

Functional limitations, depression, and cash assistance are associated with food insecurity among older urban adults in Mexico City

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Abstract

Purpose: To examine factors associated with food insecurity among urban older adults (65 years and older). **Methods:** 352 older adults attending community centers in a neighborhood of Mexico City were surveyed for food insecurity, functional impairments, health and mental health status, cash-transfer assistance, socio-demographic characteristics, social isolation, and the built food environment. **Results:** Having at least primary education and receiving cash-transfers were significantly associated with a lower probability of being moderately or severely food insecure (OR=0.478 and 0.597, respectively). The probability of moderate and severe food insecurity was significantly higher among elderly at risk of depression (OR=2.843), those with at least one activity of daily living impaired (OR=2.177) and those with at least one instrumental activity of daily living impaired (OR=1.785). **Conclusions:** Having primary education completed or more, and cash transfers may have a positive influence on reducing food insecurity. Depression and functional limitations may increase the likelihood of food insecurity among older adults.

Key words: food insecurity, older adults, *Escala Latinoamericana y Caribeña de Seguridad Alimentaria* (ELCSA), experienced-based food security scales, conditional cash-transfer programs

Food insecurity in older adults that reside in Mexico is an important phenomenon from two standpoints. First, Mexico – as many other middle income countries – is immersed in a demographic transition characterized by an aging of its population. According to the Mexican National Census 2010,⁽¹⁾ adults 65-years-old and over will increase as a share of the population from 6.2 percent in 2010 to 22.6 percent in 2050. The increasing representation of older adults in Mexican society calls for understanding how to secure their access to a nutritious diet. This is especially relevant considering that older adults in Mexico are highly vulnerable, as over half of them (55%) lack pensions and social security (National Income and Expenditure Survey (ENIGH-2008)). Second, empirical evidence indicates that the prevalence of food insecurity, defined as the lack of access and consumption of foods in adequate quality and/or quantity due to limited socio-economic resources,^(2, 3) is particularly high among older adults.⁽⁴⁻⁸⁾ Among older adults there are different factors associated with an increased risk of food insecurity including: functional impairments,⁽⁵⁾ health problems,⁽⁹⁻¹¹⁾ the built environment,^(12, 13) social isolation,^(5, 14) and financial vulnerability.⁽¹⁵⁻¹⁷⁾

Studies focusing specifically in urban older adults are important since in such environments most meals consumed are purchased outside the home, therefore, financial security⁽¹⁸⁾ and physical access to food play a crucial role in determining food security among older adults, both in terms of dietary quantity and variety.⁽¹⁹⁾ Thus, the purpose of this study was to examine factors associated with household food insecurity among urban older adults in Mexico City. Based on prior studies, we hypothesized that poorer physical and mental health, lack of social networks, socio-demographic and economic factors, and

elements related to the built food environment, are associated with food insecurity among older adults.

Methods

The current analysis is based on a cross-sectional survey of older adults in Mexico City.

The study population included older adults who were 65 years or older, who attended a community group for senior citizens and who lived in the Northwest region of Mexico City, a region with a high poverty prevalence (i.e. 31.3 percent of the population live in poverty and 2.4 percent in extreme poverty,⁽²⁰⁾ based on multidimensional poverty measures).

Senior citizens community groups have diverse goals, but an underlying theme is to provide older adults with a space where they can get together at least one day per week (i.e. frequency of meetings vary) to perform different leisure activities including craft making, dancing, physical activities, and skills workshops. The initial contact with the study participants took place between May and September 2013 in the community centers where they regularly congregated. Because the community centers had not been mapped, it was not possible to select randomly the study centers included in the study. Rather, community centers were identified through three different convenience sampling approaches: referral from local authorities, Internet searches, and key informants snow-ball sampling. All community centers found through these approaches were included in the sample (n=18). The characteristics of each community center varied in terms of resources, leadership, and number of people who accessed them. All community centers were kept in the sample as this contributed to diversity in the

characteristics of the unit of analysis (i.e. older adults). Study participants were actively engaged with their community organizations. Thus their cognitive abilities and functionality were such that they could walk or use public transportation to participate in their weekly community center activities. All older adults were sufficiently functional to answer the study questionnaire unassisted. For these reasons our sample is biased towards more functional and potentially healthier older adults. Thus, findings may be only generalized to older adults attending community centers.

