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Abstract

This paper explores two different aspects of food security, namely undernourishment and overweight in the two Caribbean Islands of Jamaica and St. Lucia. The analysis draws on household surveys conducted in late 2006 and early 2007 among 729 St. Lucian and 1009 Jamaican households. Combining qualitative and quantitative methods, the paper focuses on the main vulnerable livelihoods on the two islands, including subsistent farmers and farm labourers, city dwellers, hotel workers and fisher folks. Exposure to risk is an important determinant of food insecurity. Shocks of relevance to vulnerable groups in the two islands include both household specific shocks such of illness, but more importantly also community level shocks such as natural disasters in form of droughts, storms and floods. Natural disasters are of particular importance to these livelihoods and changes in the frequency and severity of such shocks, e.g. as a consequence of changing climate may lead to increased food insecurity. At the same time, it is generally acknowledged that the food systems and the very nature of the food security problem in the Caribbean countries are gradually changing, with food availability becoming less of an issue in most of the region. Instead, energy intensive and unbalanced diets leading to overweight and obesity is increasingly becoming the key food security challenge, even so among households considered vulnerable of becoming food insecure. This is confirmed by the study, looking at anthropometric data collected from the participating households.

JEL Codes: Q18, P46

Keywords: food security, obesity, vulnerability, Jamaica, St. Lucia

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1 Introduction

The nature of food security is changing in the Caribbean. Structural changes and their impact on food systems have for many countries and in particular the island states resulted in growing food import dependency, furthered by a general neglect of the agricultural sector in favor of the service sector and in particular tourism. As in many other regions, increased economic development has been accompanied by nutritional transition, amplified by a globalization of dietary habits and changing lifestyles (Pingali, 2004).

Whilst economic performance varies widely in the region, spreading from the poorest country in the Western Hemisphere, Haiti, to the more affluent island states of Trinidad and Tobago and Barbados, the majority of countries witness food shortage for specific vulnerable groups in the midst of aggregate national food supply beyond what is nutritionally required as a minimum. That such dichotomy exists within a country is nothing new, but there is growing evidence that undernourishment and overweight may even be co-existing within the same households.

A recent study conducted by the Caribbean Food and Nutrition Institute in collaboration with FAO concluded that *"Food security is being compromised not in terms of availability of food, but in terms of accessibility and consumption/utilization"* (CFNI, 2007, p. 86). It pointed out that the overall macronutrient food supply was more than needed for the region as a whole; Hence, food availability, at least at regional/national level, was not the main constraint, but rather deficiencies in diets with respect to fruits and vegetables. At the same time, poverty and income inequality is high, whilst nutritional and health profiles in the region suggest serious imbalances in diets, resulting in high proportions of non-communicable diseases. Given the significant changes that the world food systems have undergone over the last two years, moving away from an era of long-term declines in real food prices, at least in the medium term, more households may be coming under pressure from rising food prices.

Methodology

This paper is based on household data collected from respectively 729 households in St. Lucia and 1009 in Jamaica[1]. The household surveys aimed at collecting primary qualitative and

[1] For more details on sampling, see CFNI 2008a and CFNI 2008b.

quantitative data as part of a Food Security Assessment and Vulnerability Profiling (FSA) in Jamaica and St. Lucia. The surveys were undertaken as an integrated part of a broader regional initiative to strengthen food security in the region through improving the understanding of who are food insecure and vulnerable, where they live, how many they are, why they are food insecure/vulnerable and what policy options exist to improve their situation. Such studies were, in addition to St. Lucia and Jamaica, also conducted in Belize, Guyana and Suriname.

The identification of, and establishing the sampling frames for vulnerable livelihoods[2], preceded the actual data collection. Thus, a general list of the main livelihoods considered vulnerable to food insecurity was developed at national consultation workshops held in St. Lucia and Jamaica. These lists were further refined through literature review, secondary data analyses and key informant interviews.

The final list of vulnerable livelihoods in St. Lucia include: Fisher folk, Banana[3] farmers, Urban/peri-urban poor; Hotel workers, and Construction workers. In Jamaica, the main vulnerable livelihoods identified were: Fisher folk, Inner city poor, Sugar workers and Subsistence farmers. Following the identification of the vulnerable livelihoods[4], the population of the targeted vulnerable livelihoods from which statistically valid samples could be drawn, was established.

