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# Association between food assistance program participation and overweight

## Associação entre participação em programa de assistência alimentar e sobrepeso

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### ABSTRACT

**OBJECTIVE:** The objective of this study was to investigate the association between food assistance program participation and overweight/obesity according to poverty level.

**METHODS:** A cross-sectional analysis of data from 46,217 non-pregnant and non-lactating women in Lima, Peru was conducted; these data were obtained from nationally representative surveys from the years 2003, 2004, 2006, and 2008-2010. The dependent variable was overweight/obesity, and the independent variable was food assistance program participation. Poisson regression was used to stratify the data by family socioeconomic level, area of residence (Lima *versus* the rest of the country; urban *versus* rural), and survey year (2003-2006 *versus* 2008-2010). The models were adjusted for age, education level, urbanization, and survey year.

**RESULTS:** Food assistance program participation was associated with an increased risk of overweight/obesity in women living in homes without poverty indicators [prevalence ratio (PR) = 1.29; 95% confidence interval (CI) 1.06;1.57]. When stratified by area of residence, similar associations were observed for women living in Lima and urban areas; no associations were found between food assistance program participation and overweight/obesity among women living outside of Lima or in rural areas, regardless of the poverty status.

**CONCLUSIONS:** Food assistance program participation was associated with overweight/obesity in non-poor women. Additional studies are required in countries facing both aspects of malnutrition.

**DESCRIPTORS:** Overweight, epidemiology. Nutrition Programs and Policies. Socioeconomic Factors.

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## RESUMO

**OBJETIVO:** Investigar associação entre participação no programa de assistência alimentar e sobrepeso/obesidade, segundo nível de pobreza.

**MÉTODOS:** Estudo transversal com dados sobre 46.217 mulheres não gestantes e não lactantes, de Lima, Peru, obtidos de pesquisas, com representatividade nacional, nos anos de 2003, 2004, 2006 e 2008-2010. A variável dependente foi o sobrepeso/obesidade e a independente foi a participação no programa de assistência alimentar. Utilizou-se regressão de Poisson; os modelos foram estratificados por nível socioeconômico familiar para todo o país, por área de residência (Lima *versus* o resto do país; urbano *versus* residência rural) e anos de estudo (2003-2006 *versus* 2008-2010). Os modelos foram ajustados por idade, nível acadêmico, urbanização e ano de estudo.

**RESULTADOS:** Participar do programa de assistência alimentar associou-se com risco aumentado de sobrepeso/obesidade para as mulheres que viviam em domicílios sem indicadores de pobreza (PR = 1,29; IC95% 1,06;1,57). Quando estratificados por área de residência, foram observadas associações similares para as mulheres que vivem em Lima e em áreas urbanas; não foram encontradas associações entre a participação no programa de assistência alimentar e sobrepeso/obesidade entre as mulheres que vivem fora de Lima ou em áreas rurais, independentemente de sua condição de pobreza.

**CONCLUSÕES:** Participar do programa de assistência alimentar associou-se com sobrepeso/obesidade para mulheres não pobres. Estudos adicionais serão necessários em países que enfrentam ambas as faces da má nutrição.

**DESCRITORES:** Sobrepeso epidemiologia Programas e Políticas de Nutrição e Alimentação. Fatores Socioeconômicos.

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## INTRODUCTION

Obesity is no longer a problem exclusive to developed countries. In Peru, the prevalence of overweight and obesity has steadily increased over time. Data from national representative surveys show that the prevalence of overweight and obesity among women has almost doubled from 31.0% in 1992<sup>a</sup> to 55.0% in 2012.<sup>b</sup> The association between obesity and socioeconomic status in Peru is mixed: obesity is higher among wealthier women but lower among those with higher education.<sup>8</sup> Despite the observed increase in overweight and obesity, virtually, no prevention efforts are being made and the Ministry of Health has yet to develop the infrastructure required to combat obesity and associated chronic diseases.<sup>6</sup> Given the relatively high overweight and obesity prevalence observed in Peru, the upward trend in prevalence, and the high costs associated with the consequences

of obesity, it is critical for the government to identify and implement successful obesity prevention strategies. In this sense, food assistance programs (FAP) deserve closer attention.