All eligible older adults within the community groups were invited to participate. Participants were asked to report on all the community groups they attended. The only one participant who attended more than one community group was excluded from the analyses. The vast majority of participants approached agreed to participate (>95 percent). This very high participation rate may have been the result of a combination of factors including: (i) incentives (all older adults participating in the study were offered an individualized nutrition and basic health assessment report); (ii) training of interviewers which included several techniques to establish rapport with older adults; and (iii) the positive attitude that most older adults showed towards interacting with young adults (i.e. the interviewers).

The analytical sample included 329 older adults. Of the 352 older adults interviewed 23 participants were excluded from the analyses because they had incomplete or unreliable information. Most exclusions were related to implausible anthropometric measures resulting from uneven floors.

Data were collected face-to-face in the community centers by trained interviewers. Interviewers received a three-day training where each of the questionnaire items was reviewed and practiced. In addition, interviewers performed pilot interviewing senior citizens attending community groups in an area of the city not included in the sample. Technicians in charge of anthropometric and physiological measures were trained at the Nutrition Clinic of the Universidad Iberoamericana. Most of the socio-economic and demographic questionnaire items used were derived from nationally representative surveys previously conducted in Mexico (i.e. Mexican National Health and Nutrition Survey), as well as additional validated instruments, (i.e. Lubben social isolation scale, the geriatric depression scale, the Latin American and Caribbean Food Security Scale (ELCSA)) and it took approximately 35 minutes to complete. The ethics committee from Universidad Iberoamericana approved the study.

Measures. *Dependent Variable – Food insecurity.* A 15-item version of the ELCSA assessed older adult's perception of their household's experience regarding lack of access and consumption of healthy nutritious foods in adequate quality and/or quantity due to socio-economic constraints (2, 3). Based on the respondent's number of affirmative answers, households were categorized as being food secure (score=0), mildly food insecure (score=1 to 5 in households with minors; score=1 to 3 in households without minors), moderately food insecure (score=6 to 10 in households with minors; score=4 to 6 in households without minors), or severely food insecure (score=11 to 15 in households with minors; score=7 to 8 in households without minors). Prior studies have demonstrated that ELCSA has excellent construct validity, face validity, psychometric properties (i.e.

assessed through Rasch modeling), and strong convergence and criterion validity in the general population.⁽²¹⁻²³⁾ The modified version for urban Mexican older adults has also been reported to have good face validity.⁽²⁴⁾ In this sample Cronbach's alpha was computed using the *alpha* command in STATA. The coefficient for the items included in the food security scale modified version for urban older adults was 0.927, confirming a high internal consistency.

Independent Variables

Social programs. Prior studies have reported that receiving cash-transfers is associated with a lower risk of food insecurity among older adults in Mexico.⁽²⁵⁾ Older adults in Mexico City are eligible to receive two different demogrants or age-conditioned cash-transfers that are not mutually exclusive. The Mexico City government offers a food subsidy (*Pensión Alimentaria*) to all older adults aged 68 years or older of approximately US\$68 monthly. This money can only be spent in supermarkets. In addition, the federal government has an age-conditioned cash-transfer program (*70 y Más*), that provides all older adults over 70 years old with a monthly stipend of approximately US\$40. This federal program was rolled out in Mexico City in 2012, so when the survey was collected the program was relatively new. In addition, while data were being collected a change to the program was announced (i.e. modifying the age eligibility criteria from 70 to 65 years of age). These changes generated some confusion about the name of the programs, and study participants commonly mixed up both programs. So to avoid recall bias, the analysis categorized an older adult receiving either of the programs or both, as participating in a demogrant program. It is likely that as the federal program becomes more accepted and

visible, future studies may be able to assess independently the effect of the different types of subsidies.

