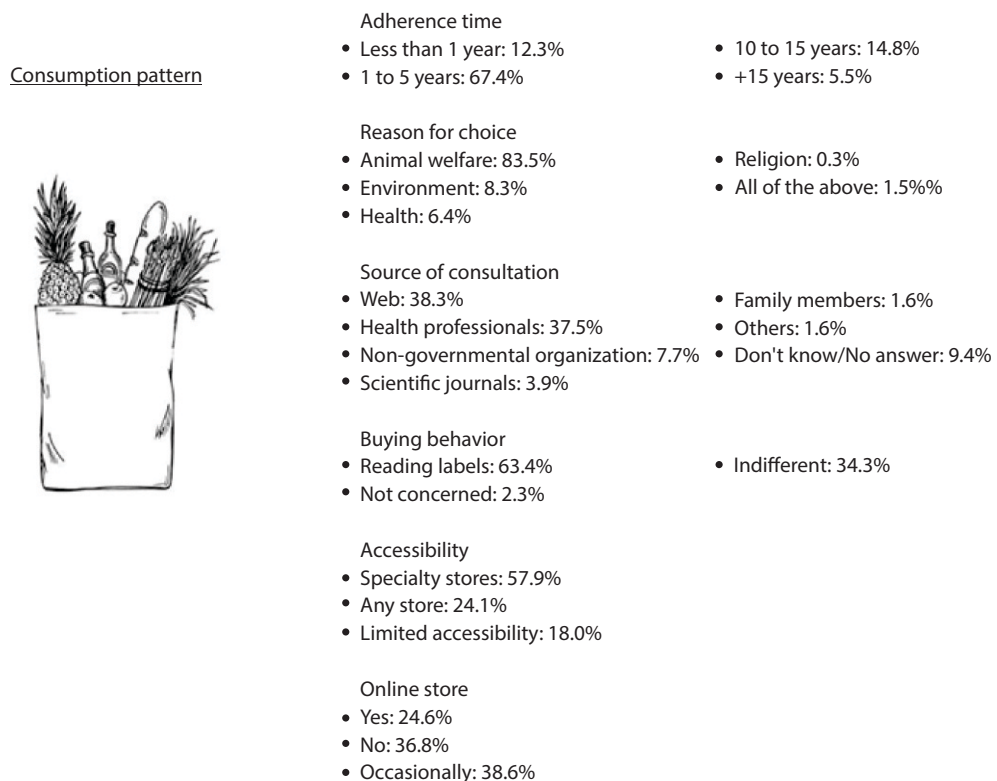
Out of a total of 1205 respondents, 1151 surveys were included. There was a predominance of female participants (83.2%), young individuals (75.6% under 35 years old), single (67.1%) with higher education (51.7%) and participation in the labor market (86.2%). 72% reported residing in the Buenos Aires metropolitan area, while 28% lived in other regions of the country (figure 1).



**Figure 1.** Sociodemographic characteristics corresponding to the total surveyed sample (n=1151).

The predominant PBD pattern was vegan (54%), followed by lacto-ovo-vegetarian (27.7%); 67.4% of respondents adhered to this diet for one to five years. The main reason for this choice was animal welfare (83.5%). 38.3% reported seeking advice through

websites followed by healthcare professionals (37.5%). Regarding PBD consumption behavior, 63.4% of respondents reported checking the labels of vegetarian and vegan products they consumed, 57.9% purchased from specialized stores, and only 24.6% online (figure 2).