Originally, FAPs were designed as safety nets to prevent undernutrition and hunger among the poor. Current research, however, shows an association between FAP participation and overweight and obesity in the United States and other Latin American contexts. In the United States, participation in the Supplemental Nutrition Assistance Program has been associated with increased obesity among women.<sup>c</sup> In Latin America, there is evidence from Mexico<sup>4</sup> and Chile<sup>9,10</sup> associating FAP participation with their increased prevalence of overweight and obesity. As the nutrition transition progresses, FAP that provide energy-dense foods may

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<sup>a</sup> Instituto Nacional de Estadística e Informática. Demographic and Family Health Survey. Lima (PE); 1992.

<sup>b</sup> Instituto Nacional de Estadística e Informática. Peru: Demographic and Family Health Survey - ENDES 2012. Lima (PE); 2013.

<sup>c</sup> Ploeg M, Ralston K. Food stamps and obesity: What do we know? Washington (DC): U.S. Department of Agriculture; 2008.

require revision as they may be contributing factors to the increasing global prevalence of overweight and obesity.

Peru features large variations in wealth and access to jobs, services, and health care. Lima, the capital and the wealthiest city in Peru, houses approximately one-third of the country's 30 million inhabitants.<sup>d</sup> The Andean region and parts of the jungle, particularly those that are rural, are the poorest.<sup>e</sup> In 2012, the Peruvian Government spent approximately US\$1.2 billion on social programs, including FAP.<sup>f</sup> These programs have wide coverage, with 27.0% of all Peruvian households and 54.0% of poor households participating in at least 1 FAP in 2012.<sup>g</sup> Characteristics of the main FAP in Peru are shown in Table 1. Geographically, Lima has the lowest participation rates (18.0% for all and 49.0% for poor households), and households in rural areas have the highest rates (49.0% for all and 62.0% for poor households).<sup>g</sup> There is evidence of poor targeting among most FAP in Peru, with a high proportion of participants not belonging to the target populations of the programs.<sup>a,g</sup> This could provide unnecessary calories to those who do not require food assistance and may consequently lead to an increased risk of obesity.

Therefore, the objective of this study was to investigate the association between FAP participation and overweight/obesity according to family poverty status.

## METHODS

This cross-sectional study used data from the National Surveillance of Nutritional Indicators (MONIN, based on its name in Spanish). MONIN is a series of cross-sectional nationally representative surveys that has been conducted annually since 1996 (except for 2005 and 2007). The objective of MONIN is to determine the nutritional status and associated factors among women of reproductive age (15-49 years) and children younger than 5 years.<sup>h</sup> MONIN follows a stratified, cluster sample design that has changed slightly over time. The data used were from 2003-2010; data from 1996-2002 were excluded because of a lack of sample weight variables and/or a lack of FAP participation variables. Between 2002 and 2006, cluster selection was conducted for each of the 24 departments in Peru to make department-level inferences.<sup>h</sup> For the 2008-2010 survey, clusters were selected within 5 regional strata: Metropolitan Lima, Remaining Coast,

Urban Highlands, Rural Highlands, and Jungle.<sup>2</sup> Clusters were created on the basis of population distribution and comprised blocks or groups of blocks with 50-100 households. Blocks within clusters and households within blocks were randomly selected.<sup>h</sup> Interviews and measurements were conducted in person by trained health personnel and covered the following topics: census and basic demographic characteristics of family members (age, gender, family relationships, educational attainment); household characteristics (access to services, FAP participation); child's characteristics (breastfeeding, complementary feeding, vaccinations, morbidity); women's characteristics (prenatal visits, supplementation); anthropometry (measured weight and height); biochemistry (hemoglobin, serum retinol, urine iodine); and food intake.<sup>2</sup> Data were collected for all women and children in the household except for the biochemical sample collection and food intake measurements, for which only a subsample of the population was used.<sup>2</sup>

This study used MONIN data<sup>i</sup> for the years 2003, 2004, 2006, and 2008-2010. For most analyses, the survey years were grouped as 2003-2006 and 2008-2010, given the similarity of the sampling designs. Analyses focused on non-pregnant, non-lactating women (n = 46,217) who participated in MONIN during the above-mentioned years and for whom complete data were available.

