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# Determinants of Calorie Intake in Widowhood in Vietnam

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**ABSTRACT**

*Widowhood has an effect on food choices, eating behaviour and dietary intake. Widows are generally viewed as a group of consumers that are particularly vulnerable to food insecurity and poverty. Research also suggests that nutrition of widows declines relative to the pre-widowhood situation. The motivation of the paper is to investigate how widowhood influences food consumption choices and calorie intake in Vietnam. Attention is focused on food poverty (calorie-poverty) in widowhood instead of total expenditure poverty (general poverty). The term widowed-household is used to refer those households in which the head of the household is widowed. Data from the Vietnamese Living Standards Survey (VLSS) are used. Determinants of per capita calorie intake in widowed-households are examined. Since calorie intake is generally used as a measure of the poverty status of a household, it is therefore important to understand the factors that influence the chances of escaping poverty in widowed-households. Results suggest that, for selected food class, calorie intake and shares are lower in widowhood. Determinants of calorie intake in widowed-households are significantly different from those observed in non-widowed households. The calorie share of eating out and alcohol consumption varies between widow-households and widower-households. Regional and ethnic variables are also statistically significant determinants of calorie intake in widowed-households. The empirical findings from this paper contribute, therefore, to an understanding calorie intake dynamics in widowed-households. The findings have implications for policies relevant to widowed livelihoods in Vietnam, and are effective at minimising the economic and nutrition vulnerability of widowed-households.*

Keywords: widowhood, calorie intake, calorie shares, instrumental variables
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## INTRODUCTION

The economic and social changes that accompany widowhood include changes in income and expenditure, fragile family support dynamics and disrupted social networks. The analysis of widowhood has often been restricted to these changes with little emphasis given to calorie intake in widowhood. Although it has been of interest to find out the extent to which widowhood affects overall household expenditures, little attention has been given to the nutrition status during widowhood. Little is also known about the causes and characteristics of food poverty in widowhood. In this paper, the term widowhood is used to refer to the state of having lost a female or male spouse (partner). The term widowhood is used, therefore, to describe both the states of widows and widowers. In addition, the term widowed-household is used to describe households in which a widow or widower heads the household. Similarly, households headed by widows and widowers will be referred to as widow-households and widower-households, respectively, in order to distinguish widowed-households from non-widowed households. This distinction between widowed-households and other types of households (non-widowed households) is fairly important given the cultural dimensions of widowhood in various countries. It is also significant to separate widowed-households from other types of households because non-widowed households may have wealth-creating activities that are significantly different from those of widowed-households. Equally important is the need to take cognisance of the fact that heads of widowed-households tend to be older, and may not have a significant number of opportunities that allow re-entry into the labour market. Finally, in cases where a partner was ill for a long time during the pre-widowhood state, a significant amount of financial resources are generally spent to cover medical expenses (Fan and Zick, 2006), and related expenses (Zick, Fan and Chang, 2004; Fan and Zick, 2004; McGarry and Schoeni, 2005). These expenditures may contribute to poverty in widowhood (Fan and Zick, 2004). Research suggests that the nutrition status of widowed-households declines, relative to the pre-widowhood situation. The incidence of poverty is also higher in widowed-household compared to other household types such as single-parent households (Paulin and Duly, 2002; Fan and Zick, 2006), female-headed or male-headed households (Ray, 1997), or married households (Rosenbloom and Whittington, 1993). In this paper, attention is focussed, therefore, on food poverty in widowhood, as opposed to total expenditure poverty. The interest in food poverty lies in the assumption that food-poor widows and widowers are likely to have lower levels of well-being.

The motivation of this paper is to investigate how widowhood influences household calorie intake in Vietnam and examine the determinants of calorie intake in widowed-households in Vietnam. Since calorie intake is generally used as a measure of the food poverty status of the household, it is important, therefore, to understand the factors that influence the chances of enhancing food security and/or escaping food poverty in widowhood. The empirical findings from this paper contribute, therefore, to the following: (i) an understanding of income and expenditure dynamics in widowed-

households; (ii) an examination of the likelihood, incidence and depth of poverty and transitions into and out of poverty, in widowed-households, and (iii) understanding of social reality of widowhood. It is important to investigate whether food choices made by widowed-households are significantly different from the food choices made by non-widowed households. Knowing whether there are gender differences in calorie intake in widowhood, and explaining the observed differences in calorie shares and per capita calorie intake, is of equal significance. As noted in (Quandt et al, 2000: 87) "despite the importance of widowhood as an event likely to result in living and eating alone, there has been very little evidence/research directed specifically at the effects of widowhood on diet and nutrition". The potentially negative effects of widowhood on food intake are noted in the literature (Rosenbloom and Whittington 1993; Quandt et al, 2000; Hungerford, 2001; Lee et al 2006). However, there has been relatively little empirical study conducted on calorie intake in widowhood.

This study is significant in that it contributes to research by Rosenbloom and Whittington (1993), Ray (1997), Hungerford (2001), Lee et al (2006), among others, and also reports evidence from a transition economy – Vietnam. In addition, almost all research on widowhood has focussed on women (Wells and Kendig, 1997). In this study focus is placed on both men and women (widowers and widows). This study adds, therefore, to the literature by examining the calorie intake of widowed men and women. The study on calorie intake, nutrition and poverty in widowhood in Vietnam is unique and the first of its kind, to the knowledge of the researcher. The results of the study have considerable policy implications especially in terms of developing policies that minimise: (i) the economic impact of widowhood, and (ii) the vulnerability of widowed-households.