A two-staged sampling design was used to select households for interviewing. Enumeration Districts (EDs) were randomly selected and the presence of the livelihood groups in each ED identified. The household count for each livelihood was then computed and a table of random numbers used to select the number of EDs using probability proportionate to size. Sixteen dwellings/households were selected from each ED with one adult (over age 18) interviewed from each household.

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[2] Identification of the sampled households is based on the sustainable livelihoods approach (SLA). As per IFAD's web page on SLA (http://www.ifad.org/sla/index.html), "*the SLA is a way to improve understanding of the livelihoods of vulnerable groups. It draws on the main factors that affect poor people's livelihoods and the typical relationships between these factors. The two key components of the SLA are: (1) a framework that helps in understanding the complexities of poverty, (2) a set of principles to guide action to address and overcome poverty*".

[3] Sampled farmers in both countries will be named interchangeably subsistent or small scale farmers in the paper.

[4] It is noted that the selected livelihoods are based on the dominant income generating activity of the sampled households. Nonetheless, all households (their heads or other members), support their family through participation into other income activities, in order to increase their diversification and reduce livelihood related risks.

The Household Surveys utilized a multi-sectioned questionnaire, containing mostly structured questions, collected data on demographics, income, employment history, indicators of vulnerability and food insecurity - food availability, food access, disease/health profile; community interventions, government interventions; food intake; and finally body mass index for the responding member. Data were collected in autumn 2006 (St. Lucia) and spring 2007 (Jamaica).

2 Key characteristics of Jamaica and St. Lucia

Overall socio-economic situation

Jamaica and St. Lucia Jamaica are small, open economies with relatively narrow economic bases. As other small island development states, both islands are extremely vulnerable to external shocks, particularly natural disasters such as hurricanes, which can cause high uncertainty in household and national income and impair the growth processes. Other major risks refer to the influence from the external economic environment and trade (including for the sugar and banana industry), given the integration of the two countries to international markets and the impact of imported market trends and volatility.

In 2007, Jamaica had a population of 2.68 million compared to 0.17 million in St. Lucia in 2007 (World Bank, 2008) and corresponding gross national income (GNI) per capita 3,710 USD/capita and 5,530 USD/capita, respectively. Remittances play a significant role in Jamaica, equalling to more than 2 billion USD in 2007 or 20% of GDP, whilst both countries have major external debt, in the case of St. Lucia equalling to 40% of GDP, and the double – 80% of GDP – in the case of Jamaica.

Economic growth in the two countries has followed different paths over the last ten years. Whilst growth in real GDP in Jamaica has systematically been below the regional level, the growth rates have moved from negative in the nineties to positive in the current decade. The growth of the St. Lucian economy has been bumpier, albeit at a higher level than for Jamaica and varying around regional levels. In particular, the impact of 9/11 on the tourism sector resulted in negative economic growth in 2001.

Inflation has generally been falling on the two islands, but global increases in commodity prices suggest that it may be picking up again, also reflected in the increase in Jamaican inflation from 6.7% in 2006 to 8.6% in 2007. Both countries exceeded the general regional trend of increased proportions of imported food as a share of national food consumption; in Jamaica 25.7% and 40.6% in St. Lucia, of all food consumed is imported, well-beyond the regional average of 20.4% (data from FAOSTAT).

The high share of imported food partly reflects the structure of the economies and the general diminishing role of agriculture as a share of the total national value-added. Thus, the industry and services sectors made up a 33% and 61% in Jamaica and 19% and 77% in St. Lucia in 2005, whilst agriculture stood for 6% and 4%, respectively. Furthermore, both countries have general substantial trade deficits, with exports and imports equalling 49% and 67% of GDP in Jamaica, and 52% and 66%, respectively, in St. Lucia.

