

# Cross-sectional study on nutritional status and dietary intake in adults and older adults beneficiaries of a food bank in Chile

## Estudio transversal sobre el estado nutricional y la ingesta alimentaria en adultos y adultos mayores beneficiarios de un banco de alimentos en Chile

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### ABSTRACT

**Background:** Food loss and waste are a threat to the environment, causing loss of biodiversity and excessive consumption of natural resources. In addition, there are nutritional losses associated with food waste, such as fruits and vegetables. Among the intermediate hierarchizing actions of the circular economy model are food banks, which reuse surplus food that is suitable for human consumption.

**Objective:** Evaluate the nutritional status and dietary intake of adults and older adult beneficiaries of a food bank in Chile.

**Materials and methods:** A descriptive, cross-sectional study was conducted in 94 beneficiaries of a food bank in Santiago, Chile. Participants were included if they had been beneficiaries of the food bank for at least one year, had no cognitive impairment, and were autonomous for the evaluations; those with recent dietary changes or food allergies/intolerances were excluded. Nutritional status was assessed using anthropometric measures (BMI), 24-hour dietary recall,

and handgrip strength; data were compared by sex and place of residence.

**Results:** In the older adults evaluated, the dietary intake was: 1677.1 kcal, carbohydrates: 133.3 grams, proteins: 207.7 grams, lipids: 45.2 grams, fiber: 27.5 grams, vitamin A: 566.8 µg/d, vitamin C: 118.8 mg, vitamin E: 13.5 mg, sodium: 1850.5 mg and potassium: 2090.6 grams. Nutritional status: underweight=13.5%; normal=26.9%; overweight=34.6%; obesity=25%. For adults, the dietary intake was: 2015.5 kcal, carbohydrates: 345.1 grams, proteins: 64.7 grams, lipids: 55.0 grams, fiber: 22.9 grams, vitamin: A: 89.1 µg/d, vitamin C: 106.8 mg, vitamin E: 80.2 mg, sodium: 2053.2 mg and potassium: 1241.5 mg. Nutritional status: underweight=35.7%; normal=0%; overweight =45.2%; obesity=19.1%.

**Conclusion:** High prevalence of malnutrition due to overeating, so food banks must focus on providing food that meets the optimal nutritional quality for a healthy and balanced diet.

### KEYWORDS

Food security, Vulnerable populations, Sustainable nutrition, Nutritional assessment, Nutritional insecurity.

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## RESUMEN

**Introducción:** El desperdicio de alimentos es una amenaza para el medio ambiente, provocando pérdida de biodiversidad y consumo excesivo de recursos naturales. Además, existen pérdidas nutricionales asociadas al desperdicio de alimentos. Entre las acciones jerarquizadoras intermedias del modelo de economía circular se encuentran los bancos de alimentos, que reutilizan los excedentes de alimentos.

**Objetivo:** Evaluar el estado nutricional y la ingesta alimentaria de adultos y adultos mayores beneficiarios de un banco de alimentos en Chile.

**Materiales y Métodos:** Estudio descriptivo de corte transversal en 94 beneficiarios de un banco de alimentos de Santiago, Chile. Se incluyeron participantes beneficiarios del banco de alimentos durante al menos un año, que no presentaban deterioro cognitivo y eran autónomos para las evaluaciones. Se excluyó aquellos con cambios recientes en dieta o alergias/intolerancias alimentarias. El estado nutricional se evaluó mediante medidas antropométricas (IMC), Recordatorio de 24 horas y fuerza de agarre; los datos se compararon por sexo y lugar de residencia.

**Resultados:** En los adultos mayores, la ingesta fue: 1677.1 kcal, carbohidratos: 133.3 gramos, proteínas: 207.7 gramos, lípidos: 45.2 gramos, fibra: 27.5 gramos, vitamina A: 566.8 µg/d, vitamina C: 118.8 mg, vitamina E: 13.5 mg, sodio: 1850.5 mg y potasio: 2090.6 gramos. Estado nutricional: bajo peso = 13,5%; normal = 26,9%; sobrepeso = 34,6%; obesidad = 25%. Para los adultos, la ingesta dietética fue: 2015.5 kcal, carbohidratos: 345.1 gramos, proteínas: 64.7 gramos, lípidos: 55.0 gramos, fibra: 22.9 gramos, vitamina A: 89.1 µg/d, vitamina C: 106.8 mg, vitamina E: 80.2 mg, sodio: 2053.2 mg y potasio: 1241.5 mg. Estado nutricional: bajo peso = 35,7%; normal = 0%; sobrepeso = 45,2%; obesidad = 19,1%.

