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Factors associated with consumption of fruits and vegetables among Community Kitchens customers in Lima, Peru

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ABSTRACT

Community Kitchens (CKs) are one of the main food providers to low-income families in Peru and may encourage healthier diets. We aimed to determine the prevalence of fruit and vegetable consumption and associated sociodemographic and behavioral factors among CKs customers. A cross-sectional study enrolling customers of 48 CKs in two areas of Lima, Peru, was performed. The self-reported amount of fruits and vegetables consumed (<5 vs. ≥5 servings/day) was the outcome. The exposures were grouped in sociodemographic variables (i.e. age, gender, education level, etc.), and self-reported intention to change eating- and exercise-related habits in the last four weeks just prior to the interview. Prevalence ratios (PR) were estimated using Poisson regression. Data from 422 subjects were analyzed, 328 females (77.9%), mean age 43.7 (±14.5) years. Only 36 (8.5%; 95% CI 5.9%–11.2%) customers reported consuming ≥5 servings of fruits and vegetables daily. This pattern was 4-fold more likely among those with higher levels of education (≥12 vs. <7 years), and 64% less common for migrants relative to non-migrants. In terms of intentions to change habits, those who reported having tried to reduce sugar consumption or to eat more fruits were up to 90% more likely to meet the ≥5 servings/day target. A substantial gap in the consumption of ≥5 servings of fruits and vegetables/day was found among CKs customers that does not appear to be dependent on familial income. The profiles reported in this study can inform appropriate strategies to increase healthier eating in this population.

1. Introduction

Worldwide, the low consumption of fruits and vegetables is considered one of the 10 leading risk factors for mortality (World Health Organization, 2004): up to 2.7 million lives could be saved annually with sufficient fruit and vegetable consumption (World Health Organization, 2003a). Despite the multiple benefits attributable to fruit and vegetable intake, their consumption is below usual recommendations (World Health Organization, 2003b), especially in resource-constrained settings.

Community Kitchens (CKs) were created in the 1960s as a survival strategy for urban populations in Peru, especially in the main cities, in response to poverty and economic crisis (Garret, 2001). Many of the CKs are located in Lima, the capital of Peru (Blondet & Trivelli, 2004), and it is estimated that around one in three families has at least one member eating at CKs (Garret, 2001), and 60% of usual customers are poor (Mujica, 1994).

Although CKs are considered one of the main channels for the supply of food to families of lower socioeconomic levels, only a third of the ingredients used in food preparation are provided by the local government: the remaining ingredients are obtained through the limited earnings from the daily sales at the CKs (Blondet & Trivelli, 2004). According to the World Health Organization (WHO), a healthy diet should include at least five servings of fruits and/or vegetables (i.e. 400 g of fruits or vegetables) per day (World Health Organization, 2003a; World Health Organization, 2003b). However, fruits and fresh vegetables are not regularly included in the menus of CKs. Moreover, a survey reported that the lowest prevalence of fruit and vegetable consumption was among users of CKs in Lima, the capital of Peru, as compared to CKs from other regions (Grupo de Opinion Publica de la Universidad de Lima, 2009). This situation can be complicated by perceptions and behaviors of the customers regarding fruits and vegetables, as information and awareness alone may not translate into behavior change (Raats et al., 1998). As a result, there is a need to determine what demographic

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and behavioral factors could be important when implementing interventions promoting healthy eating habits to tackle chronic diseases.

This study aims to explore the sociodemographic and behavioral factors, assessed by the intention to change eating and exercise-related habits, associated with greater fruit and vegetable consumption in a sample of customers of CKs.

2. Materials and methods

2.1. Design and study setting

A cross-sectional study, involving usual customers of Community Kitchens in Lima, Peru, was performed. Two different areas were considered: Las Pampas de San Juan de Miraflores, located in Southern Lima, and the Cercado, located in the center of Lima. This study was conducted between July and December 2013 and was part of the formative research related to a feasibility community intervention to introduce healthy items, including fruits and vegetables, into the usual menus prepared by CKs (Buttorff et al., 2015).