The paper is structured as follows: a summary of the literature on income, expenditure and food insecurity and nutrition in widowhood follows this introduction. A brief description of the methodology used in the paper is then provided. Results of the analysis are reported. The actual tables of results are presented as an Appendix. A discussion is presented and concluding remarks are drawn.

**LITERATURE REVIEW**

Household spending patterns just before widowhood contribute to the economic decline of widowed-households (Fan and Zick, 2006). Further changes in widowhood generally include loss of earnings, social networks and assistance to the widowed-household (Ashton-Schaeffer, 1997; Lopata, 2002; Fan and Zick, 2006). As a result the widowhood event itself becomes somewhat responsible for the observed levels of poverty in widowhood (Bound et al, 1991). Widowhood changes the lives of widowers and widows, and the magnitude of the change depends on the societal and communal variables, as well as the perceptions of the status of widowhood in the community or society (Lopata 2002; Angel, Jimenez and Angel, 2007). Significant attention has been paid, in the literature, to the study of income and expenditure dynamics of single-headed households (Zick and Smith, 1991;

McGarry and Schoeni, 2005). Particular emphasis has often been placed on male-headed and female-headed households, and how these types of households make resource allocation decisions in order to remain food secure. Although general recognition has been given to the fact that households headed by widows or widowers tend to be more food-insecure than other households, little has actually been given to the analysis of differences in the determinants of calorie intake in widow-headed and widower-headed households. Exceptions such as Rosenbloom and Whittington (1993) are noted.

In widowhood, opportunities for gainful employment are fewer, the ability to earn income is therefore lessened, and the likelihood of poverty is, as a result, increased (Hungerford, 2001). Declines in income also increase the likelihood of eating an inadequate diet (Rosenbloom and Whittington, 1993; Arcury et al, 1998; Quandt, et al. 2000; Hungerford, 2001). As a result of income constraints in widowhood the quality of life – a composite of social engagement, subjective well-being, healthy eating behaviour, to name a few aspects of quality of life- is compromised (Ashton-Schaeffer, 1997; Price, 2006). Widowhood often leaves the surviving spouse in a precarious financial situation (Zick, Fan and Chang, 2004; McGarry and Schoeni, 2005), and influences overall household expenditure (Rosenbloom and Whittington, 1993; Fan and Zick, 2006). The key determinants of expenditure in widowhood include: the level of education (Fan and Zick, 2006; Rosenbloom and Whittington, 1993); ethnicity (Fan and Zick, 2006; Rosenbloom and Whittington, 1993); household headship (Fan and Zick, 2006; Rosenbloom and Whittington, 1993); availability of retirement income (Lechner, 1998; Paulin and Duly, 2002; McGarry and Schoeni, 2005; Lee et al, 2006); region of residence (Quandt et al, 2000), gender (Quandt et al, 2000); consuming food away from home (Rosenbloom and Whittington, 1993; Lee et al, 2006); age (Fan and Zick, 2006; Rosenbloom and Whittington, 1993), and the absence/presence of private medical insurance (Zick, Fan and Chang, 2004; Fan and Zick, 2006).

The absence of a sound practice of good nutrition in widowhood is observed mainly in the form of unhealthy eating behaviours (Arcury et al. 1998) and lower dietary intake (Rosenbloom and Whittington, 1993). Adverse changes in health behaviours include unhealthy eating-out (Rosenbloom and Whittington, 1993; Hungerford, 2001; Lee et al., 2006), and unhealthy dietary patterns and food consumption choices. These adverse changes lead to poor diet. The underlying food insecurity that ensues may lead to malnutrition, and place widows and widowers at greater risk of worsening health and then mortality (Quandt et al, 2000). Most striking is the fact that in almost all cases, the widow or widower becomes the head of the household. In that regard, the widowed-households are less likely to practise good nutrition. In addition, social environment variables tend to have a larger influence on dietary intake in widowhood, than demographic variables. This evidence, therefore, gives the impetus for analyzing household food choices and calorie intake in widowhood, and also incorporating regional and communal variables.

Most family structures generally contribute to healthy household dietary activity. In particular, females tend to contribute more to males' dietary quality than males contribute to females' dietary quality. In that regard it is expected, therefore, that in widowhood, nutrient intake of widows will be significantly different from that of widowers. Widows are therefore more likely to be calorie-poor or food-insecure than widowers (Rosenbloom and Whittington, 1993). Several similar empirical questions regarding disparities between widowed-households and other households have been raised in the literature. For example, Ray (1997) compared likely disparities in widowhood in Pakistan and South Africa, and showed that widows are a particularly vulnerable to poverty in less affluent households. Evidence also points to gender differences in the effects of widowhood on well-being (Quandt et al, 2000), in particular the nutritional self-management of older women in rural communities. Research suggests that widows are generally poorer than widowers (Lechner 1998; McGarry and Schoeni, 2005) and mortality in widowhood is higher than in non-widowhood (Wells and Kendig, 1997; Quandt et al, 2000). In addition, widows and widowers experience substantial economic vulnerability (Zick and Smith, 1986; Fan and Zick, 2004) than do similar aged married couples. Widows and widowers also tend to have lower life satisfaction and poorer psychological well-being than their married counterparts (Wells and Kendig, 1997).

The capacity to survive widowhood, and adapt to widowhood, is enhanced considerably by factors such as age, education, supportive family structures and social networks, in addition of course to well-managed sound nutrition. The different ways in which in which widows and widowers socialise are also significant for calorie intake. Lopata (2002), for example, noted that if widows and widowers "considered companionship – the widows wanted someone to go out with, whereas the widowers wanted someone to come home to". This view is important to this study, given the focus on calories that are amassed from eating out behaviour. It is, therefore prudent, on the balance of the evidence presented above, to investigate the differences in calorie intake between widows and widowers, as part of a broader understanding of poverty dynamics in widowhood.