Functional impairments. Activities of daily living (ADL) and instrumental activities of daily living (IADL) were measured using the Katz ADL^(26, 27) and the Lawton IADL^(28, 29) scales. These are common instruments for use with older adults^(30, 31). The Katz ADL scale includes five items measuring aspects related to bathing, self-feeding, getting in or out of bed, dressing and toileting. Lawton's IADL scale includes four items related to preparing own meals, managing money and medicines, and shopping.⁽²⁶⁾ According to previously established cut-off points, each index was coded into a categorical variable indicating whether they have one ADL impairment or more, and if they had at least one instrumental activity IADL impairment.⁽⁵⁾

Health status and mental health. The presence of eight self-reported diagnosed chronic health problems – diabetes, high cholesterol, hypertension, heart problems, cancer, asthma, renal failure, and gastritis – was estimated through a continuous summative variable measuring the number of comorbidities. These health problems were selected based on the fact that they are some of the top national causes of mortality among older adults, and the leading causes of hospitalization in Mexico.⁽³²⁾ Older adults' body mass index (BMI) was estimated using Seca portable stadiometers and In-body portable scales. BMI was modelled as a continuous variable as the use of conventional adult BMI cut-off points is still controversial among older adults.^(33, 34) Finally, the risk of depression was measured using a self-reported geriatric depression scale of 5-items (GDS-5) with binary yes/no answer options.⁽³⁵⁾ Participants with two or more affirmative answers were

categorized at risk of depression. In Latin-American settings, the GDS-5 has exhibited adequate internal consistency (0.73), construct reliability (0.83) and one-dimensional structure.⁽³⁶⁾

Social isolation. Social isolation was evaluated by the abbreviated Lubben Social Network Scale (LSNS-6). This instrument uses six items evaluating three different aspects of social networks (i.e. size of network, perceived support, and perceived confidant network) attributed to family ties and friendship. Each item is scored on a 0 to 5 scale, a summative index across items is then computed to obtain a global score. Higher global scores indicate larger social networks. Using previously established cut-off points, an individual with a global score less than 12 was identified as socially isolated.⁽³⁷⁾

Availability of fresh fruits and vegetables. Neighborhood availability of fresh fruits and vegetables was captured by an instrument assessing how difficult it is to buy fresh fruits and vegetables in the community or neighborhood where older adults reside. These types of measures have increasingly been used across studies to capture environmental aspects of access to and availability of healthful choices.^(38, 39) We adapted items focused on assessing availability and affordability of healthful choices in the local market from the REACH 2010 survey.⁽⁴⁰⁾ The original questionnaire included four options as answers, however, during the pilot stage of the survey the four choices were difficult to manage for older adults and it was decided to keep only two options. As a result, food access was expressed as a dichotomous variable, if they answered it was difficult to buy fresh fruits and vegetables in their community or neighborhood, it was coded as low access and high access if they reported it was easy to buy fresh fruits and vegetables.

Demographics. Household size was included as a continuous variable. Educational status was broken down into two groups (none or uncompleted primary education vs. at least primary school).

Statistical Analyses. Descriptive statistics were estimated to characterize the study population. Median and interquartile range (IQR) were computed for continuous variables as their distributions were skewed. For categorical variables frequencies and percentages were estimated. To assess the association between food security level and the independent variables, an ordered logistic regression model was estimated. Due to sample size restrictions, the moderate and severely food insecure categories were collapsed into one category. In order to interpret the odds ratios, we estimated the predicted probabilities for experiencing each category of food insecurity – food secure, mild food insecure, and moderate and severe food insecure combined – with all the independent variables set at their mean values.