The outcome variables were overweight and obesity. Weight and height were measured during each survey year. Overweight was defined as a body mass index (BMI) of 25.0-29.9 kg/m<sup>2</sup> and obesity as BMI ≥ 30 kg/m<sup>2</sup>. Women with an implausible BMI (< 11 or ≥ 60) were excluded from analyses (n = 13). For most analyses, overweight and obesity were combined in a single category (overweight/obesity = BMI ≥ 25 kg/m<sup>2</sup>).

The main independent variable was FAP participation. In Peru, FAP have changed over the years; accordingly, MONIN response options to the question "*In which of the following programs do you or someone in your family participate?*" have also changed over time. Therefore, we only included in the analyses those FAP that did not change between survey years [Glass of Milk Program, Community Kitchen Program, Feeding and Nutrition Program for Tuberculosis Patients and Their Families (PANTBC), and Wawawasi Program; Table 1] and operationalized FAP participation as a categorical

<sup>d</sup> Instituto Nacional de Estadística e Informática. Sociodemographic information - data from the annual National Household Survey. Lima; 2010 [cited 2011 Mar 9]. Available from: <http://www.inei.gob.pe/>

<sup>e</sup> Vasquez E. Proposal to reform food and nutrition programs in Peru. Lima: Centro de Investigación de la Universidad del Pacífico; Programa Mundial de Alimentos de las Naciones Unidas del Perú; 2010.

<sup>f</sup> Instituto Nacional de Estadística e Informática. Social Statistics: Poverty and social expenditures. Lima; 2010 [cited 2013 Oct 18]. Available from: <http://www.inei.gob.pe/estadisticas/indice-tematico/sociales>

<sup>g</sup> Valdivia M. Peru: Is identifying the poor the main problem in targeting nutritional programs? Washington (DC): Health Nutrition and Population, The World Bank; 2005 (HNP Discussion Paper, Reaching the Poor Program Paper, 7).

<sup>h</sup> Ricaldi R. Consolidation of databases and statistical analyses for MONIN 1997-2006. Lima: Ministerio de Salud; 2007.

<sup>i</sup> Ministerio de Salud. Instituto Nacional de Salud. Biblioteca Digital. Lima (PE); 1996 [cited 2013 Oct 18]. Available from: <http://www.ins.gob.pe/insvirtual/BiblioDig/DataLib.xml>

**Table 1.** Characteristics of the food and nutrition assistance programs in Peru, 2003-2010.

Program	Objective	Target population	Type of assistance	Eligibility assessment	Budget for 2012 (million \$) <sup>a</sup>
Glass of Milk (Vaso de Leche)	To improve the nutritional status and quality of life of the poor	First priority: children younger than 6 years and pregnant and lactating women. Second priority: children aged 7-13 years, older adults, and patients with tuberculosis	250 mL of fortified whole milk or an equivalent ready-to-drink product daily	Geographical, based on neighborhood socioeconomic status; within neighborhoods, beneficiaries are chosen at the discretion of mothers' committees in charge of day-to-day operations	145
Community Kitchen Program [Comedores Populares]	To improve access to food for impoverished families by feeding vulnerable groups at high nutritional risk	People living in poverty and extreme poverty in periurban and rural areas	Low cost lunches (subsidized by the government)	Geographical, based on neighborhood socioeconomic status; within neighborhoods, beneficiaries are chosen at the discretion of mothers' committees in charge of day-to-day operations	46 <sup>b</sup>
Wawawasi (now called <i>Cuna Mas</i> )	To provide comprehensive child care for children living in poverty	Children 6-36 months of age who live in poverty	Child care plus 2 meals per day	Geographical, based on neighborhood socioeconomic status	94
<i>Programa de Alimentación y Nutrición para el Paciente Ambulatorio con Tuberculosis y Familia (PANTBC)</i>	To contribute to the integral recovery of tuberculosis ambulatory patients and their families	Patients with tuberculosis and their families	Monthly food basket comprising 13 kg of cereals, 2 kg of legumes, 1.7 kg of canned fish, and 1 liter of vegetable oil	Based on tuberculosis diagnosis; benefits distributed through hospitals or health posts	4