2.2. Study population

This study included men and women aged ≥18 years, who reported having purchased a meal from the CKs at least once during the previous week, and who consented to participate. Those who did not pay for their food (cooks and those who cannot afford a meal but receive one as part of the activities of the CKs) were excluded. Only one person per household was enrolled. Only nine customers per Community Kitchen were selected in consecutive order during sales.

2.3. Study variables

The outcome of interest was the self-reported consumption of fruits and vegetables measured using questions of the STEPwise approach to surveillance of the World Health Organization (WHO STEPs) (World Health Organization, 2008). Questions were based on the number of days per week, over the last four weeks, during which the participant reported eating fruits and vegetables, and the number of servings eaten per day. Information was then categorized according to the WHO recommendation, i.e. ≥ 5 or <5 servings of fruits and vegetables per day (World Health Organization, 2003a; World Health Organization, 2003b).

The exposures of interest were evaluated in two groups: sociodemographic characteristics and those related to intention to change to healthier lifestyle behaviors in the previous four weeks. Sociodemographic information included gender, age (<30, 30–59, and ≥60 years), education level (<7 years, 7–11 years, ≥12 years), socioeconomic status (assessed by the monthly familial income, based on the Peruvian minimum wage (up to 750 NS, 751-1500 NS and >1500 NS)), marital status (married/cohabitating partner, single, and separated/widowed), and place of birth (Lima vs. migrant).

Intention to change to better eating and exercise-related behaviors was evaluated by using questions related to the Stages of Change theory (Krummel et al., 2004; Prochaska et al., 1992). For this analysis, we used the self-report of the intention over the last four weeks to (a) lose or not gain weight, (b) do more exercise or physical activity, (c) reduce the amount of salt in foods, (d) eat less fats or fried foods, (e) consume less sugar, sweets or sodas, (f) eat more fruits, and (g) eat more vegetables. Each of these changes in behavioral intentions was assessed individually based on information of the previous four weeks, and only two response options were available: yes or no.

2.4. Procedure and data collection

Data was collected as part of a study to assess the preferences of customers of the CKs to evaluate the feasibility of implementing an intervention to increase availability of fruits and vegetables in the menus provided by CKs (Buttorff et al., 2015). Fieldworkers were trained before starting research activities. During their visits to the Community Kitchens, potential participants were informed about the nature of the study and were asked to participate. If participants were not able to respond to the questionnaire at that time, a subsequent visit was scheduled. Completing the questionnaire took approximately 20 min. Only nine customers were interviewed at each Community Kitchen, and once the number was reached, enrollment commenced in a new CK.

2.5. Sample size

Assuming a level of significance of 5% and a prevalence of 10% of recommended consumption of fruits and vegetables (Jack et al., 2013), with 420 participants, there was a power over 80% to detect a strength of association of 2.5 or more when the exposure variable of interest (demographic or change in behavioral intention) was >25%.

2.6. Statistical analysis

All analyses were conducted using STATA 13.0 for Windows (STATA Corp, College Station, TX, US). Initially, descriptive characteristics of the study population were tabulated according to the WHO-recommended consumption of fruits and vegetables. Relative frequencies were reported and comparisons were performed using the Chi-square test. In addition, prevalence of variables of interest and 95% confidence intervals (95% CI) were estimated.

Poisson regression models with robust standard errors (Barros & Hirakata, 2003; Coutinho et al., 2008) were created to estimate prevalence ratios (PR) and 95% CI. Two different models were generated in order to verify the associations of interest. The first model identified sociodemographic factors independently associated with the WHO-recommended consumption of fruits and vegetables, while the second model was used to assess the association between changes of behavioral intention and the outcome of interest adjusting for potential confounders including gender, age, education level, socioeconomic status, and place of birth. To control for potential similarities among participants from the same Community Kitchen, the regression standard errors in clustered samples in STATA was used (Rogers, 1993).