The STATA command *mf* was used to obtain the marginal effects of each independent variable, holding the others constant at their mean. Marginal effects are the partial derivatives of the predicted probability with respect to the independent variables. Therefore, they were estimated to assess the contribution of each independent variable to the probability of being food secure, mild food insecure, and moderately/severely food insecure. Multicollinearity was tested by calculating the variance inflation factors (VIF). Results indicated no presence of multicollinearity. Statistical analyses reported in this study were performed using STATA (v. 13).⁽⁴¹⁾

Sensitivity analyses were performed (results not shown) applying different cut-points for the education variable (no education, primary education uncompleted, primary education completed or secondary uncompleted, secondary education completed or more) as well as operationalizing the Katz and Lawton-Brody scales as continuous variables. However, these alternative approaches on how to express two key independent variables did not modify the results. Similar coefficients were also estimated through a multinomial logistic approach using 3 levels of household food insecurity. Nevertheless, given that the ordered logistic regression accounts for the ordinal nature of the data, this model was kept. Brant test was performed to verify no violations of the proportional odds assumption.

Results

The median age of older adults' was 71 years old (IQR=8.0). Participants' were mainly women (84.8%), with limited educational status as almost half of them had no schooling or only some primary education (i.e. less than 6 years of education). Study participants lived in households with a median of 3.0 (IQR=3.0) and had a median BMI of 29.2 (IQR=5.4). Participants had a median of 2.0 self-reported comorbidities (IQR=2.0), and more than one third of the older adults were at risk of depression (33.7%). Consistent with this finding, 42.2 percent of the participants were at risk of social isolation based on the abbreviated Lubben scale.

In terms of their functional impairments, 41.6 percent of the sample had at least one ADL and close to one-third (29.2%) had at least one IADL. In addition, according to

ELCSA more than half of the study participants lived in food insecure households (35.8 percent with mild food insecurity and 18.9 percent with moderate/severe food insecurity). According to the questions about easiness in accessing healthful foods, 23.7 percent of respondents stated that it was difficult to buy fresh fruits and vegetables in their community (i.e. they had low access). Slightly over two-thirds of the sample (66.6%) reported receiving age-conditioned cash-transfers either from the Mexico City government or the federal program (Table 1).

According to the ordered logistic regression (Table 2), the odds of being mildly or moderately/severely food insecure are lower for those having primary education completed or more (OR=0.478) and those receiving an age-conditioned cash-transfer (OR=0.597). However, the odds of being mildly or moderately/severely food insecure was significantly higher among older adults at risk of depression (OR=2.843), among older adults who had at least one ADL impairment (OR=2.177) and among those reporting at least one IADL impairment (OR=1.785).

Marginal effects analysis (Table 3), indicated that having at least primary education completed was associated with a lower probability of food insecurity compared with having no education. This finding translates into a reduction of 8.4 percentage points in the probability of mild food insecurity, a reduction of 9.5 percentage points in the likelihood of moderate/severe food insecurity, and an increase of 17.9 percentage points in the probability of being food secure among older adults. Similarly, receiving an age-conditioned cash-transfer compared to not receiving it was associated with a lower probability of food insecurity. Coefficients show a reduction of 5.4 percentage points in

the likelihood of mild food insecurity, a reduction of 6.9 percentage points in the probability of moderate/severe food insecurity, and an increase of 12.4 percentage points in the likelihood of being household food secure among older adults. The larger significant effect was estimated for risk of depression compared to individuals without such risk. This finding suggests that depression is associated with a reduction of 24.4 percentage points in the likelihood of food security, an increase of 8.3 percentage points in the probability of mild food insecurity, and an increase of 15.1 percentage points in the likelihood of being moderate/severe food insecure among older adults. Functional impairments had a similar effect but of smaller magnitude; having at least one ADL or one IADL decreased the probability of food security by 18.7 and 13.8 percentage points respectively, while it increased the likelihood of mild, moderate and severe food insecurity.

Discussion

Results of this study help understand the underlying contributors to household food insecurity in low income urban older adults, a highly vulnerable population. A key finding supported by prior research^(5, 42) is the association of functional impairments with food insecurity. Physical limitations may indeed contribute to food insecurity; as older adults with restricted mobility due to physical impairments may have serious challenges accessing food outside or inside their homes⁽⁴²⁾.