Source: Ministerio de Economía y Finanzas. Glass of Milk Program – Distribution methodology. Lima (PE); 2012 [cited 2013 Apr 21]. Available from: [http://www.mef.gob.pe/index.php?option=com\\_content&view=article&id=2304:programa-vaso-de-leche-metodologia-de-distribucion&catid=150&Itemid=100848](http://www.mef.gob.pe/index.php?option=com_content&view=article&id=2304:programa-vaso-de-leche-metodologia-de-distribucion&catid=150&Itemid=100848); Ministerio de Desarrollo e Inclusión Social. Programa de Complementación Alimentaria (PCA). Presupuesto y procesos de adquisición del PCA (Ámbito de Lima Metropolitana). Lima (PE); 2013 [cited 2013 Apr 28]. Available from: [http://www.midis.gob.pe/dmdocuments/pca/as/pca\\_5presupuesto\\_procesos\\_adquisicion.pdf](http://www.midis.gob.pe/dmdocuments/pca/as/pca_5presupuesto_procesos_adquisicion.pdf) and the following footnotes: Valdivia<sup>d</sup> (2005), Vasquez<sup>e</sup> (2010), INEI<sup>f</sup> (2013b), Alcazar<sup>g</sup> (2007).

<sup>a</sup> Dollar conversions used rates from November 2013 (1 US\$ = 2.8 Peruvian soles).

<sup>b</sup> Approximate (includes the budget for other small social programs managed by local governments along with the Community Kitchen Program).

variable (yes/no). Data regarding FAP participation were available only at the family level; in other words, we only knew whether someone in the family, not necessarily the woman, participated in a FAP.

Additional independent variables included age (years), education level, family poverty status, urbanization status, and survey year. Education level was categorized as less than primary school, primary school, secondary school, or more than secondary school. Family poverty status was assessed using a score based on 5 household indicators: precarious walls, precarious floor, inadequate water access, inadequate electricity access, and inadequate sewage access. If the walls were constructed with anything but bricks or cement, the house had precarious walls and 1 point was given. The same method was applied to the other indicators: an extra point was given to the household if the floor was made of suboptimal materials (e.g., sand and gravel); access to water was not through internal piping; or the house did not have access to electricity or an internal sewage connection. The sum of these indicators, with a maximum of 5, was categorized as 0, 1, and  $\geq 2$ . Finally, urbanization status referred to the location of the family house (urban or rural).

Stata 12 (Stata Corp., College Station, TX, USA) was used for analyses. For all estimations, we used sample weights to account for complexity of the study design, and a  $p$ -value  $< 0.05$  denoted significance. Appropriate techniques were used to estimate results in the subpopulations of interest.<sup>11</sup> Descriptive statistics were used to summarize

the sample characteristics. Differences in descriptive variables between survey years were assessed with Pearson's Chi-square test. A series of multivariate Poisson regression models were conducted to determine whether overweight/obesity ( $\text{BMI} \geq 25 \text{ kg/m}^2$ ) was associated with FAP participation. Poisson regression was used because the outcome of interest was relatively common among Peruvian women ( $> 30.0\%$ ). To test the hypothesis that targeting deficiencies in FAP could lead to the overconsumption of calories and, therefore, an increased overweight/obesity risk for those not requiring assistance, all models were stratified by family poverty status. We ran models for the sample as a whole as well as by area of residence (Lima *versus* rest of the country and urban *versus* rural) and survey year (2003-2006 *versus* 2008-2010). All models were adjusted for age, education level, urbanization status, and year.

## RESULTS

Approximately two-thirds of women had secondary or more than secondary education (Table 2). The majority of the sample had at least 1 poverty indicator. In 2003-2006, 33.0% of the sample participated in FAP compared to 30.0% in 2008-2010. The prevalence of overweight was similar between years ( $\sim 31.0\%$ ) but obesity prevalence was significantly ( $p < 0.001$ ) higher in 2008-2010 (16.0%) compared to 2003-2006 (12.0%).