**METHODOLOGY**

The determinants of the logarithm of per capita calorie intake (log_pcci) are identified by estimating a multivariate ordinary least squares (OLS) regression model using a host of explanatory variables. These explanatory variables include: seven regional dummies, six ethnic dummies, a rural dummy, two household composition variables (education of head of household, number of children and number of adults), and the logarithm of per capita food expenditure (log_pcfe). The variable log_pcfe is used as a proxy for income that is targeted to calorie acquisition. A calorie intake equation is estimated for each of the following household types: widow-, widower- and non-widowed households. These three equations model only overall calorie intake, and do not take into account the

calorie shares of the different food items consumed by the household. More-so, in explaining overall calorie shares using simple multivariate OLS regressions, a range of endogeneity issues emerge. In order to address the endogeneity and also extend the analysis to determine calorie intake across a range of food classes (groups) an instrumental variable (IV) regression model is employed. The IV regression model estimates the calorie shares of all the food classes on regional, ethnic and other demographic variables; and, is instrumented by including other variables that represent different sources of income or spending power. In running the IV regressions, a dummy variable is used to capture the type of widowhood household (that is, twhh: 0=widowed-household, & 1=widow-household).

Data from the 2002 Vietnamese Living Standards Survey (VLSS) are used. The data are organised as follows. Food items consumed by a household are classified into eleven food classes. These food classes are rice, wheat, other cereals, vegetables, fruits, meat, fish, dairy products, alcohol, eating out and the consumption of other products. The respective quantities consumed for each food classes and their calorie content are calculated. The daily per capita calorie intake for each household is then computed. The following variables are therefore used in the multivariate OLS and IV regression models for calorie intake and calorie shares.

| | |
|---|---|
| log_pcci | Logarithm of per capita calorie intake |
| log_pcfe | Logarithm of per capita food expenditure |
| Redriver | Red River Delta (geographical region of Vietnam) |
| northeast | North East Vietnam (geographical region of Vietnam) |
| northwest | North West Vietnam (geographical region of Vietnam) |
| northcentral | North Central Vietnam (geographical region of Vietnam) |
| southcentral | South Central Vietnam (geographical region of Vietnam) |
| centralhigh | Central Highlands Vietnam (geographical region of Vietnam) |
| southeast | South East Vietnam (geographical region of Vietnam) |
| Kinh | Ethnic dummy (0=otherwise; 1=Kinh) |
| Tay | Ethnic dummy (0=otherwise; 1=Tay) |
| Chinese | Ethnic dummy (0=otherwise; 1=Chinese) |
| Khmer | Ethnic dummy (0=otherwise; 1=Khmer) |
| Muong | Ethnic dummy (0=otherwise; 1=Muong) |
| Nung | Ethnic dummy (0=otherwise; 1=Nung) |
| Rural | Ethnic dummy (0=urban; 1=rural) |
| Na | Number of adults in household |
| Nc | Number of children in household |
| hh_educ | Education of head of household |
| twhh | Type of widowed-household (0=widower-household; 1=widow-household) |
| _cons | Constant |

**RESULTS**

Table 1 (see Appendix) reports the general statistics for widowed- and non-widowed households in 2002. Non-widowed households (n=25518) represent a larger proportion of the sample compared to widows (n=3278) and widows (n=733). This difference in sample size is worth noting especially given the similarity in descriptive and inferential statistics reported in Table 1, and some stylised facts in the literature on widowed. The only significant difference among widowed- and non-widowed households is the proportion of households below the food and general poverty lines. More widowed-households tend to be below the respective poverty lines. A significant proportion of widowed-households have no children. This is particularly important given the stylized facts in the literature about the burden children impose on nutrition choice in widowhood. The high proportion of childless households also means that the calorie results obtained later can also be interpreted in the context of management of own nutrition as well as the management of household nutrition. Results in Table 1 suggest that in the case of Vietnam differences in incomes between widowers and widows may not be as large as suggested by the general literature. The differences in logarithms of per capita total expenditure and food expenditure (log_pcte and log_pcfe) are small. Similarly, the differences in mean per capita daily calorie intakes (log_pcci) of widowed-households and the calorie price (cost of acquiring a calorie) in widowhood are not statistically different. The results suggest that any differences in calorie intake that may exist are not discernible at the level of total per capita daily calorie intake. For this reason consumption levels, budget shares and calorie shares for the eleven food classes are calculated. These levels of consumption and shares are reported in Table 2 (see Appendix).

The results in Table 2 show, for all food classes except alcohol, eating other and consuming other products; that there is no significant difference in food consumption (kg/month), budget shares and calorie shares in widowhood in Vietnam, in 2002. The results show, however, that widow-households consume less alcohol than widower-households. The calorie share of alcohol is therefore lower in widow-households compared to widower-households. The budget and calorie shares for eating out are slightly higher in widow-households compared to those observed in widower-households. Given that for most of the food classes the budget shares, calorie shares and consumption rates do not vary considerably across widowed-households, it is relevant to examine how per capita calorie intake is influenced by selected regional, communal and demographic variables. The results of such an analysis are presented in Table 3 (see Appendix). The signs of all ethnic dummies are negative. For widow-household the dummies Kinh, Tay and Chinese are statistically significant at the 1 percent level. The results suggest that these three ethnic groups are likely to have lower per capita calorie intake in widow-households in Vietnam. The ethnic group Kinh are likely to have lower per capita calorie intake in widower-households. The coefficient of the rural dummy (0=urban, 1=rural) is statistically significant in all types of widowed-households. The positive sign suggests that widowed-households