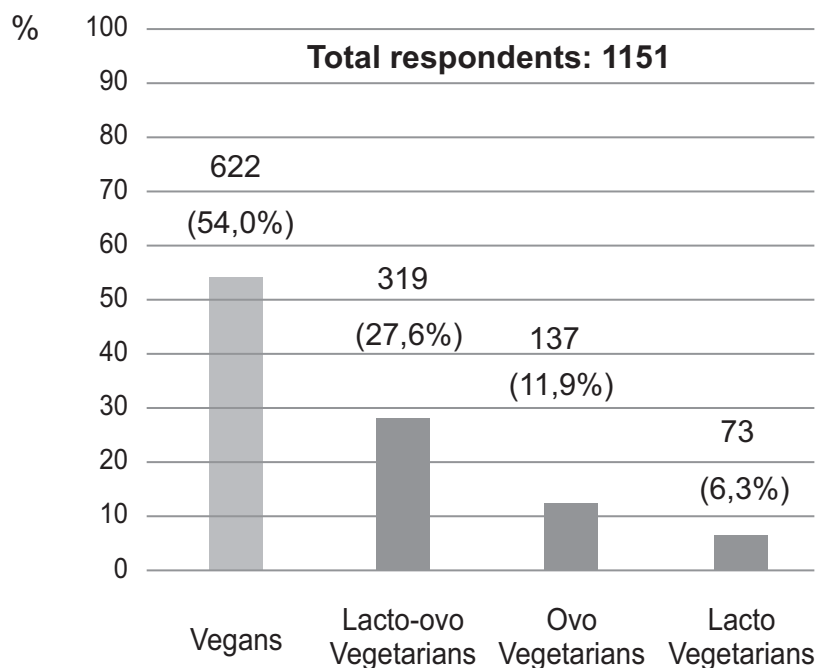


**Figure 2.** Consumption pattern corresponding to the total surveyed sample (n=1151).



When queried about healthy habits, 17.4% reported smoking, 48.5% consumed alcohol up to once a week, and 68.3% engaged in recreational physical activity. 65.8% of respondents had a body mass index (BMI) within the normal range; 7% were underweight, 12.9% overweight, 4.9% obese, 9.4% did not know/did not answer, and 56.6% received guidance from a nutritionist. 87.4% indicated that their dietary plan met daily requirements for calcium, vitamin D, and proteins. Medical check-ups were mentioned by 73.3% of respondents, with bone mineral density evaluation included in only 8.9% of them, predominantly in the 46-75 age range. Of those who underwent bone mineral density evaluation, 83% reported normal values, 15.1% osteopenia, and 1.9% osteoporosis. The use of vitamin

supplements was mentioned by 71% of respondents, with 61.4% supplementing with vitamin B12. When analyzing survey data based on PBD patterns, veganism was the predominant dietary pattern in this study (figure 3). Predominantly, these were women (43.3%), young (40.9%), single (36.3%), engaged in the private sector (16.7%), or self-defined as independent/self-employed (21.8%). The main reason for choosing PBD, as reported by vegans, was animal welfare (47.3%), with a PBD adherence time between 1-5 years (37.3%). The primary source of consultation was healthcare professionals (22.1%), followed by websites (19.5%). Regarding purchasing behavior, 32.6% of vegans reported buying from specialized stores, and 15% online.



**Figure 3.** Plant-based diet pattern corresponding to the total surveyed sample.

Regarding bone health variables, only 16% of vegans reported having suffered fractures, with 5.1% having undergone densitometry. Of these, 88.1% reported having normal bone mineral density values, with only

11.8% presenting osteopenia and no affirmative responses for osteoporosis diagnosis in the survey. 43.2% of vegans reported receiving vitamin B12 supplements.

## DISCUSSION

Our study provides information on sociodemographic aspects and bone health in Argentine adults who self-identified as vegetarians and vegans. In recent years, beef consumption has been displaced by other protein sources, despite being deeply rooted in the food culture. In 2020, beef consumption averaged 50.2 kilograms per capita, reaching one of the lowest records in the past 70 years of national history; this trend remained low in 2022, with consumption at 47.9 kg per capita<sup>(5)</sup>. The cause of this decline is clearly multifactorial, and it is difficult to establish to what extent it is influenced by the growth of PBD consumers in our country.

The main reason for respondents' choice of PBD was animal welfare (83.5%) and environmental concerns (8.3%). It is estimated that 49% of greenhouse gas emissions (GHGE) come from the agricultural sector, with 58% generated from various sources related to grazing livestock. Between 2001 and 2011, global emissions from agricultural and livestock production grew by 14%; those generated by enteric fermentation were the main source of GHG emissions and increased by 11% during that period<sup>(6,7)</sup>. Climate change experts warn of the need to reduce GHG emissions and propose, among other measures, the transformation of food systems into more regenerative, sustainable, and low-emission models<sup>(8)</sup>.

Regarding the accessibility of vegetarian and vegan products, respondents reported acquiring these from specialized stores (57.9%) and general stores (24.1%), while a minority mentioned having accessibility issues (18.0%), likely due to residing in areas with restricted access to these products. It was observed that 24.6% reported purchasing online permanently, and 38.7% occasionally. Regarding purchasing behavior, a high percentage of respondents (63.4%) reported checking the labeling of the products they consumed.

