

Association of household food insecurity and adverse health outcomes among mothers in low-income households: A cross-sectional study of a rural sample in Malaysia

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Abstract

Introduction: The consequences of food insecurity at the household level are categorized into three areas: physical impairments, psychological suffering, and socio-familial perturbations. This study examined the relationship between household food insecurity and functional health status among mothers in a rural sample in Malaysia.

Method: A cross-sectional survey of low-income households was conducted. A total of 223 mothers aged 18 years to 55 years old who are neither lactating nor pregnant were purposively selected. This study employed a pre-tested questionnaire consisting of socio-demographic questions, the 10-item Radimer/Cornell hunger scale, and the Medical Outcome Study Short Form-36 (SF-36).

Results: Household food insecurity was reported by 83.9% of respondents. The data suggest that child hunger category is associated with poor health status on each scale in the SF-36 instrument, whereas household food insecurity and adult food insecurity are associated with six scales in the instrument. No significant differences in health status were observed among the various levels of food insecurity (i.e., household food insecurity, adult food insecurity, and child hunger). After adjusting for socio-demographic variables using multiple regression analysis, food insecurity remains a significant independent predictor of responses for each SF-36 scale.

Conclusion: An association between food security and health status is suggested in the convenience sample of this paper. However, future investigations are needed to examine the relationship between

more objective measures of health status, household food inventories, and other direct measures of food availability in more diverse and larger populations.

Key words: food insecurity, quality of life, Bachok

Introduction

Food insecurity is defined as the limited or uncertain availability of nutritionally adequate and safe food.¹ Food insecurity is associated with a wide range of health outcomes for adults.² Households suffering from food insecurity are more likely to have adults who have lower nutrient intakes,^{3,4} greater probabilities of mental health problems,⁵ long-term physical health problems,⁶ higher levels of depression,⁷ higher levels of chronic diseases,⁸ and lower scores on physical and mental health evaluations.⁹ Food-insecure elderly are more likely to have limitations in activities of daily living.¹⁰ Campbell (1991) elaborated on a concept of food insecurity; the risk factors and consequences. She indicated two sets of potential consequences of food insecurity¹¹ namely, typical physical and psychological symptoms of suboptimal nutritional status.¹² Food insecurity rates in rural areas exceed those in suburbs and metropolitan areas but not those in central city areas.¹³ Quality of life, which is central for the development of social policy, is one of the most important issues facing the world today. Various literatures asserted that food insecurity not only affects the health of children negatively but also exacerbates acute diseases and speeds the onset of degenerative disease among the elderly.¹⁴ Hamelin and colleagues discussed this association with the following report: “according to respondents’ description, the experience of household food insecurity is characterized by two categories of manifestations: (a) the core characteristics of the phenomenon which are reflected by not having enough food in the present, by worrying about having enough in the future and by expressing a feeling of alienation; and (b) a related set of actions and reactions by the household to these core manifestations”.¹⁵ The consequences of food insecurity at the household level are categorized into three areas: physical impairments, psychological suffering, and socio-familial perturbations.^{15,16} Physical impairments related to insufficient food include illness, fatigue, or both illness and fatigue. In Malaysia, several public and private food assistance programs are offered at the national, state, and local community levels to alleviate food insecurity and hunger. However, in spite of these efforts, high rates of food insecurity still exist in low-income households, especially in rural areas. One of the latest food insecurity studies in rural Malaysia reported a higher prevalence of household food insecurity (77.5%)¹⁷ compared with those of other studies.^{18,19} The present study aims to investigate the association between food insecurity and quality of life in low-income households in rural peninsular Malaysia.

Material & Methods

Study location

This study was conducted in eight sub districts (i.e., Tawang, Perupok, Telong, Gunung, Mahligai, Tanjung Pauh, Melawi, and Bekelam) of Bachok; a coastal district situated 25 km east of Kota Bharu, a capital city of Kelantan state, Malaysia. Kelantan had the lowest mean monthly income (RM 1, 829)

among all the states of Malaysia in 2004. Kelantan is categorized as a less developed state because of its high poverty incidence (10.6%) and low GDP growth rate in peninsular Malaysia.²⁰