in rural areas are likely to have larger values of calorie intake. The level of calorie intake in widow-households is improved significantly by an increase in the level of education of the head of the household (hh_educ). The negative sign for the education variable (hh_educ) suggests that lower per capita calorie intake is negatively associated with higher levels of education in widower-households. The coefficient of income variable (log_pcfe) is positive and significant across all widowed-household types. This coefficient also provides the elasticity of calorie intake with respect to changes in income. In the case of Vietnam, in 2002, calorie intake was more responsive to changes income occurring in widow-households, than to income changes in widower-households. The responsiveness of calorie intake to changes in income in widowed-households is, however, still lower than that experienced in non-widowed households.

Regression diagnostics are also presented in Table 3, and point to a reliable OLS model of the determinants of calorie intake. Although the model is reasonable, from an econometric point of view, the findings reported in Table 3 must be viewed cautiously because of likely endogeneity, especially with respect to the income variable. More-so, Table 3 reports regression coefficients for overall calorie intake without taking into account the various sources of calorie intake. Results reported in Tables 4a through 4d (see Appendix) show the determinants of calorie intake by food class calorie source, using independent variables similar to those used in Table 3. The major differences are the use of IV regressions instead of OLS, and the use of the dummy (twhh) to represent the type of widowed-household (0=widower-household; 1=widow-household). The results in Table 4a show a significant negative elasticity of per capita food expenditure for rice – suggesting that a 1 percent increase in income may lead to a 0.1588 percent reduction in calorie intake for rice. The coefficients for the ethnic dummies, in the rice calorie share equation, are positive and significant for the main ethnic groups (Kinh, Tay and Chinese). Rural residence and large numbers of children in the widowed-household are positively associated with increased calorie intake for rice. The coefficient of the dummy for type of widowed-household (twhh) is insignificant suggesting that for the purpose of explaining calorie intake for rice, wheat and other cereals, it is not statistically important to consider the type of widowhood. In other words, there may be no need to distinguish between widow-households from widower-households for the purpose of calorie estimation for rice, wheat and other cereals in Vietnam.

Positive and significant income elasticity is reported for meat in Table 4b. Meat and fruit calorie intakes are lower for larger families. The insignificant dummy variable (twhh) in Table 4b is worth noting - since it shows that calorie shares for vegetables, fruit and meat are not that different across types of widowed-households. This insignificant result is the same as that observed earlier in Table 4a. In Table 4c, positive income elasticity is reported for the calorie shares of dairy products. The calorie shares for fish and dairy products tend to be lower for widowed-household with more children.

Regional effects are all negative for all fish calorie shares, for in seven regions. It is noteworthy that the reference region is Mekong River Delta – a major geographical area of fishing activity in Vietnam. The coefficient of the dummy twhh is significant for fish calorie share and the alcohol calorie share. For fish calorie share the sign of the coefficient is positive suggesting that fish calorie intake is likely to be higher in widow-households (twhh: 0=widower-household; 1=widow-households). The negative and significant coefficient of the alcohol calorie share suggests that calorie intake from alcohol is likely to be lower in widow-households.

The IV regression results for calorie shares for eating out and consumption of other products are reported in Table 4d. The results show positive calorie elasticities with respect to income. The calorie elasticities are higher compared to those for other food classes. This suggests that eating out and the consumption of other food products are making larger contributions to calorie intake in widowhood in Vietnam. It is of significance to note that the type of widowed-household dummy (twhh) is positive and significant at the 5 percent level – suggesting that widows gain calories considerably from eating out. In addition, the ethnic dummies (Kinh and Chinese) are positive suggesting larger calorie intakes for these ethnic groups. The results for regional effects are mixed. The equation for per capita calorie intake shows strong positive elasticity of income, and that higher levels of education are associated with higher levels of calorie intake. In summary, the results in Table 4a through 4d show that calorie intake in widowhood differs by the type of widowhood household only for eating out, and alcohol and fish consumption. This finding has implications for aggregating food items in Vietnam for the purpose of determining likely shifts in calorie intake.

**DISCUSSION AND CONCLUSION**

Widowhood has economic and social impacts on household consumption choices and the allocation or resources in the household. Little research has been conducted on gender differences in calorie intake in widowhood. This study focussed on calorie intake in widow-households and widower-households in Vietnam, using data from VLSS 2002. The results show significant differences in calorie intake from eating out, fish consumption and alcohol consumption, in widow-households and widower-households. These results have implications mainly for experimental design for estimating widowhood calorie equations. The positive impact of increasing income on calorie intake is larger for widow-households than for widower-households. This result has policy implications in terms of the design and implementation of any government or non-governmental scheme, and/or community cooperative programs aimed at raising household income. Improved education is associated with improvements in calorie intake in widow-households. The results emphasize the importance of disseminating information on health issues in widowhood, in particular the risks associated with high levels of alcohol consumption and over-reliance on calories from eating out. For effectiveness, the policies should focus on raising the levels of nutrition awareness in widowhood. Widow-households

and widower-households residing in rural areas of Vietnam seem to enjoy larger volumes of calorie intake than widowed-households residing in urban areas of Vietnam. The results reported in this study have interesting policy implications especially if one focuses on the determinants of calorie shares as reported in the instrumental variables regression results. For example, an income policy targeted at those in widowhood needs to take into account the likely negative calorie effects of a switch away from rice to other less calorie-rich food products as income improves. Given the significance of the rural dummy variable on rice calorie share, vegetable calorie share, it is likely that calorie intake can be enhanced significantly through sustained and well-managed agrarian programs focus on general food security and overall calorie intake.