Table 3 shows the crude prevalence of overweight/obesity by FAP participation for the sample as a

**Table 2.** Characteristics of the sample of Peruvian non-pregnant, non-lactating women (15-49 years) included in the study. (N = 46,217)

	2003-2006 (n = 43,390)	2008-2010 (n = 2,827)	$p^a$
	%	%	
Age [years; mean (SE)]	30.3 (0.1)	27.6 (0.2)	$< 0.0001$
Education level			0.0820
Less than primary school	4.0	4.5	
Primary school	28.6	23.1	
Secondary school	45.3	47.2	
More than secondary school	22.2	25.3	
Family socioeconomic status			0.1416
0 poverty indicators	12.2	16.8	
1 poverty indicator	25.8	25.4	
$\geq 2$ poverty indicators	62.0	57.8	
Urbanization status			$< 0.0001$
Urban	66.1	85.5	
Rural	33.9	14.5	
Weight status			$< 0.0001$
Overweight	31.0	31.2	
Obese	11.8	16.4	
FAP participation (yes)	33.3	29.9	0.1602

<sup>a</sup>  $p$ -values estimated using Pearson's Chi-square test.

**Table 3.** Prevalence of overweight and obesity (BMI  $\geq$  25 kg/m<sup>2</sup>) among women by food assistance program participation, family socioeconomic status, area of residence, and urbanization status in Peru, 2003-2010.

	Food assistance program participation		p <sup>a</sup>
	No	Yes	
Total	45.6	42.9	0.0567
Family socioeconomic status			
0 poverty indicators	<b>44.4</b>	<b>57.2</b>	<b>0.0428</b>
1 poverty indicator	50.0	50.7	0.8241
$\geq$ 2 poverty indicators	<b>43.7</b>	<b>40.2</b>	<b>0.0308</b>
Area of residence			
Lima	48.0	52.9	0.1609
Rest of country	<b>44.5</b>	<b>40.0</b>	<b>0.0031</b>
Urbanization status			
Urban	47.7	49.8	0.2816
Rural	<b>37.0</b>	<b>33.3</b>	<b>0.0364</b>

<sup>a</sup> p-values obtained using weighted Pearson's Chi-square analyses.

Bold values indicate statistical significance.

whole and after stratification by family socioeconomic status, area of residence, and urbanization. The samples' overweight/obesity prevalence rates were similar and independent of FAP participation. When the data were stratified by family socioeconomic status, however, we observed some significant differences. Among women who lived in households with 0 poverty indicators, those who participated in FAP had an increased overweight/obesity prevalence compared to those who did not participate (57.0% versus 44.0%). In turn, among women who lived in households with  $\geq$  2 poverty indicators, those who did not participate in FAP had a slightly higher overweight/obesity prevalence (44.0%) compared to those who did participate (40.0%). There were also some differences according to the area of residence: among women who lived outside of Lima or in rural areas, those who did not participate in FAP had a higher overweight/obesity prevalence compared to those who did participate.

Table 4 shows the results of the multivariate Poisson regression models stratified by family socioeconomic status. For the sample as a whole, FAP participation was associated with an increased risk of overweight/obesity only for women who lived in households with 0 poverty indicators. Among women who lived in households with at least 1 poverty indicator, FAP participation was not associated with overweight/obesity in fully adjusted

models. Similar patterns were observed for women who lived in Lima, in urban areas, and those surveyed from 2008-2010, wherein FAP participation was associated with an increased overweight/obesity risk for non-poor women. There was no association between FAP participation and overweight/obesity among women who lived outside of Lima and in rural areas, regardless of poverty status.

## DISCUSSION

These results provide evidence of an association between FAP participation and overweight/obesity among non-poor Peruvian women who receive FAP benefits. Among women living in households with 0 poverty indicators, FAP participation was associated with a 30.0%-50.0% increased risk of overweight/obesity after controlling for several potential confounders. Among women living in households with at least 1 poverty indicator, FAP participation was not associated with overweight/obesity. This was observed both for the sample as a whole and for women living in Lima and urban areas.

Research evaluating the association between FAP participation and obesity in Latin America is limited. In Mexico, evidence of this association emerged from research on *Oportunidades* (now rebranded as *Prospera*),<sup>1</sup> a conditional cash-transfer program. Similar to the results presented herein, Fernald et al<sup>3</sup> (2008) found that receipt of a larger cash transfer was associated with increased overweight and obesity among adults. In Chile, there is evidence associating childhood obesity with participation in 2 FAP, the Chilean Supplementary Feeding Program and the National Nursery Schools Council Program.<sup>9,10</sup> In addition, evidence from the United States has linked their largest FAP, the Supplemental Nutrition Assistance Program (formerly known as the Food Stamp Program) with an increased obesity risk among women.<sup>c</sup> One study from Peru that focused on tuberculosis patients who participated in the PANTBC, which was included in this study, found that 21.0% of the studied beneficiaries who had normal weights at baseline were overweight after 5-6 months.<sup>1</sup> That study, however, was descriptive and the reported results were unadjusted.