Subjects

A cross-sectional survey of households receiving monthly allowances was conducted. A total of 223 mothers aged 18 years to 55 years old who are neither lactating nor pregnant and have at least one child aged 2 years to 12 years old were purposively selected. Mothers were recruited because they are responsible for food production, acquisition, preparation, and security.^{21,22} Mother-child pairs are involved in most household food security studies because the attitudes and practices of mothers may influence the eating habits of their children, and the health of mothers can be adversely affected by food scarcity and maternal hardship.^{5,9} In the Bachok district, 12 villages with Malay ethnic groups comprise the majority of the population. Based on population density, eight of the largest villages were selected for the cross-sectional study. No probability sampling was conducted and all respondents were purposively selected from the records of the Welfare Department until the calculated sample size ($n = 223$) was obtained because of the strict inclusion criteria of households (Welfare assistance recipients in Bachok District, mother aged 18 to 55, mothers who were neither pregnant nor lactating during the study period, households having children aged 2 to 12 and living with the mother in the same household and signed the consent form). If there is more than one mother living in the same targeted household, only one mother who is responsible for food purchasing and preparation was interviewed to avoid the overlapping of household information such as household size, income, numbers of children and other dietary information. Prior to the data collection, list of names of the recipient of financial assistance from the Department of Social Welfare, Bachok District, Kelantan, Malaysia were identified. All the recipients received financial assistance as monthly allowances form. The total number of the recipients in Bachok District was 3,635 which has been a sampling frame for this study. The sample size was calculated using the single proportion formula. The calculated sample size of our study was 202.7 to which we added 10% as a non-response rate. Therefore, the final sample size was as follows: $202.7 + 10\% \text{ non response} = 202.7 + 20.2 = 222.7 = 223$.

Data Collection

All study procedures were reviewed and approved by the Ethical Committee of the Universiti Sains Malaysia prior to data collection. Two trained research assistants conducted visits to the houses of respondents with the guidance of the village head. The lists of mothers who receive monthly allowances were obtained from the welfare office of the Bachok district. The interviewers collected all pertinent research information through in-depth and face-to-face individual interviews with the respondents. This study employed a pre-tested questionnaire consisting of socio-demographic questions, the 10-item Radimer/Cornell hunger scale,^{23,24} and the Medical Outcome Study Short Form-36 (SF-36).

Measurement

Medical Outcome Study Short Form (SF-36): The functional health and well-being of individuals or groups were evaluated using the SF-36, a multipurpose survey consisting of 36 items representing an

eight-scale profile. The SF-36 does not rely on traditional parameters, namely, specific age, disease, or treatment.^{25,26} The 36 items comprising the SF-36 are divided in the following eight domains: physical function (ten items), role limitations caused by physical health problems (four items), bodily pain (two items), general health perception (five items), vitality (four items), social function (two items), role limitations caused by emotional problems (three items), and mental health (five items). The score on each scale ranges from 0 to 100 with a low score indicating poor health or severe disability.²⁷ These eight domains can characterize both favorable and unfavorable self-evaluations of general health status.²⁷ Close-ended questions in the SF-36 were specifically designed to encourage respondents to select responses from a set of possible answers assembled by Ware and Sherbourne²⁸ and to comply with the methodological guideline for close-ended questions.²⁹ The SF-36 has been used in the Medical Outcomes Study.³⁰ Furthermore, the SF-36 is helpful in research, clinical practice, general population surveys, health policies, and health practices evaluation.³¹ The SF-36 questionnaire was translated to Malay for the present study. This instrument is valid, reliable, and can be used in Malaysia.³² The raw score of each SF-36 dimension was derived by calculating the item scores and converting the calculated score to a value ranging from zero (i.e., the worst possible health state measured by the questionnaire) to 100 (i.e., the best possible health state). Thereafter, the raw score was re-calculated across the dimension. The raw score transformation formula³¹ is presented as follows:

$$\text{Transformed Scale} = \frac{(\text{Actual raw score} - \text{lowest possible raw score})}{\text{Possible raw score range}} \times 100$$

Household food insecurity: The 10-item Radimer/Cornell scale was designed to detect food insecurity at the household, adult, and child levels. The conceptual framework indicates that food insecurity is a “managed process” with sequential responses that arise as food supplies become more limited. First, anxiety and concern about food supply are experienced at the household level, which is classified at mild severity. Consequently, the household makes budget adjustments that may affect diet quality. At the adult level, which is of moderate severity, adults limit the quantity and quality of food they consume. Finally, children experience the direct effects of limited food supplies such as hunger at the child level, which is the most severe stage.