Another key finding from this study is the association between food insecurity and depression among older adults in a middle income country. These results are similar to

the ones reported in the literature, although prior studies have targeted different populations. For example Cole and Tembo⁽⁴³⁾ using a panel data from rural Zambia , and Maes et al⁽⁴⁴⁾ using longitudinal data on health care workers in Ethiopia, found a significant association between food insecurity and poor mental health. Kim and Frongillo,⁽⁴⁵⁾ found a similar association among in U.S. older adults using longitudinal data. On the other hand, Hanson and Olson⁽⁴⁶⁾ found that risk for depression predicted persistent food insecurity among low-income families with children in rural counties of the United States. This seemingly bi-directional phenomena was documented by Huddleston-Casas et al⁽⁴⁷⁾ in a longitudinal study focusing on the association between food insecurity and maternal depression in low-income rural families in the U.S. While these studies support our findings, it is relevant to underline that only Kim and Frongillo⁽⁴⁵⁾ focused their research on older adults and none of the reviewed studies were conducted in a middle income country. Therefore, the risk factors for food insecurity among older adults in Mexico City represents an original contribution to the field.

There has been debate about the effects of food assistance programs on household food security^(48, 49) however, less attention has been paid to assessing the effect of public pensions and aged-conditioned cash-transfers on food security among older adults. In this study it was found that aged-conditioned cash-transfer may protect elderly from food insecurity, coinciding with prior studies examining at the nutritional effects of similar programs. For example, the Elderly Nutrition and the Food Stamp Program in the USA have been reported to have a positive impact on nutrient intake among low-income beneficiaries who are older adults (65 years and older).^(45, 50) Similarly, nutrition

improvements at the household level have been reported for programs such as the means-tested pension system in South Africa.⁽⁵¹⁾ The process through which aged-conditioned cash-transfers may protect older adults from food insecurity should be further studied, as it may be linked to direct effects such as having extra money, as well as through indirect effects such as getting more help or attention from relatives due to the empowerment prompted by the cash-transfer. This may be especially relevant in settings like Mexico where older adults tend to live with extended families.

While others have found significant associations between low community social capital and food insecurity^(5, 52, 53) based on the abbreviated Lubben scale of social support, no significant associations were reported in this study. This discrepancy may arise from measurement issues or lack of statistical power. While the Lubben scale is known for its solid psychometric properties and has been used in diverse racial, ethnic, and national elderly groups⁽⁵⁴⁻⁵⁶⁾, to our knowledge the scale has been translated into Spanish but it has not been validated in the Mexican context. Given that a large proportion of Mexican Urban older adults live in extended families (i.e. according to data from ENIGH 23.5 percent of older adults live in non-nuclear households),⁽²⁵⁾ Lubben's scale may perform differently in this context. Further research is needed to better understand how to measure social isolation and social capital among Mexican older adults.

As in previous studies conducted elsewhere^(5, 48, 57) education was inversely associated with food insecurity. This association was detected in our study in spite that about half of the sample had less than primary education completed. This suggests that

household food insecurity is highly sensitive to education gradients even among populations with generalized low levels of education.

While other studies have reported an association between food insecurity and obesity – referred to as the food-insecurity-obesity paradox –in this study BMI was not significantly associated with food insecurity. Among older adults the relationship between BMI and health status has yet to be better understood.⁽⁵⁸⁾ There have been findings suggesting relatively higher BMI may be protective or that older people may be more resistant to the negative effects of adiposity.^(58, 59) This could explain, at least in part, the lack of association found in our study. To further explore this issue, we ran the same model but controlling for BMI as a categorical variable (based on internationally accepted cut-off points). In this model only the overweight category was statistically significant and had a protective association with food insecurity (OR=0.44). These results somehow mirror those of Rivera-Márquez et al,⁽⁶⁰⁾ based on the Mexican National Health and Nutrition Survey 2012 they found that older adults (60 years and older) who were overweight had significantly lower prevalence of severe food insecurity. These findings suggest that the food-insecurity paradox reported among adults may have a different behavior among the elderly.