These data illustrate the significant challenge faced by the plant-based food industry today in meeting a

demand that is constantly growing due to increased awareness of the population's environmental impact. These new challenges not only demand from the food industry a greater quantity, variety, and accessibility of products, motivated by sustainability and flavor, but also clear and understandable labeling of these products' components ("clean label")<sup>(9)</sup>.

Some progress in this regard has been observed in recent years. Recently, in our country, the use of labels with the legend "vegetarian product or food" was implemented for those that do not contain ingredients of animal origin and/or their derivatives, including additives and adjuncts, except for milk, dairy products, eggs or egg products, and honey or bee-derived products. In contrast, the term "vegan" has been reserved for those products that do not contain ingredients of animal origin and/or their derivatives (including additives and adjuncts); the legend "vegan product or food" was included on their labels<sup>(10)</sup>. Regarding bone health aspects, 192 respondents reported having experienced fractures, of which 100 were vegans and 92 were vegetarians. Different authors have reported a similar risk of fractures among omnivores, vegetarians, and vegans, with a higher risk of fracture only for those vegans with a calcium intake of less than 600 mg/day<sup>(11,12)</sup>.

The most commonly used sources of consultation mentioned by respondents were healthcare professionals (37.5%) and websites (38.3%)<sup>(13,14)</sup>. These results reflect the increasing trend of using the internet as a source of health information by the public. The causes of this trend include a more active role of the public in decision-making associated with the demand for quick responses to their inquiries. Thus, information and communication technologies (ICTs) have changed the relationship model between patients and healthcare professionals. Previous reports have stated that 60.5% of the public used the internet to inform themselves about their health. When the timing of web consultations was analyzed, 31% used it before and 45% after consulting with a healthcare professional<sup>(15)</sup>.



Finally, our study's main limitation is the methodology used. Among the main advantages of digital surveys is their ability to recruit and engage a larger number of participants due to society's digitalization, coupled with shorter data collection times, low economic costs, and ease of use associated with the logistical simplicity provided by digitization. However, their main disadvantages include limitations in sample validity due to self-selection or self-exclusion based on interest or disinterest in the topic being investigated<sup>(16)</sup>. Just over half (54%) of the respondents in this study self-identified as vegans, which could indicate a higher level of interest and commitment to the survey's topic. Another point is the quality of questionnaire completion, which results in abandonment rates or

non-response to a part of the question<sup>(15)</sup>. Out of a total of 1205 respondents, 55 were excluded for this reason. Lastly, most respondents lived in the metropolitan area of Buenos Aires, so these results are not representative of the entire country. In conclusion, consumers of PBD constitute a significant minority in Argentina, with projections to increase in the coming years. This represents a significant challenge for both the food industry to meet their consumption demands and for government agencies to generate appropriate food policies aimed at ensuring product quality and implementing health policies that promote optimal and adequate planning of PBD to maintain overall health, particularly bone health.

**Authorship contribution:** PT and SM: conception, study design, data acquisition, analysis and interpretation of data, and writing; MM: critical revision of intellectual content; PT, MM and SM: final approval of the version to be submitted.

**Conflicts of interest:** None.

**Additional information:** This work was presented and awarded the 2nd Young Investigator Prize at the 4th Argentine Congress of Osteology 2021.