Clearly, there are differences in FAP benefits and coverage within and between countries, which makes cross-country and even cross-FAP comparisons difficult. However, this type of analysis warrants a closer look at programs intended to feed populations who were previously but may no longer be undernourished. As countries progress through

<sup>1</sup> Secretaria de Desarrollo Social: Prospera, Programa de Inclusion Social. Mexico; 2014 [cited 2014 Sep 11]. Available from: <https://www.prospera.gob.mx/Portal/>

**Table 4.** Poisson regression results predicting overweight and obesity (BMI  $\geq 25$  kg/m<sup>2</sup>) by food assistance program participation<sup>a</sup> for Peruvian women, stratified by family poverty status.

FAP participation (yes/no)	Whole sample		Lima only		Rest of country		Urban areas		Rural areas		2003-2006		2008-2010	
	PR	95%CI	PR	95%CI	PR	95%CI	PR	95%CI	PR	95%CI	PR	95%CI	PR	95%CI
0 poverty indicators														
Crude	<b>1.29</b>	<b>1.03;1.61</b>	<b>1.36</b>	<b>1.01;1.85</b>	1.16	0.92;1.47	<b>1.29</b>	<b>1.03;1.61</b>	1.09	0.60;1.98	0.99	0.74;1.32	<b>1.68</b>	<b>1.31;2.14</b>
Adjusted <sup>b</sup>	<b>1.29</b>	<b>1.06;1.57</b>	<b>1.36<sup>c</sup></b>	<b>1.01;1.85</b>	1.19	0.86;1.64	<b>1.30</b>	<b>1.06;1.58</b>	0.79	0.38;1.65	1.07	0.82;1.40	<b>1.56<sup>d</sup></b>	<b>1.18;2.06</b>
1 poverty indicator														
Crude	1.01	0.90;1.15	1.09	0.87;1.36	0.96	0.84;1.10	1.01	0.89;1.15	1.06	0.71;1.58	1.07	0.94;1.21	0.95	0.75;1.20
Adjusted <sup>b</sup>	1.03	0.92;1.15	1.08	0.88;1.32	0.99	0.87;1.12	1.02	0.91;1.15	0.98	0.71;1.36	1.06	0.94;1.18	0.97	0.79;1.20
≥ 2 poverty indicators														
Crude	<b>0.92</b>	<b>0.85;0.99</b>	0.98	0.81;1.20	<b>0.92</b>	<b>0.86;0.99</b>	1.02	0.92;1.13	<b>0.90</b>	<b>0.81;0.99</b>	<b>0.92</b>	<b>0.86;0.98</b>	0.93	0.79;1.10
Adjusted <sup>b</sup>	0.99	0.92;1.06	0.97	0.79;1.17	1.01	0.94;1.08	1.02	0.93;1.12	0.95	0.87;1.04	1.00	0.94;1.06	0.96	0.83;1.11

FAP: Food Assistance Program; BMI: body mass index

<sup>a</sup> Refers to someone in the family (not necessarily the woman) who participates in FAP.

<sup>b</sup> Adjusted for age, educational level, urbanization status (except when stratified by urbanization), and year of survey (except when stratified by year).

<sup>c</sup> Due to small variability, only adjusted by year (most women in Lima live in urban areas and have a high education level).

<sup>d</sup> Due to small variability, not adjusted by education (approximately 95% of women who have 0 poverty indicators also have a high education level).