**Conclusión:** Elevadas prevalencias de malnutrición por exceso por lo que los Bancos de Alimentos deben preocupar la entrega de alimentos que cumplan con la calidad nutricional óptima para una dieta sana y equilibrada.

## PALABRAS CLAVES

Seguridad alimentaria, Población vulnerable, Nutrición sustentable, Evaluación nutricional, Inseguridad nutricional.

## INTRODUCTION

Food loss and waste (FLW) originate at different stages of the food supply chain, from the stages of initial agricultural production, followed by stages of processing, distribution, retail, and finally final domestic consumption<sup>1</sup>. FAO data suggest that approximately one-third of the food produced in the world for human consumption is lost or wasted, equivalent to around 1.3 billion tons per year of food that does not reach

the consumer<sup>2</sup>. That is why both the FLW from an environmental health perspective are a threat to the environment, causing loss of biodiversity, increased particle pollution, and excessive consumption of natural resources such as land, energy, fuel, water, and fertilizers used in food production<sup>3</sup>.

Without a doubt, FLW affects the food security of the world population since it reduces the amount of food suitable and available for human consumption. Food insecurity leads low consumption of fruits, vegetables, and dairy products associated with lower intakes of vitamins A and B6, calcium, zinc, and magnesium<sup>4</sup>.

The circular economy proposes a model of prioritization in the management of food waste, with the reuse of surplus food suitable for human consumption carried out by establishing donations of fruits and vegetables through food banks<sup>5</sup>.

Food banks are defined as Non-Profit Social Organizations that collect, systematize, and redistribute a variety of foods and liquids (fresh, perishable, frozen, powders) to a wide variety of charitable institutions that then provide these foods to people of limited resources<sup>6</sup>. The first Food Bank was born in 1966 in Phoenix, Arizona, USA called St. Mary's Food Bank, founded by John Van Engel. In Europe, the first food bank was created in Paris in 1984 and in Spain, the first food bank was created in Barcelona in 1987<sup>7</sup>.

Food banks have a positive impact on the environment, reducing FLW as well as on the health of the population, delivering food and nutrients to people who are food insecure, avoiding malnutrition, and contributing to a better quality of life. Despite the contributions these organizations make, there is little research in Latin America on food banks and the nutritional status of their beneficiaries. Therefore, it is necessary to have information regarding the assessment of nutritional status to inform decision-making, implementation, and evaluation of these programs<sup>8</sup>. Therefore, the objective of this research was to evaluate the nutritional status and dietary intake of adults and older adult beneficiaries of a food bank in Chile.

## MATERIALS AND METHODS

### Study design

Descriptive, non-experimental, cross-sectional quantitative study. The sampling was non-probabilistic and non-randomized, since beneficiaries of a food bank in Santiago, Chile were evaluated. Food Bank beneficiaries received only fresh fruits and vegetables weekly, with a daily allowance of one serving of fruits (80 grams) and vegetables (80 grams).

The study sample consisted of 94 people, between 20 and 86 years old of both sexes, of which 52 people were older adults who resided in a Long-Term Care Establishment for Older Adults (ELEAM). In the case of adults, 42 male subjects were evaluated, of which 18 adults resided in "Home 1 (H1)"

and 24 adults resided in "Home 2 (H2). These adults reside in these homes and receive lunch from Monday to Sunday. The absence of women in the adult group is due to the fact that the center participating in the study did not have female residents. Therefore, the inclusion of only men reflects the real characteristics of the available population. Both older adults and adults receive a daily portion of fruit and a portion of vegetables at lunchtime.

The inclusion criteria were to be beneficiaries of food delivery from the food bank for at least one year and to complete all the evaluations carried out. In addition, in the case of older adults, they should not have deterioration in their cognitive abilities and be self-sufficient in order to carry out the anthropometric measurements. Exclusion criteria included changes in participants' eating habits one month ago or during the study and individuals with food allergies or intolerances. Six participants were excluded due to cognitive impairment that prevented proper administration of the study instruments. No data losses or refusals by participants were recorded during data collection.