2.7. Ethics

This study and informed consent forms were reviewed and approved by the Institutional Review Board at the Universidad Peruana Cayetano Heredia, Lima, Peru.

3. Results

3.1. Characteristics of the study population

A total of 432 participants from 48 Community Kitchens (24 from each study area) were enrolled. Of these, data from 10 subjects (2.3%) were excluded due to lack of information regarding the outcome of interest. Thus, a total of 422 records were analyzed: 328 (77.9%) were from women, and the mean age of all analyzed records was 43.7 (SD: 14.5).

3.2. Consumption of fruits and vegetables

Only 36 (8.5%; 95% CI: 5.9%–11.2%) participants reported consuming ≥5 servings of fruits or vegetables per day. The characteristics of the study population according to the consumption of fruits and vegetables are detailed in Table 1. Education level and place of birth, but not familial income, were associated with a greater consumption of fruits and vegetables. Among the intention to change variables, those reporting a consumption of ≥5 servings of fruits or vegetables per day also reported

Table 1
Description of the study population based on the consumption of fruits and vegetables recommended by the WHO.

Characteristics of the population	Recommended consumption of fruits and vegetables[a]		p-Value
	<5 servings/day	≥5 servings/day	
Gender	[*n* = 385]	[n = 36]	0.98
Female	300 (91.5%)	28 (8.5%)	
Male	85 (91.4%)	8 (8.6%)	
Age	[n = 386]	[n = 36]	0.34
<30 years	75 (88.2%)	10 (11.8%)	
30–59 years	253 (91.7%)	23 (8.3%)	
≥60 years	58 (95.0%)	3 (5.0%)	
Level of education	[n = 386]	[n = 36]	0.02
<7 years	104 (96.3%)	4 (3.7%)	
7–11 years	221 (91.3%)	21 (8.7%)	
≥12 years	61 (84.7%)	11 (15.3%)	
Monthly family income	[n = 383]	[n = 36]	0.07
Up to 750 NS	228 (91.6%)	21 (8.4%)	
751–1500 NS	130 (93.5%)	9 (6.5%)	
>1500 NS	25 (80.7%)	6 (19.3%)	
Marital status	[n = 386]	[n = 36]	0.17
Married/domestic partner	230 (91.6%)	21 (8.4%)	
Single	75 (87.2%)	11 (12.8%)	
Separated/widowed	81 (95.3%)	4 (4.7%)	
Place of birth	[n = 383]	[n = 36]	0.01
Lima	191 (88.0%)	26 (12.0%)	
Outside Lima	192 (95.1%)	10 (4.9%)	
Community Kitchen area	[n = 386]	[n = 36]	0.82
Pampas de San Juan de Miraflores	196 (91.2%)	19 (8.8%)	
Cercado de Lima	190 (91.8%)	17 (8.2%)	

Abbreviations: NS, Peruvian currency (Nuevos Soles: PEN); WHO, World Health Organization.
[a] Comparisons were made using the Chi-square test.

trying to reduce consumption of sugar and to eat more fruits. Trying to eat more vegetables was not associated with greater consumption of fruits and vegetables (Table 2).

In the multivariable model, among sociodemographic factors (Table 3), eating ≥5 servings of fruits and vegetables per day was more frequent in those with a higher level of education, while those who were migrants were less likely to eat the WHO-recommended amount of fruits and vegetables. With respect to behavioral intentions to change, trying to reduce sugar consumption and trying to eat more fruits in the last four weeks were positively associated with an increased consumption of fruits and vegetables after adjusting for sociodemographic variables (Table 4).

Table 3
Association between the recommended consumption of fruits and vegetables with sociodemographic factors: bivariable and multivariate models.