Bold values indicate statistical significance.

the nutrition transition with undernutrition prevalence dropping and the prevalence of overweight and obesity increasing, FAP reform becomes even more urgent.<sup>5</sup> In Peru, some FAP provide enough calories to raise concerns depending on the nutritional status of the populations reached. The Community Kitchen Program (CKP), which is widely popular in Lima, is a good example. The CKP is a food subsidy program in which women's clubs receive some free staples (e.g., cereals, legumes, oil) from the government, which they use (in addition to purchased food) to prepare and distribute meals at a low cost to impoverished families.<sup>k</sup> By law, the meals provided by CKP are supposed to cover approximately 30.0% of an adult's daily energy requirement.<sup>l</sup> However, research has shown that the energy provided by each ration varies widely, ranging from 550 to 2,000 kcal per ration (25.0% to 100% of the usual recommendations).<sup>m,n</sup> Some older reports indicate that some families split these meals within family members,<sup>l</sup> although the percentage of beneficiaries that currently do so is unknown.

The FAP included in this study all provide prescribed food offerings that are, for the most part, energy-dense (Table 1). However, even programs that provide cash transfers may negatively influence dietary intake. A study that evaluated beneficiaries of *Bolsa Família*,<sup>o</sup> Brazil's cash-transfer program, found that although program participation increased the consumption of all studied food groups, the increase was more pronounced for processed and energy-dense foods.<sup>7</sup> Similar findings have been reported for participants of the Supplemental Nutrition Assistance Program in the United States.<sup>p</sup> It is important to note that fresh foods with low energy density (e.g., fruits and vegetables) are usually more expensive and are therefore unavailable to people living with limited budgets, regardless of FAP participation.

Correct targeting of FAP, particularly those that provide food baskets, may therefore play a significant role, as the delivery of extra calories to individuals who do not need them could increase their risk of overweight and obesity. Based on a Food and Agriculture Organization (FAO) survey of 19 Latin American countries (including Peru), Uauy

et al<sup>10</sup> (2006) reported that > 20.0% of the population or 83 million people in these countries received some benefits from FAP. The same survey reported that only 10 million people in these countries were undernourished; therefore, approximately 88.0% of all FAP beneficiaries have a normal weight or are overweight/obese.<sup>10</sup> Most FAP in Latin America provide energy-rich supplements that may or may not have adequate micronutrient contents.<sup>9</sup> For the most part, Latin American diets are not deficient in energy but rather in essential micronutrients associated with improved growth (e.g., bioavailable zinc and iron); the provision of energy-dense supplements may therefore promote a positive energy balance.<sup>9</sup>

In Peru, leakage rates for the major FAP are 20.0%-40.0%,<sup>d,e,i</sup> meaning that 20.0%-40.0% of FAP beneficiaries are not part of the target populations. Moreover, 70.0%-80.0% of FAP participants do not live in extreme poverty.<sup>l</sup> These deficits may explain the observed association between FAP participation and overweight/obesity among women with 0 poverty indicators and may be because of the way in which FAP are distributed and need is assessed. Most FAP in Peru target beneficiary households on the basis of neighborhood socioeconomic characteristics rather than the socioeconomic status of the household or the presence of undernourished children.<sup>d,i</sup> In addition, most FAP do not have a "graduation" system to discontinue food aid once households escape poverty.<sup>d,i</sup> In FAP managed by mothers' clubs (e.g., the CKP or Glass of Milk Program; Table 1), the mothers assess poverty subjectively and decide who should receive benefits.<sup>d,i</sup>

Peru is a very diverse country, and different regions within the country are undergoing different stages of the nutrition transition.<sup>3</sup> FAP are still very much required to help the 30.0% who live in poverty, particularly those in Andean rural areas where the poverty rate approaches 65.0%.<sup>f</sup> However, Lima is a wealthy city in which only 13.0% of the population lives in poverty, and only 5.0% of children suffer from chronic undernutrition.<sup>f,q</sup> On the other hand, 55.0% of women in Lima are either overweight or obese.<sup>m</sup> FAP reform is warranted and should include better targeting and better defined goals to reach the people most in need while preventing an inadvertent increase in overweight and obesity risk among

<sup>k</sup> Alcazar L. Why food assistance and nutritional programs in Peru do not work? Risks and opportunities for their reform] In: Research, Policies, and Development in Peru. Lima: Grupo de Análisis para el Desarrollo; 2007.