Table 1. Key socio-economic data, Jamaica and St. Lucia

	Jamaica	**St. Lucia**
Undernourishment, 2002/04		
- Number	0.2 million	--
- As share of total population	9%	5%
Per capita Dietary Energy Consumption, 2002/04	2710 Kcal/day/person	2930 Kcal/day/person
Minimum requirements[5]	1930 Kcal/day/person	1900 Kcal/day/person
Share of total Dietary Energy Consumption, 200/04		
Carbohydrates	65 %	61%
Proteins	12 %	14%
Fat	23 %	23%
Food Import/Total food Consumption*	16.7% (1990)	39.5% (1990)
	25.7% (2003)	40.6% (2003)
Headcount poverty rate	16.9% (2004)	28.8 (2005)
GNI/capita 2007 (current USD)	3710 USD/capita	5530 USD/capita
GDP growth rate 2007	2.0%	3.2%
Sectoral contribution to GDP, 2005		
Agriculture	6% of GDP	4% of GDP
Industry	33% of GDP	19% of GDP
Service	61% of GDP	77% of GDP
Inflation, GDP deflator (annual %)	8.6%	0.4%
Export of goods and services, 2005 (% of GDP)	41%	52%
Import of goods and services, 2005 (% of GDP)	61%	66%

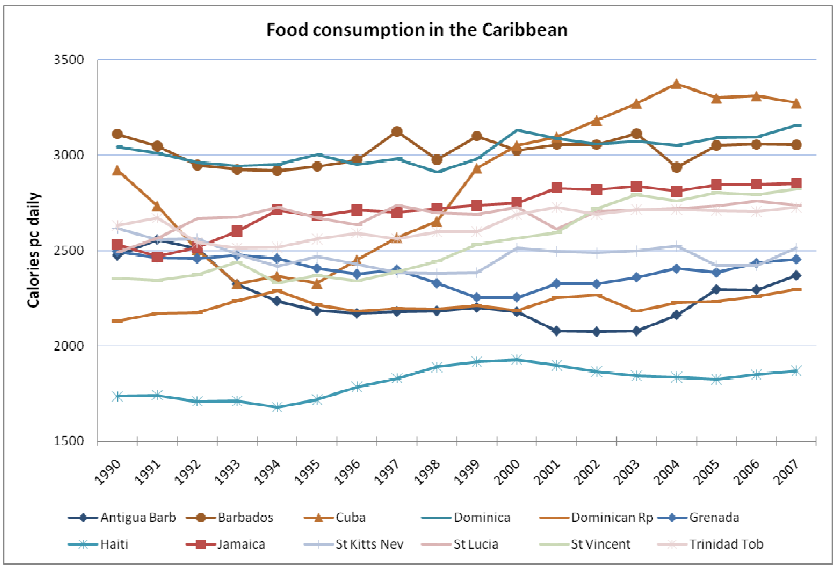
Source: FAOSTAT (2008), CFNI (2007), World Bank Development Indicators (2008)
* Including meat and fish.

[5] In a specified age and sex group, the minimum required amount of dietary energy per person is that considered adequate to meet the energy needs for maintaining a healthy life and carrying out a light physical activity. In the entire population, the minimum energy requirement is the weighted average of the minimum energy requirements of the different age and sex groups in the population, and hence may differ according to population structure.

The most recent study on poverty on St. Lucia (Kairi, 2006) reports that headcount poverty increased from 25.1% in 1995 to 28.8% in 2005, while the share considered "food poor", decreased from 7.1% to 1.6%. The incidence of poverty fluctuated slightly in Jamaica between 1999 to 2004, returning to 16.9% in 2004 (MoA, Jamaica, 2008).

Food security in Jamaica and St Lucia, has generally followed the trend of the region for the last decade of falling numbers and proportions of under nourished, with both countries being significantly below the regional average of 21%. Thus, St. Lucia has already achieved the targets of halving the proportion as well as number of undernourished, and in 2002/04, only 3% of the population was considered undernourished. Also Jamaica has achieved significant reductions in food insecurity, with the share of undernourished down to 9% in 2002/04. It should be noted that these figures dates before the global food price increases and hence some increases are likely to have occurred since 2002/04. Figure 1, shows the trends of caloric intake in the region from 1990 until 2007.

Figure 1. Trends of calorie intake per capita, in the Caribbean.