Data Management and Analysis

All survey data were entered into electronic format using a key. The model was verified to minimize data transcription errors and enhance data integrity. All analyses were completed using PASW SPSS (version 18.0) for Windows. Food security categories were computed to yield four groups: food-secure households, food-insecure households, households with food-insecure adults, and households with child hunger. The SF-36 scales were computed using the guidelines by Ware et al.²⁷ Independent t-test, chi-square test, and Fisher’s exact test with STATA software were used to compare the socio-economic and demographic characteristics of all households. Analysis of variance was used to examine the differences between the categories of food security and the scale scores of the SF-36. When the p values of the omnibus F test were less than 0.05, Bonferroni corrections were applied to compare each of the food security groups. Single linear regression (SLnR) was used to examine the relationship between each of the eight domains of the quality of life (outcome variables) and the predicted

variables, particularly food insecurity status. Depending on SLnR results, significant factors, that is, independent variables with a p value < 0.25 and variables that might be related to quality of life (i.e., food insecurity status, age of mothers, occupation, type of household, BMI of mothers, and income per capita), were included in the stepwise multiple linear regression (MLR) analysis.

Result

Table 1 describes the participants in this study. Among the 223 respondents, 187 (83.9%) reported certain levels of food insecurity with 66 (29.6%), 43 (19.3%), and 78 (35%) categorized under food-insecure households, households with food-insecure adults, and households with child hunger, respectively. The Radimer/Cornell scale showed an acceptable internal consistency (Cronbach's alpha = 0.88).

The majority of the mothers (60.5%) are at a moderate age (i.e., 31 years to 45 years old). Food-insecure households are more likely to have larger household sizes and greater numbers of children compared with other households. In addition, mothers from food-insecure households are less likely to have graduated from high school; some participants (10.4%) did not even receive any formal education. Almost 60% of the households are headed by mothers who are either widowed or divorced. No significant difference was found between the proportion of household types or the marital status of mothers and food-secure and food-insecure households. The monthly income of food-secure households is significantly higher than that of their counterparts. Among the 223 households, 44.3% are living below the poverty line.³³

The respondents in each of the three categories of food-insecure households reported poorer functional health status compared with those in food-secure households (Table 2). The mean differences between the scores of food-secure households and households with child hunger were significant for all health domains. No significant mean difference was found between food-secure households, food-insecure households, and households with food-insecure adults regarding role limitations caused by physical health problems and bodily pain. No differences in health status were observed among food-insecure groups.

Prior to the stepwise MLnR analysis, SLnR was conducted to investigate the associations between each of the eight scales of SF-36 (dependent variables), household food insecurity status, and other predicted variables (independent variables). Simple linear regression (SLnR) was conducted to identify significant independent variables for multivariable analysis. Simple Linear Regression was performed on each independent variable. The assumption of normality for the score and the linearity for each domain were found to be approximately normally distributed; residuals appeared linear and randomly scattered.

The direction of the association between household food insecurity and the quality of life via stepwise MLnR in obtaining the final model are shown in Table 3. The following are the MLnR results for the eight models. For physical function, the final model of the MLnR analysis implied a significant association between household food insecurity status and physical function ($p < 0.001$) as well as between physical function and the BMI of the mothers ($p < 0.05$). An increase of one percent in food insecurity decreased the physical function score by 9.6 ($b = -9.64$). Moreover, a one-point increase in the BMI decreased the physical function of the mothers by 0.38. For role limitations caused by