The results of this study show that, in the case of Vietnam, food poverty and calorie intake in widowhood are not a feminine problem as often suggested in the empirical evidence from other countries. Widows and widowers are more calorie-vulnerable than non-widowed households. Calorie intake in widowed-households may respond slowly to improvements in income, compared to the sensitivity observed in non-widowed households. This is consistent with the view that poverty in widowhood is often difficult to eliminate. Therefore any policies targeted at enhancing food security in widowhood must consider the differences in consumption choices as well as the key determinants of calorie shifts in widow-households and widower-households.

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# APPENDIX

**Table 1: Statistics for Widowed and Non-Widowed Households in Vietnam in 2002[1]**

| | Widows | Widowers | Non-Widowed |
|---|---|---|---|
| **Sample size** | 3278 | 733 | 25518 |
| **Mean Number of children** | 1.76 | 1.82 | 2.37 |
| | (1.39) | (1.46) | (1.45) |
| **Mean Number of adults** | 1.83 | 2.01 | 2.24 |
| | (1.19) | (1.39) | (0.79) |
| **Mean log_pcte** | 8.28 | 8.28 | 8.32 |
| | (0.63) | (0.63) | (0.61) |
| **Mean log_pcfe** | 7.60 | 7.58 | 7.65 |
| | (0.49) | (0.48) | (0.46) |
| **Mean log_pcci** | 7.52 | 7.57 | 7.91 |
| | (0.69) | (0.72) | (0.47) |
| **Mean calorie price[2]** | 0.0028 | 0.0027 | 0.0024 |
| | (0.009) | (0.004) | (0.003) |
| **% choosing full FGP set[3]** | 40.75 | 41.75 | 39.37 |
| **% below the food poverty line** | 22.24 | 22.92 | 16.81 |
| **% below the general poverty line** | 10.86 | 12.96 | 8.48 |
| **% with no children** | 20.87 | 22.24 | 8.38 |

**Notes:**

1. The values in parenthesis () are standard errors.
2. Calculated by dividing the calories by expenditure
3. FGP set is the Food Guide Pyramid (FGP)

**Table 2: Consumption, Budget and Calorie Shares (%) in Widowhood in 2002**

| | Widows | | | Widowers | | |
|---|---|---|---|---|---|---|
| | Monthly Consumption (kg) | Budget Share (%) | Calorie Share (%) | Monthly Consumption (kg) | Budget Share (%) | Calorie Share (%) |
| | | | | | | |
| **Rice** | 16.34 | 31.34 | 78.96 | 16.71 | 31.93 | 77.88 |
| **Wheat** | 0.58 | 0.96 | 0.70 | 0.43 | 0.92 | 0.60 |
| **Other Cereals** | 0.82 | 2.11 | 1.17 | 0.86 | 2.11 | 1.47 |
| **Vegetables** | 4.08 | 6.44 | 0.80 | 4.16 | 6.11 | 0.90 |
| **Fruits** | 1.35 | 3.38 | 0.19 | 1.37 | 3.32 | 0.18 |
| **Meat** | 1.72 | 18.69 | 5.34 | 1.71 | 18.81 | 5.12 |
| **Fish** | 2.00 | 11.40 | 1.20 | 1.81 | 10.40 | 1.04 |
| **Dairy** | 0.29 | 2.27 | 1.18 | 0.30 | 2.08 | 1.29 |
| **Alcohol** | 0.29 | 0.82 | 1.11 | 0.69 | 1.94 | 2.68 |
| **Eating Out** | 5.51 | 9.87 | 8.84 | 5.46 | 8.61 | 8.27 |
| **Other** | 5.74 | 12.72 | 0.51 | 5.67 | 13.77 | 0.57 |
| | | | | | | |

**Table 3: Determinants of log per capita daily calorie intake in 2002**

| | Widows | | | Widowers | | | Non-Widowed | | |
|---|---|---|---|---|---|---|---|---|---|
| | **coef** | **t** | **sig** | **coef** | **t** | **sig** | **coef** | **t** | **sig** |
| **redriver** | -0.01 | -0.37 | | 0.03 | 0.70 | | 0.08 | 14.37 | * |
| **northeast** | 0.12 | 4.38 | * | 0.05 | 0.88 | | 0.11 | 16.78 | * |
| **northwest** | 0.03 | 0.41 | | -0.28 | -2.19 | ** | 0.04 | 3.39 | * |
| **northcentral** | 0.03 | 1.24 | | 0.06 | 1.23 | | 0.04 | 6.69 | * |
| **southcentral** | -0.04 | -1.89 | *** | -0.07 | -1.46 | | -0.03 | -4.92 | * |
| **centralhigh** | -0.02 | -0.59 | | -0.03 | -0.36 | | 0.02 | 2.20 | ** |
| **southeast** | -0.15 | -7.96 | * | -0.19 | -4.33 | * | -0.12 | -19.45 | * |
| **Kinh** | -0.16 | -4.09 | * | -0.16 | -2.11 | ** | -0.07 | -8.67 | * |
| **Tay** | -0.18 | -2.66 | * | -0.09 | -0.76 | | -0.02 | -1.38 | |
| **chinese** | -0.33 | -3.58 | * | -0.09 | -0.56 | | -0.16 | -7.48 | * |
| **Khmer** | -0.06 | -0.98 | | -0.11 | -0.79 | | -0.04 | -2.32 | ** |
| **Muong** | -0.07 | -0.75 | | -0.04 | -0.24 | | 0.05 | 3.05 | * |
| **Nung** | -0.08 | -0.90 | | -0.03 | -0.22 | | -0.04 | -2.30 | ** |
| **Rural** | 0.22 | 14.69 | * | 0.21 | 5.84 | * | 0.20 | 43.62 | * |
| **Na** | 0.25 | 47.87 | * | 0.25 | 25.54 | * | 0.20 | 91.11 | * |
| **Nc** | 0.29 | 63.37 | * | 0.29 | 31.59 | * | 0.21 | 174.37 | * |
| **hh_educ** | 0.01 | 1.73 | *** | -0.02 | -1.91 | *** | -0.02 | -14.02 | * |
| **log_pcfe** | 0.48 | 32.92 | * | 0.52 | 16.46 | * | 0.41 | 92.17 | * |
| **_cons** | 9.90 | 81.89 | * | 9.61 | 36.87 | * | 10.76 | 292.37 | * |
| | | | | | | | | | |
| **Sample size** | | 3275 | | | 732 | | | 25510 | |
| **F-ratio** | | 555 | | | 127 | | | 2974 | |
| **Prob > F** | | 0.00 | | | 0.00 | | | 0.00 | |
| **$R^2$** | | 0.75 | | | 0.76 | | | 0.68 | |
| **Adj. $R^2$** | | 0.75 | | | 0.76 | | | 0.68 | |
| **Root MSE** | | 0.34 | | | 0.35 | | | 0.27 | |