Sociodemographic factors	Bivariable model	Multivariate model[a]
	RP (CI95%)	RP (CI95%)
Gender		
Female	1 (Reference)	1 (Reference)
Male	1.01 (0.48–2.10)	0.90 (0.45–1.83)
Age		
<30 years	1 (Reference)	1 (Reference)
30–59 years	0.71 (0.32–1.57)	0.92 (0.42–1.99)
≥60 years	0.42 (0.13–1.36)	0.79 (0.22–2.82)
Level of education		
<7 years	1 (Reference)	1 (Reference)
7–11 years	2.34 (0.93–5.91)	2.32 (1.03–5.21)
≥12 years	4.13 (1.53–11.11)	4.20 (1.79–9.88)
Monthly family income		
Up to 750 NS	1 (Reference)	1 (Reference)
751–1500 NS	0.77 (0.32–1.85)	0.63 (0.28–1.40)
>1500 NS	2.29 (1.16–4.56)	2.05 (0.97–4.34)
Marital status		
Married/domestic partner	1 (Reference)	1 (Reference)
Single	1.53 (0.72–3.25)	1.17 (0.59–2.32)
Separated/widowed	0.56 (0.21–1.52)	0.60 (0.20–1.82)
Place of birth		
Lima	1 (Reference)	1 (Reference)
Outside Lima	0.41 (0.19–0.90)	0.36 (0.18–0.73)

Abbreviations: NS, Peruvian currency (Nuevos Soles: PEN); CI, Confidence interval; RP: Prevalence ratio.
[a] The multivariate model was adjusted by all listed variables.

Table 2
Description of the study population's intention to change based on the consumption of fruits and vegetables recommended by the WHO.

Intention to change: in the last 4 weeks, you have…	Recommended consumption of fruits and vegetables[a]		p-Value
	<5 servings/day	≥5 servings/day	
Tried to lose weight	[n = 386]	[n = 36]	0.88
No	296 (91.4%)	28 (8.6%)	
Yes	90 (91.8%)	8 (8.2%)	
Tried to engage in more physical activity	[n = 386]	[n = 36]	0.66
No	312 (91.8%)	28 (8.2%)	
Yes	74 (90.2%)	8 (9.9%)	
Tried to reduce consumption of salt	[n = 386]	[n = 36]	0.77
No	314 (91.3%)	30 (8.7%)	
Yes	72 (92.3%)	6 (7.7%)	
Tried to reduce consumption of fats	[n = 386]	[n = 36]	0.37
No	254 (92.4%)	21 (7.6%)	
Yes	132 (89.8%)	15 (10.2%)	
Tried to reduce consumption of sugar	[n = 386]	[n = 36]	0.02
No	295 (93.3%)	21 (6.7%)	
Yes	91 (85.9%)	15 (14.1%)	
Tried to eat more fruits	[n = 386]	[n = 36]	0.008
No	284 (93.7%)	19 (6.3%)	
Yes	102 (85.7%)	17 (14.3%)	
Tried to eat more vegetables	[*n* = 386]	[n = 36]	0.19
No	276 (92.6%)	22 (7.4%)	
Yes	110 (88.7%)	14 (11.3%)	

Abbreviations: WHO, World Health Organization.
[a] Comparisons were made using the Chi-square test.

Table 4
Association between the recommended consumption of fruits and vegetables with intentions to change: crude and adjusted models.

Intention to change: in the last 4 weeks, you have…	Crude model	Adjusted model[a]
	RP (CI95%)	RP (CI95%)
Tried to lose weight		
No	1 (Reference)	1 (Reference)
Yes	0.94 (0.47–1.90)	0.78 (0.38–1.62)
Tried to engage in more physical activity		
No	1 (Reference)	1 (Reference)
Yes	1.18 (0.62–2.25)	1.08 (0.59–1.98)
Tried to reduce consumption of salt		
No	1 (Reference)	1 (Reference)
Yes	0.88 (0.32–2.40)	0.92 (0.35–2.45)
Tried to reduce consumption of fats		
No	1 (Reference)	1 (Reference)
Yes	1.34 (0.78–2.29)	1.26 (0.68–2.35)
Tried to reduce consumption of sugar		
No	1 (Reference)	1 (Reference)
Yes	2.13 (1.42–3.20)	1.87 (1.18–2.94)
Tried to eat more fruits		
No	1 (Reference)	1 (Reference)
Yes	2.28 (1.27–4.10)	1.91 (1.04–3.52)
Tried to eat more vegetables		
No	1 (Reference)	1 (Reference)
Yes	1.53 (0.77–3.03)	1.54 (0.76–3.09)

Abbreviations: CI, Confidence interval; RP: Prevalence ratio.
[a] Models were adjusted by gender, age, level of education, monthly family income, marital status, and place of birth. In addition, the Community Kitchen area was included in the model as cluster.