physical health problems, a significant association was found between the dependent variable (i.e., role limitations caused by physical health problems) and the two predictor variables, that is, household food insecurity status ($p = 0.003$) and employment status of the mother ($p = 0.025$). An increase of one percent in food insecurity decreased the score for role limitations caused by physical health problems by 18.5 ($b = -18.50$, 95% CI, $-30.18, -6.33$). For bodily pain, a significant association was found between bodily pain scale and food security status ($p = 0.001$); no significant association was recorded for the other predictor variables. An increase of one percent in food insecurity decreased the bodily pain score by 11.8 ($b = -11.782$). For general health, a significant association was found between the dependent variable (i.e., general health) and the independent variable (i.e., household food insecurity status; $p < 0.001$), age of mothers ($p = 0.044$), and type of household ($p = 0.021$). An increase of one percent in food insecurity decreased the general health score by 15.0 ($b = -15.05$). An increase in the age of the mothers decreased general health by 0.33. For vitality, a significant association between the criterion variable (i.e., vitality) and the predictor variable (i.e., household food insecurity status) was noted ($p < 0.001$); however, no significant association was recorded for the other predictor variables. An increase of one percent in household food insecurity decreased the vitality score by 13.0 ($b = -13.03$). For social function, a significant association was established between the criterion variable (i.e., social function) and the predictor variable (i.e., household food insecurity status) at $p < 0.001$. An increase of one percent in food insecurity decreased the social function score by 20.76 ($b = -20.76$). Income per capita was also associated with the social function score ($p = 0.019$). For role limitations caused by emotional health problems, a significant association was found between the criterion variable (i.e., role limitation caused by emotional factors) and the predictor variable (i.e., food security status) at $p < 0.001$; no significant association was found for the other included predictor variables. An increase of one percent in food insecurity decreased the role limitation score by 36.2 ($b = -36.23$). For mental health, a significant association between the criterion variable (i.e., mental health) and the predictor variable (i.e., food security status) was noted at $p < 0.001$; however, no significant association was recorded for the other predictor variables. Furthermore, 14% of the variations in mental health are explained by food security status (R square = 0.14). An increase of one percent in food insecurity decreased the mental health score by 15.6 ($b = -15.68$).

The results of the MLR analysis show a significant association between each of the eight SF-36 scales and the predictor variable (i.e., household food insecurity status).

Discussion

The region where this study was conducted is characterized by low socio-economic status. Kelantan had the lowest mean monthly income (RM 1, 829) among all the states of Malaysia in 2004. Kelantan is classified as a less developed state because of its high poverty incidence (10.6%) and low GDP growth rate in peninsular Malaysia.²⁰ This study reports a higher prevalence of household food insecurity in low-income households in rural Malaysia than those cited in previous studies.¹⁷⁻¹⁹ This result can be explained by the higher percentage of households (44.3%) living under the poverty line and larger household size in our study sample. The average household size in this study 6.71 (2.29) is higher than the reported household size for rural areas in Malaysia (4.6).³⁴

The findings of the present study indicate that food insecurity status is associated with the quality of life and may lead to adverse effects on the well-being of individuals in low-income communities. The current findings are consistent with those of Campbell's model, which asserts that food insecurity may

lead to suboptimal quality of life and health (i.e., physical, social, and mental well-being). Furthermore, the findings in this study is in agreement with those by Tarasuk,⁶ who found that women in food-insecure households are more likely to report their health as fair, poor, or very poor with longstanding health conditions or activity limitations. Parents in food-insecure households are highly vulnerable to feelings of anxiety and helplessness, loss of control, family dysfunction, and psychological impairment. When accompanied by concerns on how to procure food, this condition may engage parents in undesirable activities such as borrowing money, selling assets, or even stealing.⁴ The constant psychological stress linked with food insecurity may increase the risk for depression, particularly for single mothers, who are more likely to report poorer mental health than married or partnered mothers. Single, unemployed mothers are twice as likely to report higher levels of distress compared with other groups. Single mothers in general, regardless of employment status, are more likely to report higher personal and chronic stress.³⁵ This interpretation is consistent with our results, in which single mothers constitute 60% of the respondents.

This study shows that social function and social interaction are associated with food insecurity. The results of the present study are in agreement with those reported in previous studies,³⁶ which found that parents of food-insecure households compromise their diet to protect their children and seek socially stigmatized means of food acquisition. The health and positive sense of self and outlook of parents in food-insecure households may suffer, leading to negative physical and/or mental health outcomes. These parents may experience distress because of the manner in which they feed their children, such as using food banks, borrowing money or food, or sending their children to charities where free meals are offered. A parent's shame or embarrassment concerning inadequacy in providing food to his/her children can translate to social elimination as well as a sense of isolation and ignorance from the community.