**Notes:**

* significant at the 1 percent level
** significant at the 5 percent level
*** significant at the 10 percent level

**Table 4a: IV Regressions of Calorie Shares and Calorie Intake in Widowhood in 2002**

| | rice | | | wheat | | | other cereals | | |
|---|---|---|---|---|---|---|---|---|---|
| | **coef** | **z** | **sig** | **Coef.** | **z** | **sig** | **Coef.** | **z** | **sig** |
| **log_pcfe** | -0.159 | -5.26 | * | 0.0026 | 0.54 | | -0.0016 | -0.19 | |
| **Redriver** | -0.014 | -1.41 | | -0.0032 | -2.01 | ** | 0.0014 | 0.5 | |
| **northeast** | 0.021 | 1.94 | *** | -0.0010 | -0.61 | | 0.0026 | 0.93 | |
| **northwest** | 0.027 | 1.25 | | -0.0035 | -1.03 | | -0.0135 | -2.4 | ** |
| **northcentral** | 0.017 | 1.25 | | -0.0018 | -0.86 | | 0.0021 | 0.6 | |
| **southcentral** | -0.025 | -2.91 | * | -0.0012 | -0.89 | | 0.0009 | 0.39 | |
| **centralhigh** | 0.006 | 0.46 | | -0.0029 | -1.4 | | 0.0038 | 1.11 | |
| **southeast** | -0.043 | -5.74 | * | 0.0011 | 0.93 | | 0.0027 | 1.39 | |
| **Kinh** | 0.057 | 3.75 | * | 0.0019 | 0.79 | | -0.0680 | -16.93 | * |
| **Tay** | 0.053 | 2.28 | ** | -0.0018 | -0.5 | | -0.0620 | -10.1 | * |
| **Chinese** | 0.058 | 1.73 | *** | -0.0019 | -0.35 | | -0.0694 | -7.81 | * |
| **Khmer** | 0.094 | 4.6 | * | 0.0021 | 0.64 | | -0.0684 | -12.62 | * |
| **Muong** | 0.042 | 1.37 | | -0.0016 | -0.32 | | -0.0521 | -6.43 | * |
| **Nung** | 0.046 | 1.61 | | -0.0038 | -0.84 | | -0.0064 | -0.84 | |
| **Rural** | 0.069 | 6.06 | * | -0.0043 | -2.42 | ** | 0.0024 | 0.8 | |
| **Na** | -0.003 | -1.23 | | 0.0004 | 1.12 | | 0.0000 | -0.01 | |
| **Nc** | 0.014 | 6.5 | * | 0.0001 | 0.35 | | 0.0002 | 0.3 | |
| **Hh_educ** | -0.007 | -2.43 | ** | 0.0006 | 1.2 | | -0.0001 | -0.19 | |
| **twhh** | 0.003 | 0.58 | | 0.0002 | 0.22 | | -0.0014 | -0.99 | |
| **_cons** | 1.811 | 7.79 | * | -0.0123 | -0.34 | | 0.0864 | 1.41 | |
| | | | | | | | | | |
| **Sample size** | | 4007 | | | 4007 | | | 4007 | |
| **F-ratio** | | 69.63 | | | 5.95 | | | 32.24 | |
| **Prob > F** | | 0.00 | | | 0.00 | | | 0.00 | |
| **Centered $R^2$** | | 0.41 | | | 0.04 | | | 0.13 | |
| **Uncentered $R^2$** | | 0.97 | | | 0.11 | | | 0.21 | |
| **Root MSE** | | 0.131 | | | 0.021 | | | 0.03 | |
| **Anderson LR** | | 112.36 | | | 112.36 | | | 112.36 | |
| **$X^2$ (5) p-value** | | 0.00 | | | 0.00 | | | 0.00 | |
| **Sargan statistic** | | 27.11 | | | 0.80 | | | 0.80 | |
| **$X^2$ (4) p-value** | | 0.00 | | | 0.93 | | | 0.94 | |

**Notes:**

* significant at the 1 percent level
** significant at the 5 percent level
*** significant at the 10 percent level