The study did not find high or low self-reported access to fresh fruits and vegetables to be a statistically significant predictor of food insecurity. This type of predictor has not traditionally been included in prior studies assessing the determinants of food insecurity among older adults. However, given the effects that the physical environment may impose to older adults in terms of access to healthful choices, we expected for lack of

access to fruits and vegetables to be a risk factor for food insecurity. It is possible that the measure we used in our study was not sensitive enough to capture fruit and vegetable access issues affecting older adults in low income urban neighborhoods. Future studies should consider including more objective assessments of the neighborhood food built environment including geo-referencing.

There are some weaknesses of the study. First, it is based on cross-sectional data that limits the ability to attribute causality and establish the temporal sequence of associations. In addition, the study is based on a sample of older adults who attended community centers and participated in group activities. Thus, the external validity of the study needs to be interpreted with caution as our sample represents older adults from the Northwest region of Mexico City with enough functionality to be able to attend and participate in community center activities and who were able to respond to the study questionnaire without special assistance. Furthermore, the fact that most participants were women could have created a gender-bias. The high female participation can be explained because women's attendance to community organizations in Mexico is much greater than men's, and women's life expectancy is greater than men's. Additionally, even though the analysis controlled for the potential effect of comorbidities in food insecurity among older adults; this variable was based on self-reported diagnosed conditions which tend to be underestimated.⁽⁶¹⁾ Nevertheless, in the study population we were able to test the accuracy between self-reported hypertension and type-2 diabetes *versus* objective measures of capillary glucose and blood pressure, and the results showed similar outcomes (analysis not shown). Finally, the study could not tease out the differential

impacts of the two demogrants – the Mexico City vs. the federal program vs. having both. As indicated before, this resulted from the fact that the federal program was relatively new at the time the survey was collected which limited older adults' ability to differentiate the programs. From a policy perspective, future studies should assess the differential impact of these demogrants.

Despite these limitations, the findings of the study are relevant in understanding key food insecurity risk factors among older urban adults in a middle income country. Aging and urbanization are demographic trends that will expand the proportion of older adults in urban settings globally, and consequently a larger number of individuals at risk of food insecurity in this vulnerable segment of the population. This is of concern from a healthy aging perspective, as good nutrition is a key factor for the management and prevention of chronic conditions, as well as physical functionality among older adults. Monitoring food insecurity among the older adults is highly relevant as it complements substantially health and nutritional status information. Among this highly vulnerable population, food insecurity may be a relevant policy indicator as it relates to aspects of quality of life, morbidity and mortality, costs derived from caregiver burden, and health care utilization.⁽⁶²⁾

The research suggests that age-conditioned cash-transfers can contribute to social well-being of low income older adults. Due to the relevance of these findings for future policy decisions, some aspects of this type of interventions should be further studied. First, future studies should assess potential secondary fiscal effects (i.e. whether non-contributory pensions have effects on earlier labor decisions) and budgetary sustainability

(i.e. the eligibility criteria of the program has been expanded without thinking about the future sustainability of such entitlement). Second, given that in countries like Mexico many older adults live in extended families, it will be relevant to study if age-conditioned cash-transfers have spillover effects to other household members as it has been reported in countries like South Africa.^(51, 63)

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TABLES

Table 1. Descriptive statistics for the sample of older adults in Mexico City.

Characteristics of participants	n=329
Age. Median, (IQR)	71 (8.0)
Gender %, (n)	
Male	15.2 (279)
Female	84.8 (50)
Education (%)	
None or primary education uncompleted	49.2 (162)
Primary education completed or more	50.8 (167)
Householdsize. Median, (IQR)	3.0 (3.0)
Body mass index. Median, (IQR)	29.2 (5.4)
Number of comorbidities. Median, (IQR) ¹	2.0 (2.0)
Depressive symptoms (%) ²	
No	66.3 (218)
Yes	33.7 (111)
Social isolation (%) ³	
No	57.8 (190)
Yes	42.2 (139)
Activities of daily living %, (n) ⁴	
No impairments	58.4 (192)
At least one impairment	41.6 (137)
Instrumental activities of daily living %, (n) ⁵	
No impairments	70.8 (233)
At least one impairment	29.2 (96)
Food security status %, (n) ⁶	
Food secure	45.3 (149)
Mildly food insecure	35.8 (118)
Moderately or severely food insecure	18.9 (62)
Fruit and vegetable availability %, (n) ⁷	
Low access	23.7 (78)
High access	76.3 (251)
Aged-conditioned cash transfers %, (n) ⁸	
Yes	66.6 (219)
No	33.4 (110)