The findings of the current study were confirmed by several previous studies that measured food insecurity and general health status.³⁷⁻⁴⁰ Pheley et al.³⁷ found that food-insecure adults have poorer functional status compared with food-secure respondents based on all SF-36 scales in a clinical/non-clinical setting in Appalachia.

Scores of the quality of life domains in our study are higher than those in other studies. This result might be attributed to the characteristic of rural communities, which tend to have higher social cohesion within and outside the family compared with other communities. These findings are in agreement with other studies that reported the association of living in rural areas with better overall mental health.⁴¹ Rural areas exhibit relatively higher average health and less prevalence of premature mortality.^{42, 43} Rural dwellers are also less likely to rate their health as fair or poor.^{44, 45}

In view of the sampling and recruitment strategies utilized in this project, the use of a convenience sample may result in selection biases that could affect the generalizability of the findings.

Conclusion

Child hunger is associated with poor health status on each scale in the SF-36 instrument, whereas household food insecurity and adult food insecurity are associated with six scales. No differences in health status were observed between the various levels of food insecurity (household food insecurity, adult food insecurity, and child hunger). The MLR analyses demonstrate a consistent, independent

relationship of each SF-36 scale with food insecurity. Hence, food insecurity, to a certain extent, is one of the strongest predictors of each health status construct. Although an association between food security and health status is suggested in this convenience sample, future investigations are needed to examine the relationship between more objective measures of health status, household food inventories, and other direct measures of food availability in more diverse and larger populations.

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Author's contributions

Ihab A.N. wrote the manuscript and performed data collection, data entry, and data analysis. Rohana A.J. is the principal investigator for this study. She also contributed to the design of the study, liaised with the authorities involved, supervised data collection in the field and wrote the initial draft of the manuscript. Wan Manan W.M responsible for the application of grant, budget, and ethical approval. Wan Suriati W.N. was fully involved in data collection as a trained research assistant and managing technical problems in the field. Zalilah M.S. and Mohamed Rusli A. participated in the design of the study. All authors participated in the review of the manuscripts and approved the final version.

Competing interests: The authors declare no competing interests.

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Table 1: Baseline characteristics between food secure and food insecure households

| Variables | Food secure (n = 36) | | Food insecure (n =187) | | p Value |
|-------------------------------|----------------------|-------------|------------------------|--------------|--------------------------|
| | n (%) | Mean(SD) | n (%) | Mean(SD) | |
| Age of mother(years) | | 42.14(6.97) | | 42.26 (6.33) | 0.921 [†] |
| Age category (years) | | | | | 0.726^F |
| 18-30 | 2(0.9) | | 8(3.6) | | |
| 31-45 | 23(10.3) | | 112(50.2) | | |
| 46-55 | 11(4.9) | | 67(30) | | |
| Educational level of mother | | | | | 0.047^F |
| Never been to school | 1(0.4) | | 23(10.3) | | |
| Primary | 4(1.8) | | 21(9.4) | | |
| Lower Secondary | 15(6.7) | | 95(42.6) | | |
| Higher Secondary | 14(6.3) | | 32(14.3) | | |
| others | 2(0.9) | | 16(7.2) | | |
| Household size | | 5.92(1.90) | | 6.87(2.33) | 0.023 [†] |
| No. of children per household | | 4.28(2.27) | | 5.31(2.49) | 0.022 [†] |
| Marital status of mother | | | | | 0.861 [¶] |
| Double headed household | 15(6.7) | | 75(33.6) | | |
| Single headed household | 21(9.4) | | 112(50.2) | | |
| Employment status | | | | | 0.527 [¶] |
| Working women | 26(11.7) | | 125(56.1) | | |
| Housewife | 10(4.5) | | 62(27.8) | | |

| | | | | |
|-------------------------|-------------|-----------------|---------------|--------------------------|
| Household income RM | | 1101.97(437.19) | 760.67(323.6) | <0.001 [†] |
| < RM691 ^a | 7(3.0) | | 92(41.3) | <0.001 [¶] |
| 691-1000 | 10(4.5) | | 65(29.1) | |
| > RM 1000 | 19(8.5) | | 30(13.5) | |
| Food security status | | | | |
| Household food secure | 187 (83.9%) | | | |
| Household food insecure | 66 (29.6%) | | | |
| Adult food in secure | 43 (19.3%) | | | |
| Child Hunger | 78 (35%) | | | |
| BMI of mothers | | | | 0.544^F |
| <18.5 | 2(0.9) | | 12(5.4) | |
| 18.5-24.99 | 18(8.1) | | 75(33.6) | |
| 25-29.99 | 9(4.0) | | 69(30.9) | |
| ≥30 | 7(3.1) | | 31(13.9) | |

† Independent t test.,

¶ Pearson Chi-Square Test.,

F Fisher exact test.