Source: FAOSTAT (2008)

Characteristics of vulnerable households in St. Lucia and Jamaica

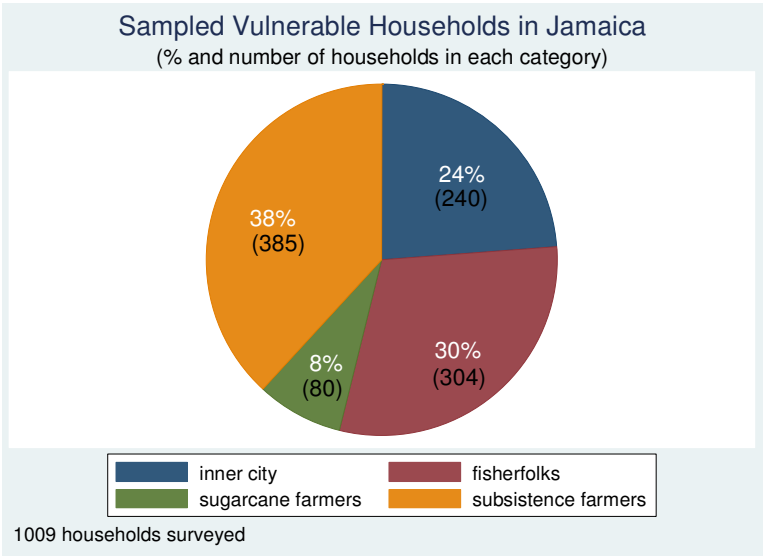
In figures 2 and 3, some descriptive statistics are shown on the sampled household characteristics by livelihood. The small size of both countries justifies expecting rather small heterogeneity in the profiling of the characteristics of the sampled vulnerable groups. However, some important observations can be drawn from the descriptive analysis of the

survey data, as can be seen from tables 2 and 3 below. The descriptive analysis points out that, mainly urban households are inadequately equipped, both in terms of income flows and assets, to cope with livelihood risks and thus may face major threats in their food security.

In particular, in both countries the urban based vulnerable group, constituting nearly 25 percent of the Jamaican and nearly 40 percent of the St Lucian samples, appears to be the worst off in terms of income earnings. In Jamaica, nearly 40 percent of the group reports weekly earnings of less than 6 thousand J$ (equivalent with about 143 $US during the survey year). In all other vulnerable livelihood groups the proportion does not exceed 35 percent, the lowest being in sugar cane farmers where 30 percent of them report earning less than 6 thousand J$ weekly income. It is also observed that the distribution of earnings within the urban poor is relatively wider in comparison with all other groups whose earnings are concentrated in the middle (earnings between 6 and 9 thousand J$, or about 143-215 US$, respectively), or the middle low income classes.

Similarly, in Saint Lucia, 67 percent of the urban poor group, report weekly earnings smaller than 400 EC$ (equivalent with about 150 $US), while the corresponding proportion is just above 40 percent for farmers and fishermen and around 27 percent for hotel and construction workers. In the latter two groups, about 54 percent of households are concentrated in the middle income class (earning between 400 and 700 EC$ or 150-264 $US).

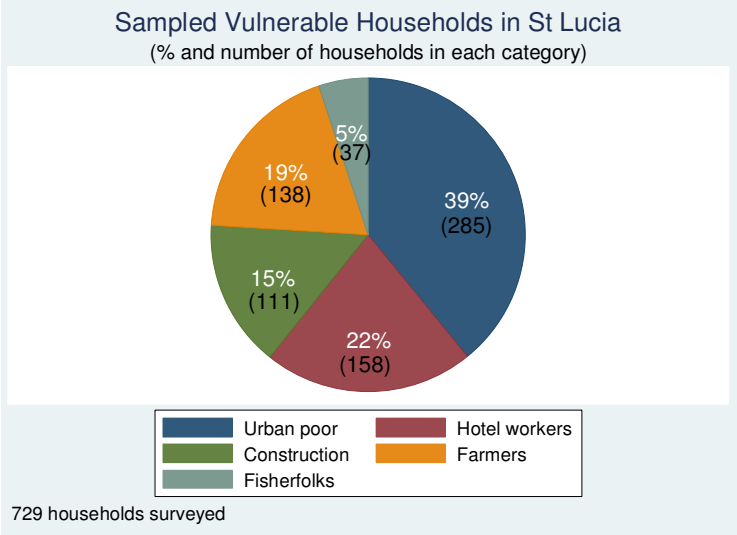
Figure 2. Jamaica: Sampled households by livelihood.