**Table 4b: IV Regressions of Calorie Shares and Calorie Intake in Widowhood in 2002**

| | vegetables | | | Fruits | | | meat | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Coef.** | **z** | | **Coef.** | **Z** | | **Coef.** | **z** | |
| Log_pcfe | 0.0026 | 0.44 | | 0.0012 | 0.8 | | 0.0299 | 3.66 | * |
| Redriver | 0.0016 | 0.81 | | 0.0005 | 0.95 | | 0.0068 | 2.49 | ** |
| northeast | -0.0030 | -1.44 | | 0.0002 | 0.35 | | 0.0093 | 3.23 | * |
| northwest | 0.0312 | 7.59 | * | 0.0001 | 0.07 | | 0.0081 | 1.4 | |
| northcentral | 0.0122 | 4.8 | * | 0.0002 | 0.31 | | -0.0051 | -1.42 | |
| southcentral | 0.0030 | 1.83 | *** | 0.0000 | 0.11 | | -0.0115 | -4.94 | * |
| centralhigh | 0.0010 | 0.42 | | 0.0005 | 0.79 | | -0.0021 | -0.6 | |
| southeast | -0.0010 | -0.73 | | 0.0008 | 2.22 | ** | -0.0053 | -2.66 | * |
| Kinh | -0.0382 | -13.07 | * | 0.0003 | 0.41 | | 0.0058 | 1.4 | |
| Tay | -0.0343 | -7.69 | * | 0.0007 | 0.59 | | 0.0195 | 3.11 | * |
| Chinese | -0.0377 | -5.84 | * | -0.0006 | -0.38 | | 0.0015 | 0.17 | |
| Khmer | -0.0341 | -8.67 | * | 0.0001 | 0.11 | | 0.0004 | 0.07 | |
| Muong | -0.0422 | -7.17 | * | 0.0007 | 0.5 | | 0.0048 | 0.58 | |
| Nung | -0.0342 | -6.19 | * | 0.0001 | 0.07 | | 0.0128 | 1.64 | |
| Rural | 0.0037 | 1.69 | *** | -0.0002 | -0.43 | | -0.0067 | -2.18 | ** |
| Na | 0.0011 | 2.58 | ** | -0.0002 | -1.67 | *** | -0.0003 | -0.51 | |
| Nc | -0.0005 | -1.22 | | -0.0004 | -4.32 | * | -0.0058 | -10.08 | * |
| Hh_educ | -0.0004 | -0.65 | | -0.0002 | -1.18 | | 0.0008 | 0.98 | |
| twhh | -0.0002 | -0.23 | | -0.0004 | -1.34 | | -0.0001 | -0.08 | |
| _cons | 0.0198 | 0.44 | | -0.0065 | -0.58 | | -0.1692 | -2.7 | * |
| | | | | | | | | | |
| Sample size | | 4007 | | | 4007 | | | 4007 | |
| F-ratio | | 26.07 | | | 3.34 | | | 30.86 | |
| Prob > F | | 0.00 | | | 0.00 | | | 0.00 | |
| Centered $R^2$ | | 0.11 | | | 0.004 | | | 0.22 | |
| Uncentered $R^2$ | | .18 | | | 0.046 | | | 0.66 | |
| Root MSE | | 0.03 | | | 0.006 | | | 0.04 | |
| Anderson LR | | 112.36 | | | 112.36 | | | 112.36 | |
| $X^2$ (5) p-value | | 0.00 | | | 0.00 | | | 0.00 | |
| Sargan statistic | | 3.59 | | | 0.13 | | | 11.45 | |
| $X^2$ (4) p-value | | 0.46 | | | 0.99 | | | 0.02 | |

**Notes:**

* significant at the 1 percent level
** significant at the 5 percent level
*** significant at the 10 percent level

**Table 4c: IV Regressions of Calorie Shares and Calorie Intake in Widowhood in 2002**

| | fish | | | dairy products | | | alcohol | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Coef.** | **z** | **sig** | **Coef.** | **z** | **sig** | **Coef.** | **z** | **sig** |
| log_pcfe | -0.0003 | -0.11 | | 0.0088 | 2.61 | * | -0.0017 | -0.3 | |
| Redriver | -0.0121 | -13.54 | * | -0.0006 | -0.5 | | -0.0029 | -1.51 | |
| northeast | -0.0123 | -13.12 | * | 0.0013 | 1.12 | | -0.0034 | -1.67 | *** |
| northwest | -0.0112 | -5.97 | * | -0.0017 | -0.71 | | 0.0055 | 1.34 | |
| northcentral | -0.0086 | -7.37 | * | 0.0001 | 0.09 | | -0.0042 | -1.65 | |
| southcentral | -0.0035 | -4.57 | * | 0.0011 | 1.13 | | -0.0060 | -3.61 | * |
| centralhigh | -0.0097 | -8.51 | * | 0.0048 | 3.31 | * | -0.0011 | -0.44 | |
| southeast | -0.0057 | -8.71 | * | -0.0002 | -0.2 | | -0.0032 | -2.27 | ** |
| Kinh | 0.0036 | 2.7 | * | 0.0030 | 1.78 | *** | -0.0115 | -3.95 | * |
| Tay | 0.0024 | 1.16 | | 0.0046 | 1.78 | *** | -0.0008 | -0.17 | |
| Chinese | 0.0025 | 0.85 | | -0.0004 | -0.11 | | -0.0163 | -2.53 | ** |
| Khmer | 0.0014 | 0.8 | | 0.0020 | 0.86 | | -0.0121 | -3.07 | * |
| Muong | 0.0018 | 0.68 | | 0.0023 | 0.66 | | 0.0039 | 0.66 | |
| Nung | 0.0005 | 0.18 | | 0.0000 | 0 | | -0.0096 | -1.74 | *** |
| Rural | -0.0002 | -0.17 | | 0.0012 | 0.96 | | 0.0018 | 0.83 | |
| Na | -0.0003 | -1.61 | | 0.0000 | 0.2 | | 0.0003 | 0.82 | |
| Nc | -0.0007 | -3.65 | * | -0.0016 | -6.74 | * | 0.0002 | 0.4 | |
| hh_educ | 0.0000 | 0 | | 0.0000 | 0.03 | | -0.0003 | -0.59 | |
| Twhh | 0.0009 | 1.98 | ** | -0.0008 | -1.4 | | -0.0139 | -13.35 | * |
| _cons | 0.0166 | 0.81 | | -0.0573 | -2.2 | ** | 0.0486 | 1.09 | |
| Sample size | | 4007 | | | 4007 | | | 4007 | |
| F-ratio | | 38.61 | | | 7.24 | | | 15.58 | |
| Prob > F | | 0.00 | | | 0.00 | | | 0.00 | |
| Centered $R^2$ | | 0.15 | | | 0.2 | | | 0.065 | |
| Uncentered $R^2$ | | 0.50 | | | 0.35 | | | 0.25 | |
| Root MSE | | 0.01 | | | 0.01 | | | 0.03 | |
| Anderson LR | | 112.36 | | | 112.36 | | | 112.36 | |
| $X^2$ (5) p-value | | 0.00 | | | 0.00 | | | 0.00 | |
| Sargan statistic | | 3.75 | | | 1.12 | | | 10.71 | |
| $X^2$ (4) p-value | | 0.44 | | | 0.89 | | | 0.03 | |