^a Household Poverty line income: USD 1 = RM 3.15

Significant level at 0.05..

Table 2: Mean (SD) Medical Outcome Study Short Form 36 (SF-36) Scaled Scores by Food Security Category

| Domains | Food Secure (n = 36) | Household food insecure (n = 66) | Adult food insecure(n = 43) | Child hunger (n = 78) | F statistic |
|-----------------------------|-------------------------|-------------------------------------|--------------------------------|--------------------------|-------------|
| Physical functioning | 92.50(7.88) | 83.25(14.84)** | 84.06(11.71)* | 81.73(15.24)** | 5.46 |
| Role limitation (physical) | 78.47(31.70) | 61.36(37.51) | 63.95(31.95) | 58.01(33.82)* | 3.039 |
| Bodily pain | 74.88(22.59) | 64.48(20.67) | 64.60(18.52) | 61.11(19.20)* | 3.896 |
| General health | 81.22(15.95) | 66.95(15.80)*** | 66.32(13.159)*** | 65.50(17.71)*** | 8.883 |
| Vitality | 76.11(11.95) | 63.93(13.45)*** | 64.41(11.29)** | 61.60(15.63)*** | 9.669 |
| Social functioning | 90.27(11.22) | 72.91(13.79)*** | 72.67(14.24)*** | 72.43(11.80)*** | 18.998 |
| Role limitation (emotional) | 87.03(19.96) | 56.56(33.57)*** | 58.13(34.18)** | 41.88(34.16)*** | 16.252 |
| Mental Health | 74.88(13.67) | 62.00(14.12)*** | 61.11(12.32)*** | 55.79(15.43)*** | 14.859 |

Bonferroni corrections were used to make comparisons between each of the food security groups.

*p < 0.05

** p < 0.01

*** p < 0.001

Table 3: Predictor factors of the eight domains of Quality of Life –Stepwise method* (n=223)

| Variables | Simple Linear Regression | | Multiple Linear Regression | | | |
|-----------------------------|--------------------------|----------------|------------------------------|-----------------------|-----------------------|----------------|
| | <i>b</i> (95%CI) | <i>p</i> value | Adjusted <i>b</i> (95%CI) | <i>t</i> - Statistics | <i>R</i> ² | <i>p</i> value |
| Physical functioning | | | | | | |
| Food security status | -9.69(-14.53, -4.84) | <0.001 | -9.64 (-14.53, -4.84) | -3.95 | 0.08 | <0.001 |
| Age of mother | -0.18(-0.47, 0.09) | 0.198 | - | | | |
| Occupation | 2.02(-1.72,5.77) | 0.289 | - | | | |
| Type of household | -2.25(-6.18, 1.68) | 0.260 | - | | | |
| BMI | -0.38(-0.75,-0.20) | 0.039 | -0.38(-0.73, -0.02) | -2.11 | | 0.036 |
| Income per capita | 0.04(0.008, 0.067) | 0.013 | - | | | |
| Role limitation | | | | | | |
| Food insecurity status | -17.91(-30.18, -5.6) | 0.004 | -18.5(-30.18, -6.33) | -2.99 | 0.06 | 0.003 |
| Age of mother | -0.15(-0.87, 0.56) | 0.672 | - | | | |
| Occupation | 10.38(0.64, 20.12) | 0.037 | 11.00(1.42, 20.58) | 2.26 | | 0.025 |
| Type of household | -3.99(-13.35, 5.36) | 0.402 | - | | | |
| BMI | 0.66(-0.26, 1.53) | 0.160 | - | | | |
| Income per capita | 0.03(-0.04, 0.11) | 0.407 | - | | | |
| Bodily pain | | | | | | |
| Food insecurity status | -11.78(-18.89, -4.58) | 0.001 | -11.78(-18.98, -4.58) | -3.22 | 0.05 | 0.001 |
| Age of mother | -0.26(-0.69, 0.15) | 0.211 | - | | | |
| Occupation | 1.97(-3.81, 7.76) | 0.502 | - | | | |
| Type of household | 2.28(-3.22, 7.80) | 0.415 | - | | | |
| BMI | 0.17(-0.37, 0.72) | 0.525 | - | | | |
| Income per capita | 0.02(-0.02, 0.06) | 0.416 | - | | | |
| General health | | | | | | |
| Food insecurity status | -15.01(-20.76, -9.27) | <0.001 | -15.05(-20.76, -9.27) | -5.25 | 0.14 | <0.001 |
| Age of mother | -0.32(-0.67, 0.02) | 0.066 | -0.33(-0.65, -0.009) | 2.32 | | 0.044 |
| Occupation | -2.17(-6.95, 2.59) | 0.371 | - | | | |
| Type of household | 4.70(0.18, 9.22) | 0.041 | 5.00(0.76, 9.25) | -2.02 | | 0.021 |
| BMI | -0.41(-0.86, 0.03) | 0.071 | - | | | |