### Study procedures

Nutritional status was assessed by measuring the weight and height of each participant, and then calculating the Body Mass Index ( $\text{kg}/\text{m}^2$ ) using the cutoff points of the Chilean Ministry of Health. To assess abdominal obesity, waist circumference was measured, defining it with values:  $\geq 102$  cm for men, and  $\geq 88$  cm for women. Muscle mass was evaluated by calf circumference. The cut-off points to classify decreased muscle mass were  $< 31$  cm for both sexes. Muscle strength was assessed using a JAMAR® hand-held dynamometer. Grip strength was measured on the dominant hand for 3 seconds, with a 1-minute rest between each repetition, for 3 repetitions. The average of the 3 measurements was used as the final result. The cut-off points to classify low muscle strength in older Chilean adults were: Women  $< 15$  kg and men  $< 27$  kg.

To determine dietary intake of nutrients, the 24-hour recall questionnaire was performed. This procedure consisted of interviewing the participant by a trained nutritionist and collecting detailed information regarding the foods and beverages consumed the previous day, such as type, quantity, and method of preparation, among others. All foods and beverages recorded in the 24-hour recall questionnaire were analyzed by the Chilean Table of Chemical Composition of Foods.

### Ethical approval

Each participant agreed to participate voluntarily by signing an informed consent. This study was approved by the Ethics Review Committee of the Faculty of Health Sciences of Bernardo O'Higgins University, respecting the Helsinki Research Ethics Agreement.

### Statistical analysis

Descriptive and inferential statistical analyses were performed using Statgraphics Centurion XVI (version 16.1, StatPoint Technologies, Inc., Warrenton, USA). Data normality was evaluated using the Shapiro-Wilk test, and significant differences between means were determined via a t-test. A significance level of  $p < 0.05$  was used. Furthermore, to analyze and understand the data obtained, the patients were divided into age groups: one group of older adults and the other, because the age of the participants is a key variable when evaluating similarities and discrepancies in the categorization of individuals.

### RESULTS

A total of 94 individuals participated in the study: 52 older adults and 42 adult men. Among the older adults, women represented a higher proportion (57.7%) compared to men (42.3%), with a mean age of  $71.8 \pm 7.6$  years. The adult group consisted entirely of men, with a mean age of  $38.8 \pm 12.6$  years (table 1). Anthropometric analysis revealed that women had significantly higher values regarding waist circumference ( $p=0.012$ ) and calf circumference ( $p=0.001$ ), while men exhibited greater height ( $p=0.001$ ) and dynamometry ( $p=0.007$ ). The prevalence of overweight in the total number of older adults evaluated was 34.6% and obesity reached 25%, overweight and obesity being higher in the women evaluated with the prevalence of malnutrition being higher by sex in women (table 1).

The calories and dietary intake of nutrients in older adults according to sex were evaluated. The average energy intake among older adults was 1677.1 kcal/day. Protein intake was 67.2 g, while fiber (27.5 g), vitamin A (566.8  $\mu\text{g}/\text{d}$ ), and vitamin C (118.8 mg) were within recommended levels. Men had higher intakes of protein ( $p=0.044$ ), vitamin A ( $p=0.006$ ), and sodium ( $p=0.003$ ) compared to women. Higher intakes of carbohydrates and vitamin C were observed in women but without significant differences (table 2).

The anthropometric characteristics of the adult's beneficiaries of the food bank of Santiago, showed that the H2 group exhibited higher body weight and BMI (80.9 kg and  $28.2 \text{ kg}/\text{m}^2$ , respectively) compared to the H1 subgroup (75.8 kg and  $26.0 \text{ kg}/\text{m}^2$ ). They were not statistically significant in any of the variables studied. The overall prevalence of overweight was 45.2%, and obesity affected 19% of participants (table 3).