4. Discussion

4.1. Main findings

Only 8.5% of the population reported consuming ≥5 servings of fruits or vegetables per day, therefore constituting a substantial gap to address towards achieving the goal of healthy eating and the prevention of chronic diseases. Among sociodemographic factors, consuming the WHO recommended amount of fruits and vegetables per day was directly associated with higher levels of education, i.e. seven or more years of education, but negatively associated with being a migrant. Among intention to change variables, only those reporting having tried to reduce consumption of sugar and having attempted to eat more fruits, but not vegetables, were more likely to eat ≥5 servings of fruits or vegetables per day.

4.2. Comparison with literature

As in previous studies (Ball et al., 2006; Galobardes et al., 2001; Irala-Estevez et al., 2000), higher levels of education were associated with greater consumption of fruits and vegetables. Education might influence the lifestyles chosen as well as the awareness of several preventive measures in this population group. Despite this, levels of consumption in the better educated group were still low. Being migrant was associated with a reduction of 64% in the likelihood of eating at least five servings of fruits and vegetables. Many of the migrants living in Lima, especially in the selected study areas, come from the Andean regions of Peru. The diet in these regions is mainly based on carbohydrates (Ochoa-Aviles et al., 2014), and a reduced consumption of fruits and vegetables in this population has also been reported elsewhere (Bermudez & Tucker, 2003). Other factors, such as socioeconomic level, evaluated through the monthly familial income, were not associated with an increased consumption of fruits and vegetables in our sample. However, the predominance of low socioeconomic status among participants (i.e. 60% below the minimum wage) could have affected our results. Gender has been also reported to be associated with greater consumption of fruits and vegetables (Krolner et al., 2011), but this was not the case in our study. Other factors described in the literature and not assessed in this study included the family size and the perception of the type of food (Cutler et al., 2011; Dynesen et al., 2003; Hill et al., 1998).

Regarding the intention to change eating-related habits, the consumption of fruits and vegetables was associated with the intention to reduce consumption of sugar, but not with the intention to lose weight or engage in physical activity, as was previously reported (Racette et al., 2005; Riebe et al., 2005; Trudeau et al., 1998). Lack of awareness of the potential benefits of eating fruits and vegetables beyond weight loss might be an explanation. Two recent systematic reviews including randomized clinical trials reported that bodyweight change due to fruits and vegetables consumption was almost negligible (Kaiser et al., 2014; Mytton et al., 2014).

A greater consumption of fruits and vegetables was associated with the intention to eat more fruits, but not vegetables. These results support people's preferences for fruits instead of vegetables (Krolner et al., 2011). Compared to fruits, vegetables usually have an increased cost and require more significant preparation time and the use of additional ingredients. A previous study showed that fruits had preferred sensory attributes compared to vegetables, which can have an impact on individual's consumption (Krolner et al., 2011). Other studies are needed to identify the mechanisms through which intentions to change play a role in the decision to eat fruits and vegetables.