| | | | |
|-------------------|------------------|------|---|
| Income per capita | 0.03(0.00, 0.07) | 0.05 | - |
|-------------------|------------------|------|---|

Note: * Regression p values are included only for variables in the final model.

Table 3 continued

| Variables | Simple Linear Regression | | Multiple Linear Regression | | | |
|---------------------------|--------------------------|---------|----------------------------|--------------|----------------|---------|
| | b(95%CI) | P Value | Adjusted b(95%CI) | t Statistics | R ² | P Value |
| General Health | | | | | | |
| Food insecurity status | -13.03(-17.93, -8.13) | <0.001 | -13.03(-17.93, -8.13) | -5.24 | 0.11 | <0.001 |
| Age of mother | -0.11(-0.41, 0.18) | 0.447 | - | | | |
| Occupation | 1.47(-2.60, 5.56) | 0.476 | - | | | |
| Type of household | 1.23(-2.66, 5.12) | 0.53 | - | | | |
| BMI | -0.30(-0.41, 0.35) | 0.881 | - | | | |
| Income per capita | 0.03(0.005, 0.065) | 0.025 | - | | | |
| Social functioning | | | | | | |
| Food insecurity status | -17.62(-22.19, -13.03) | <0.001 | -20.76(-26.00, -15.52) | -7.80 | 0.22 | <0.001 |
| Age of mother | 0.04(-0.25, 0.33) | 0.779 | - | | | |
| Occupation | 1.30(-2.73, 5.34) | 0.525 | - | | | |
| Type of household | -1.71(-5.56, 2.13) | 0.381 | - | | | |
| BMI | 0.11(-0.26, 0.49) | 0.562 | - | | | |
| Income per capita | 0.02(-0.006, 0.06) | 0.111 | -0.037(0.068, 0.006) | -2.35 | | 0.019 |
| Role limitation | | | | | | |
| Food insecurity status | -36.23(-47.97, -24.49) | <0.001 | -36.23(-47.97, -24.49) | -6.08 | 0.14 | <0.001 |
| Age of mother | -0.53(-1.25, 0.19) | 0.150 | - | | | |
| Occupation | 0.43(-9.55, 10.41) | 0.932 | - | | | |
| Type of household | -1.71(-5.56, 2.13) | 0.381 | - | | | |
| BMI | -0.18(-1.13, 0.75) | 0.692 | - | | | |
| Income per capita | 0.09(0.024, 0.17) | 0.010 | - | | | |

| Mental health | | | | | | |
|------------------------|---------------------------|--------|------------------------|--------|------|--------|
| Food insecurity status | -15.68(-20.84,- 20.51) | <0.001 | -15.68(-20.84, -10.51) | -5.984 | 0.14 | <0.001 |
| Age of mother | -0.07(-0.39, 0.24) | 0.653 | - | | | |
| Occupation | 1.28(-3.09, 5.66) | 0.563 | - | | | |
| Type of household | -1.62(-5.79, 2.54) | 0.442 | - | | | |
| BMI | -0.08(-0.49, 0.33) | 0.703 | - | | | |
| Income per capita | 0.04(0.012, 0.077) | 0.007 | - | | | |

Note: * Regression **p** values are included only for variables in the final model.