Calories and dietary nutrient intakes in the 42 participating adults are set out in Table 4. Significant differences are observed, with higher values found in the H2 group in terms of calories (2015.5 kcal), carbohydrates (345.1 grams), proteins (64.7 grams), lipids (55.0 grams), dietary fiber (22.9 grams), vitamins C (89.1 22.9 grams), vitamin E (80.2), sodium (2053.2 mg) and potassium (1241.5 mg). In contrast, the H1 group, which only received lunch, exhibited much lower nu-

**Table 1.** Sociodemographic and anthropometric characteristics of the elderly beneficiaries of the food bank of Santiago, Chile (n = 52)

	Participant gender		Total	p-value
	Female	Male		
Count (n)	30	22	52	
Age (years)	70.3±7.8	73.9±7.0	71.8±7.6	
Weight (kg)	69.5±10.2	63.7±12.3	67.1±11.4	0.151
Height(cm)	152.4±5.0	162.7±6.0	156.8±7.5	0.001*
BMI (kg/mt2)	29.7±4.5	24.8±4.0	27.6±4.9	0.362
Underweight n (%)	1 (3.3%)	6 (27.3%)	7 (13.5%)	
Normal n (%)	6 (20%)	8 (36.4%)	14 (26.9%)	
Overweight n (%)	10 (33.3%)	8 (36.4%)	18 (34.6%)	
Obesity n (%)	13 (43.3%)	0	13 (25%)	
Waist circumference (cm)	99.4±10.4	90.9±12.8	95.7±12.2	0.012*
Normal n (%)	8 (26.7%)	11 (50%)	19 (36.5%)	
Abdominal obesity n (%)	4 (13.3%)	6 (27.3%)	10 (19.2%)	
Calf circumference (cm)	36.6±3.1	33.9±3.1	35.6±3.4	0.001*
Dynamometry (kg)	15.2±5.4	20.5±6.3	17.4±6.3	0.007*

Data reported are mean values ± standard deviations and frequency (percentage) of nutritional classification. \* p-value shows statistical differences between male and female older adults using a t-student test with a 0.05 significance level.

**Table 2.** Dietary intake of nutrients from the 24-hour recall questionnaire in older adult beneficiaries of the food bank of Santiago, Chile (n = 52)

		Calories	CHO (g)	Protein (g)	Lipids (g)	Fiber (g)	Vit. A (µg/d)	Vit. C (mg)	Vit. E (mg)	Sodium (mg)	Potassium (mg)
Total	mean	1677.1	133.3	67.2	45.2	27.5	566.8	118.8	13.5	1850.5	2090.6
	SD	751.6	170.9	4.6	31.7	25.5	599.9	271.0	10.2	1110.1	1724.7
Female	mean	1667.4	174.4	66.8	44.4	31.0	373.3	164.3	13.0	1778	1492.3
	SD	803.8	214.8	4,5	32.7	29.9	502.0	354.1	10.0	1301.2	919.2
Male	mean	1689.7	79.6	67.8	46.2	23.0	819.1	59.4	14.2	1950.6	2871.0
	SD	695.3	53.9	4.8	31.0	18.0	633.1	42.2	10.5	813.8	2189.2
	p-value	0.916	0.055	0.600	0.835	0.261	0.006*	0.165	0.692	0.003*	0.570

\* Data reported are mean values and standard deviations.

**Table 3.** Sociodemographic and anthropometric characteristics of adult beneficiaries of the food bank of Santiago, Chile (n = 42)

	H1	H2	Total	p-value
Count (n)	18	24	42	
Age (years)	39.4±16.2	38.2±9.3	38.8±12.6	
Weight (kg)	75.8±10.2	80.9±16.9	78.7±14.4	0.266
Height (cm)	170.9±6.2	169.4±5.5	170.0±5.8	0.404
BMI (kg/mt2)	26.0±3.4	28.2±5.6	27.2±4.9	0.120
Underweight n (%)	10 (55.6%)	5 (4.2%)	15 (35.7%)	
Normal n (%)Overweight n (%)	06 (33.3%)	013 (54.2)	019 (45.2%)	
Obesity n (%)	2 (11.1%)	6 (25%)	8 (19,1%)	
Waist circumference	97.8±12.3	95.5±12.5	96.5±12.3	0.562
Normal n (%)	10 (55.6%)	11 (45.8%)	21 (50%)	
Abdominal obesity n (%)	6 (33.3%)	4 (16.7%)	10 (23.8%)	

Data reported are mean values ± standard deviations and frequency (percentage) of nutritional classification. \* p-value shows statistical differences between H1 and H2 adults using the t-student test with a 0.05 significance level.