**Funding:** Argentinian Society of Osteology and Mineral Metabolism (AAOMM), Clinical Scientific Research Project 2020.

**Received:** June 30, 2023.

**Approved:** February 07, 2024.

**Correspondence:** Dra. Silvina Mastaglia.

**Address:** Av. Córdoba 2351; Piso 8 (CP: 1120).

**Telephone:** (+54) 1159508972

**E-mail:** [silvinamastaglia@hotmail.com](mailto:silvinamastaglia@hotmail.com)

## REFERENCES

- Hsu E. Plant-based diets and bone health: sorting through the evidence. *Curr Opin Endocrinol Diabetes Obes* 2020; 27 (4):248-252.
- Veganos y vegetarianos: son más de 4 millones en Argentina [Internet]. *Diario La Nación*. Consultado el 25 de junio 2023. Disponible en: <https://www.lanacion.com.ar/lifestyle/veganos-vegetarianos-son-mas-4-millones-argentina-nid2298027>
- Población vegana y vegetariana. ¿Cuántos veganos y vegetarianos hay en Argentina? [Internet]. Unión Vegana Argentina. Consultado el 25 de junio de 2023. Disponible en: <http://www.unionvegana.org/wp-content/uploads/2020/11/informe-medicion-poblacion-vegana-y-vegetariana-2020>
- G illi RV, Leeson S, Montes-Chañi EM, Xutuc D, Contreras-Guillén IA, Guerreros-Flores GN, et al. Healthy lifestyle practices among Argentinian vegetarians and non-vegetarians. *Nutrients* 2019; 11 (1): 154. [Doi: 10.3390/nu11010154](https://doi.org/10.3390/nu11010154).
- Treboux T, Terrè E. Consumo de carne en Argentina: dinámica y tendencia. [Internet] *Especial ganadería*. Bolsa de Comercio de Rosario, Argentina. 4 de junio 2021. Consultado el 25 de junio 2023. Disponible en: <https://www.bcr.com.ar/es/mercados/investigacion-ydesarrollo/informativo>
- Europa environment agency. 2015. Available in: <https://www.eea.europa.eu/es/senales/senales-2015/articulos/la-agricultura-y-el-cambio-climatico>
- Constatini A, Pérez GM, Busto M, González F, Cosentino V, Romaniuk R, y col. Emisiones de gases de efecto invernadero en la producción ganadera. *Ciencia e Investigación* 2018, 5 (68):47-54.
- Willett W, Rockstrom J, Loken B, Springmann M, Lang T, Vermeulen S, et al. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *Lancet* 2019; 393:447-92. [doi:10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4).
- Noguero AT, Pagán MJ, García-Segovia P, Varela P. Green or clean? Perception of clean label plant-based products by omnivorous, vegan, vegetarian and flexitarian consumers. *Food Res Int* 2021; 149:110652. [doi:10.1016/j.foodres.2021.110652](https://doi.org/10.1016/j.foodres.2021.110652)
- Código alimentario argentino (CAA), artículo 229. RESFC-2022-5-APN-SCS#MS [Internet]. Boletín oficial de la República Argentina. 28/07/2022. Consultado 25 de junio de 2023. Disponible en: <https://www.boletinoficial.gob.ar/detalleAviso/primera/267781/20220802>.
- Allès B, Baudry J, Mejean C, Touvier M, Peneau S, Hercberg S, et al. Comparison of sociodemographic and nutritional characteristics between self-reported vegetarians, vegans, and meat-eaters from the NutriNet-Santé Study. *Nutrients* 2017; 9 (9): 1023. [doi:10.3390/nu9091023](https://doi.org/10.3390/nu9091023).
- Appleby P, Roddam A, Allen N, Key T. Comparative fracture risk in vegetarians and nonvegetarians in EPIC-Oxford. *Eur J Clin Nutr* 2007; 61 (12): 1400-06. [doi:10.1038/sj.ejcn.1602659](https://doi.org/10.1038/sj.ejcn.1602659).
- Tong TYN, Appleby PN, Armstrong MEG, et al. Vegetarian and vegan diets and risks of total and site-specific fractures: results from the prospective EPIC-Oxford study. *BMC Medicine* 2020; 18:353-67. [doi:10.1186/s12916-020-01815-3](https://doi.org/10.1186/s12916-020-01815-3).
- Sutter DO, Bender N. Nutrient status and growth in vegan children. *Nutrition Research* 2021; 91: 13-25. [doi:10.1016/j.nutres.2021.04.005](https://doi.org/10.1016/j.nutres.2021.04.005)
- Observatorio Nacional de las Telecomunicaciones y de la SI. ONTSI. Los ciudadanos ante la e-Sanidad. Opiniones y expectativas de los ciudadanos sobre el uso y la aplicación de las TIC en el ámbito sanitario. Abril 2016. [Internet]. Consultado 25 de junio 2023. Disponible en: [https://www.ontsi.red.es/ontsi/sites/ontsi/files/los\\_ciudadanos\\_ante\\_la\\_e-sanidad.pdf](https://www.ontsi.red.es/ontsi/sites/ontsi/files/los_ciudadanos_ante_la_e-sanidad.pdf).
- Arroyos Menéndez M, Finkel L. Encuestas por internet y nuevos procedimientos muestrales. *Opinión pública y encuestas*. *Panorama Social*. 2019; 30:41-53.