**Notes:**

| | |
|---|---|
| * | significant at the 1 percent level |
| ** | significant at the 5 percent level |
| *** | significant at the 10 percent level |

**Table 4d: IV Regressions of Calorie Shares and Calorie Intake in Widowhood in 2002**

| | eating out | | | other products | | | per capita intake | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Coef.** | **z** | **sig** | **Coef.** | **z** | **sig** | **Coef.** | **z** | **sig** |
| Log_pcfe | 0.049 | 1.82 | *** | 0.067 | 4.55 | * | 0.338 | 4.2 | * |
| Redriver | 0.006 | 0.68 | | 0.0166 | 3.31 | * | -0.038 | -1.4 | |
| northeast | -0.026 | -2.69 | * | 0.012 | 2.19 | ** | 0.078 | 2.72 | * |
| northwest | -0.040 | -2.09 | ** | -0.001 | -0.11 | | -0.051 | -0.89 | |
| northcentral | -0.016 | -1.35 | | 0.005 | 0.7 | | -0.015 | -0.43 | |
| southcentral | 0.049 | 6.38 | * | -0.008 | -1.77 | *** | -0.068 | -2.97 | * |
| centralhigh | -0.014 | -1.26 | | 0.015 | 2.26 | ** | -0.054 | -1.56 | |
| southeast | 0.043 | 6.53 | * | 0.010 | 2.63 | * | -0.143 | -7.25 | * |
| Kinh | 0.029 | 2.12 | ** | 0.017 | 2.24 | ** | -0.118 | -2.91 | * |
| Tay | 0.007 | 0.34 | | 0.012 | 1.02 | | -0.125 | -2.02 | ** |
| Chinese | 0.060 | 1.98 | ** | 0.004 | 0.24 | | -0.189 | -2.11 | ** |
| Khmer | 0.003 | 0.16 | | 0.011 | 1.11 | | -0.031 | -0.56 | |
| Muong | 0.009 | 0.34 | | 0.031 | 2.04 | ** | -0.076 | -0.93 | |
| Nung | 0.005 | 0.18 | | -0.010 | -0.73 | | -0.039 | -0.51 | |
| Rural | -0.059 | -5.72 | * | -0.008 | -1.38 | | 0.170 | 5.65 | * |
| Na | 0.003 | 1.55 | | -0.001 | -1.33 | | 0.245 | 42.98 | * |
| Nc | 0.009 | 4.73 | * | -0.014 | -13.7 | * | 0.298 | 52.82 | * |
| Hh_educ | 0.009 | 3.25 | * | -0.002 | -1.25 | | 0.013 | 1.68 | ** |
| Twhh | 0.011 | 2.25 | ** | 0.002 | 0.58 | | 0.016 | 1.14 | |
| _cons | -0.316 | -1.5 | | -0.422 | -3.68 | | 10.969 | 17.72 | * |
| | | | | | | | | | |
| Sample size | | 4007 | | | 4007 | | | 4007 | |
| F-ratio | | 46.89 | | | 35.73 | | | 558.44 | |
| Prob > F | | 0.00 | | | 0.00 | | | 0.00 | |
| Centered $R^2$ | | 0.25 | | | 0.13 | | | 0.75 | |
| Uncentered $R^2$ | | 0.48 | | | 0.64 | | | 1.00 | |
| Root MSE | | 0.12 | | | 0.06 | | | 0.35 | |
| Anderson LR | | 112.36 | | | 112.36 | | | 112.36 | |
| $X^2$ (5) p-value | | 0.00 | | | 0.00 | | | 0.00 | |
| Sargan statistic | | 22.04 | | | 5.43 | | | 27.72 | |
| $X^2$ (4) p-value | | 0.00 | | | 0.25 | | | 0.00 | |

**Notes:**

* significant at the 1 percent level
** significant at the 5 percent level
*** significant at the 10 percent level

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