**Table 4.** Dietary intake of nutrients from the 24-hour recall questionnaire in adult beneficiaries of the food bank of Santiago, Chile (n = 42)

		Calories	CHO (g)	Protein (g)	Lipids (g)	Fiber (g)	Vit. A (µg/d)	Vit. C (mg)	Vit. E (mg)	Sodium (mg)	Potassium (mg)
Total	mean	1575.7	317.2	51.9	42.5	16.4	630.7	116.2	40.9	1487.2	1066.8
	SD	326.5	68.5	11.9	14.3	6.5	450.9	54.2	21.2	308.9	246.2
H2	mean	2015.5	345.1	64.7	55.0	22.9	890.1	106.8	80.2	2053.2	1241.5
	SD	460.0	86.2	12.4	17.4	11.0	790.9	44.7	41.0	529.5	337.8
H1	mean	1135.8	289.3	39.1	30.0	9.9	380.3	125.6	1.6	921.2	892.0
	SD	193.0	50.7	11.3	11.1	1.3	110.9	63.7	1.3	88.3	154.6
	p-value	<0.001*	0.019*	<0.001*	<0.001*	<0.001*	0.011*	0.267	<0.001*	<0.001*	<0.001*

\* Data reported are mean values and standard deviations.

trient intake overall. Only vitamin A was higher in the H1 group but without significant differences.

## DISCUSSION

This is the first study in Chile that examines body composition and food intake in adults and older adults who are beneficiaries of a food bank, providing information on the nutritional quality of food intake and their nutritional status. The

descriptive findings indicate that approximately 60% of older adults are obese and overweight, and in the case of adults this figure is 64.2%, this situation could be explained by the food insecurity suffered by these people. This situation not only affects developing countries but also some high-income countries. In the United Kingdom (UK), in a representative sample of the adult population of the United Kingdom, 14.2% of those evaluated reported having some degree of food insecurity in the last 12 months<sup>9</sup> and in the United States, the



prevalence of food insecurity in 2019 was 10.5%<sup>10</sup>. In the case of Chile, data from 2020 identified moderate and severe insecurity in 19.8% of the population<sup>11</sup>. Food insecurity is associated with a number of negative health consequences, including the development of chronic diseases and obesity; poor self-control of diseases; depression, and anxiety in addition to increased healthcare costs and mortality<sup>12</sup>. Because many low-income households experience chronic food insecurity, food banks, once considered emergency organizations, are now places where people seek food assistance once a week or even more and for long periods<sup>13</sup>, which has made them an important and periodic source of food for those people who experience food insecurity, contributing to the dietary intake of people who receive these foods<sup>14</sup>. The work carried out by food banks is so relevant that it has been estimated that they provide up to 25% of the diet of low-income beneficiaries monthly<sup>15</sup>.

There is limited research, especially in Latin America, on the nutritional status and dietary intake of food bank users. However, studies like Neter et al. have assessed the nutritional status of food bank beneficiaries, including 167 participants in the Netherlands reporting a prevalence of overweight and obesity of 32.7% and 37% respectively<sup>16</sup>. Another study with results similar to ours was carried out on 212 adults and older adults of low socioeconomic status, beneficiaries of a food bank in Connecticut, United States, the average BMI was 29.5 kg/m<sup>2</sup> and regarding nutritional status, 25.4% had a normal nutritional status, 31.7% were overweight, 29.8% were obese and 10.2% were morbidly obese<sup>17</sup>. Other studies were carried out in Alabama, United States in 55 women between 19 and 50% of users of a food bank, 21.8% were overweight, 45% had an obese nutritional status and 21.8% had morbid obesity<sup>18</sup>. In 115 adults from a food bank in the United States, were stated figures similar to those reported in the present study, with a prevalence of overweight of 36.3% and obesity of 37.2%<sup>19</sup>. In 101 users of the Israeli food bank, the average BMI was 26.9 kg/m<sup>2</sup> and 34.3% of the studied population was classified as obese and 22.9% were overweight<sup>20</sup>. Liu and collaborators reported an even higher prevalence of malnutrition due to excess in 270 beneficiaries of a food bank in the United States between 21 and 80 years old, where 61% were obese and only 20% had a normal nutritional status. and an average BMI of (33.6 kg/m<sup>2</sup>)<sup>21</sup>. The data presented reveal that a significant number of food bank beneficiary users are obese, which is extremely worrying, given that according to data from around 3,000 food bank clients in the United States, it was revealed that those users who had high food insecurity and were beneficiaries for longer periods had a higher risk of having obesity (OR = 1.68,  $p < 0.05$ ) compared to those people with greater food security and were short-term food bank users with greater food security<sup>22</sup>. Obesity and overweight have been increasing worldwide, but they continue to be higher in those groups with low income and educational levels, so there is a strong

relationship between low socioeconomic level and obesity in the case of food bank beneficiaries<sup>23</sup>.