<sup>l</sup> Programa Nacional de Alimentación Complementaria. Complementary Feeding Program - Community Kitchens. Lima (PE); 2010 [cited 2013 Oct 12]. Available from: <http://www.pronaa.gob.pe/index.php/programas-sociales/complementacion-alimentaria.html>

<sup>m</sup> Instituto Cuánto. Evaluation of impacto del programa de comedores populares. Lima (PE); 2005 [cited 2014 Feb 2]. Available from: <http://www.ins.gob.pe/insvirtual/BiblioDig/MISC/COME/COMPOP05/IFComPop05.pdf>

<sup>n</sup> Instituto de Investigación Nutricional. Evaluation of Food Assistance Programs in Peru Title II: 1990-1995. Lima (PE); 1996.

<sup>o</sup> Ministério do Desenvolvimento Social e Combate à Fome. Bolsa Família. Brasília (DF); 2014 [citado 2014 Sep 11]. Available from: <http://www.mds.gov.br/bolsafamilia>

<sup>p</sup> Wilde P, McNamara PE, Ranney C. The effect on dietary quality of participation in the Food Stamp and WIC Programs. Washington (DC): U.S. Department of Agriculture, Economic Research Service; 2000.

<sup>q</sup> Instituto Nacional de Estadística e Informática. Peru: Results from the strategic programs, 2010. The Demographic and Family Health Survey, ENDES Continua (first results). Lima (PE); 2011.

participants. Throughout the years, it has been politically unpopular to remove benefits from certain beneficiary groups that may no longer need them, particularly in Lima where mothers' clubs are highly visible and politically vocal.<sup>4</sup> Most FAP in Peru do not monitor the progress of their recipients in any of their established goals,<sup>d,e,i</sup> which makes evaluation efforts difficult.<sup>5</sup> Some people participate in multiple FAP, and there is no way of knowing who may be "double-dipping". Although the government initiated efforts to create a census of all FAP participants to avoid multiple program participation in the future, the entity charged with this task has been recently dismantled for reform with no update on the status of the census. The government needs to urgently focus on program surveillance to allow for the conduction of proper evaluations that would provide appropriate data to inform new targeting strategies. In addition to targeting improvements, we recommend a decentralization of FAP so that each region within Peru can adapt their FAP based on their nutritional realities,<sup>3</sup> with a focus on low-energy, high-nutrient density offerings for women in areas with a high prevalence of obesity (e.g., Lima).

To our knowledge, this is the first study to assess the relationship between FAP participation and overweight/obesity in Peru. Other strengths of this study include the availability of nationally representative data from multiple years. However, different sampling designs over the years have made it difficult to compare data over time. This difference in sampling designs only allowed the use of cluster sample weights and no sample weights from higher levels (e.g., departments as used in 2003-2006 or regional strata as used in 2008-2010). Moreover, we only had information regarding FAP participation at the family level, which prevented us from analyzing the direct effect of FAP participation on overweight/obesity in women. Although this might have affected our results, we believe

that any misclassification of FAP participation would result in an attenuation of the true association; in other words, the effect of FAP participation on overweight/obesity might be greater than the association observed in this study. Ideally, we would have included in the analysis only FAP participants and eligible non-participants as a comparison group. As explained above, however, FAP eligibility is mostly assessed subjectively, making it virtually impossible to identify a suitable comparison group. The multivariate analysis was stratified by family socioeconomic status and adjusted for educational attainment as an attempt to account for this limitation. However, actual family income data were not available; therefore, the socioeconomic status was assessed based on household characteristics. Even though similar socioeconomic status indicators are widely used in developing countries, these are imperfect and could be a source of error. In addition, we did not have information about the participants' food intake, which might mediate the association between FAP participation and overweight/obesity. It is also possible that other individual or family characteristics not addressed in the analysis may have led people both to participate in FAP and to engage in certain behaviors that might have increased their risk of becoming overweight. As this was a cross-sectional study, the direction of the observed associations cannot be determined. Despite these limitations, we believe the trends shown in this article to be true in the context of the nutrition transition currently observed in Peru, in which most of the country suffers from the double burden of malnutrition, with high overweight/obesity among women and a high prevalence of stunting among young children.<sup>3</sup> More research is required to assess the pathways by which FAP participation may lead to overweight and obesity, particularly research of longitudinal nature to account for self-selection into FAP.

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