¹Presence of 8 self-reported diagnosed chronic health problems: diabetes, high cholesterol, hypertension, heart problems, cancer, asthma, renal failure and gastritis.

²Depression was measured using a self-reported geriatric depression scale of 5-items (GDS-5)

³Social isolation was evaluated by the abbreviated Lubben Social Network Scale (LSNS-6)

⁴Activities of daily living were measured using the Katz ADL scale

⁵Instrumental activities of daily living were measured using the Lawton IADL scale

⁶A modified 15-item version of the ELCSA was used

⁷Low access=it is difficult to buy fresh fruits and vegetables in their communities. High access=it is easy to buy fresh fruits and vegetables in their communities

⁸If participants receive at least one of the two different demogrants: *Pensión Alimentaria* and/or *70 y más*

Table 2. Ordered logistic regression model for the association of social programs, functional impairments, health status, mental health, social isolation and food availability with household food insecurity of older adults in Mexico City

n=329	Odds ratio	95% Confidence intervals	p value
Education			
None or primary education uncompleted	1.000		
Primary education completed or more	0.478***	(0.304, 0.752)	0.001
Householdsize	1.029	(0.942, 1.125)	0.520
Bodymassindex	1.006	(0.960, 1.055)	0.796
Number of comorbidities	0.978	(0.840, 1.139)	0.776
Depressive symptoms			
No	1.000		
Yes	2.843***	(1.777, 4.549)	0.000
Social isolation			
No	1.000		
Yes	1.381	(0.888, 2.147)	0.152
Activities of daily living			
No impairments	1.000		
At least one impairment	2.177***	(1.356, 3.496)	0.001
Instrumental activities of daily living			
No impairments	1.000		
At least one impairment	1.785*	(1.073, 2.969)	0.026
Fruit and vegetable availability			
Low access	1.000		
High access	0.717	(0.429, 1.177)	0.181
Aged-conditioned cash transfers			
No	1.000		
Yes	0.597*	(0.375, 0.951)	0.030

^areference group, being moderately or severely food insecure

*p<0.05 **p<0.01 ***p<0.001

Table 3. Marginal effects of social programs, functional impairments, health status, mental health, social isolation and food availability on household food insecurity of older adults in Mexico City

Variables	(1) Food secure n=149	(2) Mildly food insecure n=118	(3) Moderately or severely food insecure n=62
Education			
None or primary education uncompleted	-	-	-
Primary education completed or more	0.179** (0.055)	-0.084** (0.028)	-0.095** (0.031)
Householdsize	-0.007 (0.011)	0.003 (0.005)	0.004 (0.006)
Bodymassindex	-0.002 (0.006)	0.001 (0.003)	0.001 (0.003)
Comorbidities	0.005 (0.019)	-0.003 (0.009)	-0.003 (0.010)
Depressivesymptoms	-0.244*** (0.052)	-0.093*** (0.024)	0.151*** (0.039)
Social isolation	-0.079 (0.054)	0.037 (0.025)	0.042 (0.030)
Activities of daily living	-0.187*** (0.060)	0.082** (0.026)	0.104** (0.035)
Instrumental activities of daily living	-0.138* (0.060)	0.058* (0.024)	0.081* (0.039)
Fruit and vegetable availability	0.084 (0.062)	-0.037 (0.025)	-0.048 (0.038)
Aged-conditioned cash transfers			
No	-	-	-
Yes	0.124* (0.056)	-0.054* (0.023)	-0.069* (0.034)

*p<0.05 **p<0.01 ***p<0.001

Standard errors displayed in parentheses