4.3. Public health relevance

Less than 10% of these customers reported consuming the WHO-recommended amount of fruits and vegetables. Due to resource constraints, CKs are not able to provide these products. The scenario is complicated as some food assistance programs, including CKs, have been linked to overweight and obesity (Carrillo-Larco et al., 2016; Chaparro et al., 2014). Thus, our findings emphasize the need of increasing awareness among customers of CKs regarding the benefits of fruits and vegetables. As determined in this study, greater familial income was not associated with an increased consumption of fruits and vegetables; therefore, creating markets with lower prices may not increase the consumption of fruits and vegetables. As CKs are part of the food assistance programs in Peru and one of the main providers of food, especially for poor people, there is a need to better understand the mechanisms behind the decision to consume fruits and vegetables, including the impact of both sociodemographic variables and intentions to change, and thus create appropriate strategies to increase availability and consumption of these products. As a result, potential interventions must increase awareness regarding fruits and vegetables, especially among those who are migrants, who constitute approximately 60% of the population of the areas included in the study. Although information may not be sufficient to produce a behavior change (Raats et al., 1998), health promotion strategies aimed at influencing individuals' food choices should be implemented (Hill et al., 1998). This is particularly important because of the persistent effect of education regarding taste and habit formation, which can lead to long-term gains. Thus, the identification of cultural and environmental contexts are required as part of this process. Moreover, our results suggest that strategies for encouraging the consumption of fruits and vegetables should be different, since people prefer fruits over vegetables. As vegetables are generally more nutrient-rich, contain less natural sugar, and more fibers than fruits, appropriate promotion strategies for each kind of product should be created to ensure that the consumption of both is encouraged.

As expected, a significant proportion of CKs users were women as these community-based organizations are almost entirely led by women. Each Community Kitchen groups between 30 and 60 female members from the same neighborhood who take turns cooking – they are both suppliers as well as users of CKs. These women cook between 100 and 200 food rations per day, receiving a meal as a reward for their time. Almost 60% of the rations cooked in Lima are sold, at a discounted price, to female members of the CKs, 13% are for members who cooked, 9% are given for free to vulnerable neighbors (i.e. elderly, orphan children) and 18% are sold to other neighbors or people who work but do not live in the community (Blondet & Trivelli, 2004). On a complementary note, marketing of unhealthy products are very common in various settings, including the environment where CKs are located. However, because CKs only sell and serve cooked food, they introduce an opportunity to provide better offerings related to healthy eating with minimal or nearly absent competition from industry-wide marketing strategies.

4.4. Strengths and limitations

The importance of this study lies in the assessment of a well-established food assistance program in Peru. Moreover, customers participating in this study could be considered similar to those eating in the street. This is a common behavior yet difficult to collect information on. However, this study has some limitations. Given the cross-sectional nature of the study, it is not possible to determine the causal relation but only associations. In addition, because of the low proportion of individuals who report eating the WHO-recommended amount of fruits and vegetables, the consumption of these products was analyzed together, not separately as in previous studies (Dynesen et al., 2003; Trudeau et al., 1998). However, results might help in planning and implementing appropriate strategies for CKs customers. Second, the consumption of fruits and vegetables was self-reported; despite using validated questions to determine the proportion of people consuming fruits and vegetables, social desirability bias might arise. This can be more patent when assessing intentions to change behaviors. Third, some variables of

interest, e.g. family size, perceptions on the type of foods, among others, were not assessed in this study. Furthermore, we did not collect persistence behavior nor strengths of intention, both important factors that may be considered for future studies. Finally, information about eating behaviors was collected at the provider level; we suggest collecting similar information in other settings for future related studies.

5. Conclusions

Less than 10% of customers of CKs reported eating the amount of fruits and vegetables recommended by the WHO. Those with a higher education level, reporting an intention to reduce consumption of sugar, and reporting an intention to increase their consumption of fruits were more likely to eat more than five servings of fruits and vegetables per day. However, those who reported being migrants were less likely to eat five servings per day. Our results suggest the need to implement appropriate strategies to increase consumption of fruits and vegetables in this population.

Conflict of interest

The authors declare that a conflict of interest does not exist.

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Author's contribution

FADG, IV-M, AB-O and FD-C developed the idea for this manuscript. FADG and IV-M drafted the first version of the manuscript with great input of AB-O and FD-C. FD-C coordinated fieldwork activities. AB-O led the statistical analysis. AJT and JJM are senior authors who conceived, designed and supervised the overall study. All authors participated in writing the manuscript, provided important intellectual content and gave their final approval of the version submitted for publication.

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