In our study, handgrip strength was measured using a dynamometer as an indicator of muscle function. This is particularly relevant, as reduced muscle strength is one of the primary diagnostic criteria for sarcopenia, a condition commonly associated with aging and linked to increased risk of functional decline, frailty, and loss of independence. Nutritional support, particularly adequate protein intake, and structured physical activity programs are considered fundamental components of sarcopenia management<sup>24</sup>. In this context, our findings highlight the importance of including functional assessments such as dynamometry in food assistance programs targeting older adults, as these allow for early detection of functional impairment and can inform integrated nutritional and physical strategies to improve quality of life and reduce long-term health risks.

On the other hand, scientific evidence has shown that waist circumference is a good predictor of cardiovascular disease and visceral fat. Concerning the results obtained regarding waist circumference, they are lower than those described in other studies on food bank beneficiaries, such as in the cross-sectional study carried out in Netherlands where the waist circumference in women was 102 cm and in men it was 101.8 cm<sup>16</sup>. However, the values in this study regarding waist circumference in the case of older adult women exceed the range of normality, which is 80 cm for women, so it should be treated with concern<sup>25</sup>.

The definition of a diet of high nutritional quality to meet nutrient requirements and reduce the risk of chronic diseases may be based on the dietary recommendations made by different countries. Chile has its Food Guide updated in 2022 that seeks to promote healthy eating with respect for culture and care for the environment<sup>26</sup>. That is why to promote the food security of the population it is important to comply with the nutritional guidelines of each country. The results of the National Food Consumption Survey of Chile revealed that the average calorie intake for older male adults was 1684.9 kcal (1615.0-1754.8 kcal) and for women it was 1302.2 kcal (1261.7 kcal – 1342.7 kcal), with values comparable to the findings of this research (1677.1 kcal). Regarding the calorie consumption of men in group H1 and H2, the average value reported in this study (2015.5 Kcal) is similar to the national average (2166.5 kcal)<sup>27</sup>. The results obtained are similar to those of the study carried out on 167 Dutch beneficiaries of a food bank, reporting an average intake of 1986 calories (1830–2089 kcal)<sup>16</sup>. The lower energy intake of the beneficiaries of group H1 could be because they only receive lunch in that place, which is the only meal they consume per day.

The quality of the diet of food bank users is below national recommendations and the quality of their diet is worse than that of the general population<sup>28,29</sup>. This situation is reflected

by the lower availability of food groups such as fruits, vegetables, and dairy products, associated with deficient levels of vitamins A and C, zinc, and calcium, negatively impacting the intake of critical nutrients by users of these food assistance agencies<sup>30</sup>. This is particularly important considering that other studies in Chile have analyzed the intake of vitamins C and A, showing that the Recommended Daily Allowance (RDA) is not met, and have reported serum deficiencies in 25-hydroxyvitamin D, vitamin B12 and calcium<sup>31</sup>.

The international recommendations for dietary fiber are between 25 to 35 grams in people over 18 years of age<sup>30</sup> due to the benefits it has, such as the lower incidence of coronary heart disease, stroke, type 2 diabetes and colorectal cancer<sup>32</sup>. In the case of the sample evaluated, the dietary fiber intake of older adults was 27.5 grams per day, complying with the recommendations, and in the case of men in the H1 and H2 group, the average intake was 22.9 grams/day, a value close to recommended. The intake of dietary fiber in the Chilean population is 12.5 grams per day for men and 11.5 grams/day for women, figures lower than those reported in this study. These higher intakes of dietary fiber in the people evaluated could be explained because older adults and adults in the H2 group reside in shelters receiving four meals a day, which allows them to ingest other foods such as legumes that also provide dietary fiber and are more economical foods<sup>33</sup>. Similar findings were found in Israeli food bank users with an average fiber intake of 23.0 grams per day<sup>20</sup>. However, other investigations in North American adults and older adults who use food banks have found daily fiber intakes of 1.3 grams and 7.7 grams, values closer to what is consumed by adults in group H1, but still, the Intake is higher in this group<sup>21,34</sup>.

Regarding the information on vitamin intake in this type of population, it is even scarcer; reported intakes of vitamin C are disparate, since average intakes of 167.5 mg were identified in Israeli users<sup>19</sup> but in beneficiaries from the United States the average intake of vitamin C was 29.4 mg/day<sup>35</sup>. The intake of vitamin C in Chile is 53.2 mg/day for men and 51.8 mg/day for women<sup>27</sup> and in the studied sample of adults the daily intake ranges between 38.3 mg and 89.1 mg, not meeting the RDAs. Unlike older adults, vitamin C intake meets the requirements, which are 75 and 90 mg for women and men respectively<sup>36</sup>. Compliance with vitamin C recommendations is given because, on the one hand, it is a powerful antioxidant because donating electrons eliminates harmful free radicals, acting as a reducing agent, preventing other compounds from oxidizing<sup>37</sup> and on the other hand it participates in the response of the innate and adaptive immune system<sup>38</sup>. Vitamin A<sup>39</sup>, recognized for its antioxidant function, had an average intake in the older adult population of 373.3 µg/day in women and 819.1 µg/day in men. These values are below the established RDA, which are 700 µg/day for women and 900 µg/day for men, indicating insufficient intake in both sexes. In the case of the men evaluated, the average intake

of vitamin A was 630.7 µg/day, also not meeting the RDA. Regarding sodium<sup>39</sup> intake, the established daily recommendation is 1,500 mg. However, the average values observed in the older adult population exceeded this recommendation, recording 1,778 mg/day in women and 1,950.6 mg/day in men. This high intake could be associated with an aging-related decrease in taste sensitivity, which could lead to greater use of salt to enhance the flavor of foods. In the case of the male population, the average sodium intake is within the recommended threshold of 1500 mg/day, thus meeting the established dietary recommendations for this mineral. The recommended<sup>40</sup> intake of protein for healthy older adults is 15–20% of total daily caloric intake. In this case, the proportion of protein in the diet was 16%, which is within the recommended range for this age group. The general recommendation for daily protein intake in adults, according to the World Health Organization (WHO), is 0.8 g/kg of body weight. However, in the male population evaluated, the average intake was 0.65 g/kg/day, which represents a failure to meet established recommendations. This deficiency could be related to a dietary pattern characterized by reduced intake during breakfast and dinner, considering that individuals only receive one main meal (lunch) daily, from Monday to Sunday.

Our research had several strengths. The main one is that it is the first in Chile to provide data on the nutritional status of Food Bank beneficiaries, as well as their usual dietary intake, along with quantitative and qualitative analysis in terms of calories and nutrients, for which there is little evidence. Secondly, the number of people assessed who voluntarily agreed to participate in the study and expressed great interest and commitment, coupled with the collaboration of the food bank in coordinating activities to assess nutritional status, contributed to the high participation rate. Third, the 24-hour dietary recalls were administered by trained nutritionists, which reduced the risk of bias inherent in this instrument. Finally, the researchers conducted several exploratory visits to understand the reality of these individuals, which provided key information considered in this study. The results of this research are valuable, but should be analyzed with caution, recognizing the study's limitations. The present study was limited to beneficiaries of a food bank in Santiago, Chile, so the findings may not be generalizable to other users in different geographic locations. A second limitation was the lack of recent scientific evidence on the nutritional status and dietary intake of this population, demonstrating the need for this type of research to improve decision-making. Due to the study group's time constraints, only a 24-hour recall survey was possible, which could underestimate intake. However, it provides valuable information given the lack of available data in Chile.

## CONCLUSIONS

This study highlights the critical role of food banks in addressing food insecurity and their potential impact on the nu-

tritional status of beneficiaries. The findings reveal high rates of overweight and obesity of a food bank in Chile, emphasizing the need for improved dietary quality among food bank users. While food banks provide essential food assistance, their offerings should be optimized to ensure adequate nutrient intake. Implementing periodic nutritional monitoring of their beneficiaries and targeted interventions within these organizations could enhance their effectiveness in promoting health and food security. Future research should focus on expanding data collection and evaluating long-term dietary patterns to guide policy development and improve food assistance programs.

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