Note: Number of sampled households in parenthesis.

Source: Computed by authors

Figure 3. St. Lucia: Sampled households by livelihood.



Note: Number of sampled households in parenthesis.
Source: Computed by authors

The differences in income earnings among groups are somehow reflected in the demographic, social, financial and asset characteristics of the households. In Jamaica, subsistent farmers and urban poor have larger families and the proportion of those having female heads, is the highest[6] (52 percent for the inner city group). Nonetheless sugarcane farmers, is the group characterized by a lower average level of education. Still in the inner city group, household heads are significantly younger than those in other groups, while only 2 percent of them participating in some social association and 72 percent have a bank account; these are the smallest proportions in comparison with any other group.

Correspondingly in Saint Lucia, for the urban poor and construction worker households, household size is significantly larger; the level of education of the head is lower, while a relatively higher proportion of those households are female headed. Participation of these groups in social organizations/associations is rather small; however, it is noteworthy that 90 percent of farmers and 43 percent of fishermen participate in such associations. A significantly lower proportion of urban poor and construction workers, relative to the other groups, have a bank account and this characteristic is expected to increase their vulnerability in case of shocks.

[6] In the suspicion that some sampling bias may be possible in this case, a reviewer from CFNI, suggested that Jamaica is characterized by a very high proportion of female-headed households, especially in the inner-cities.

Table 2. Characteristics of vulnerable households in Jamaica

	Unit	Inner city	Fisher folks	Sugarcane farmers	Subsistence farmers	Total
Number of sampled households	units	240	304	80	385	1009
Demographic structure						
Age of head	years	44.57***	46.73***	53.64***	51.71***	48.66
Female headed hh	proportion	0.52***	0.18***	0.16**	0.21***	0.27
Hh size	units	3.83	3.57	2.83***	3.90***	3.7
Education level of hh head	years	7.72***	6.89	6.31***	6.76***	6.99
Dependency ratio (1)	proportion	0.38	0.36**	0.45*	0.41	0.39
Hh belongs in association	proportion	0.02***	0.10	0.09	0.14***	0.09
Financial characteristics (2)						
Bank account	proportion	0.72***	0.90***	0.82	0.80	0.82
Hh owes money	proportion	0.23***	0.35**	0.38	0.28	0.30
Received remittances	proportion	0.23	0.31***	0.16*	0.22	0.25
Weekly income						
<3000J$	proportion	0.07	0.08	0.09	0.07	0.07
3000J$-6000J$	proportion	0.32	0.26	0.21	0.29	0.28
6000J$-9000J$	proportion	0.31***	0.49***	0.61***	0.38*	0.41
9000J$-12000J$	proportion	0.25***	0.11***	0.07**	0.18	0.16
>15000J$	proportion	0.06	0.07	0.01**	0.08	0.07
Wealth (2)						
Household wealth (3)	000$J	1386.44	749.34*	1028.2	1303.79*	1096.67
Share from house	percent	33.33	23.92**	19.82	16.12**	19.35
Share from land	percent	11.11	13.68	22.62	16.89	16.22
Share from trees	percent	0.00	0.70	1.61	0.70	0.77
Share from vehicles	percent	33.33***	4.09***	0.00**	12.78***	9.14
Share from small animals	percent	17.78	7.01**	12.1	11.92	10.41
Share from big animals	percent	4.44	2.59***	4.39	12.11***	8.13
Share from boats	percent	0.00	16.72***	0.00**	0.10***	5.62
Share from other equipment	percent	0.00**	31.29	39.47	29.37	30.36
Sector of employment						
Farm employment	proportion	0.02***	0.03***	0.60***	0.81***	0.37
Fishing	proportion	0.00***	0.83***	0.00***	0.01***	0.25
Self employed business	proportion	0.42***	0.09***	0.05***	0.06***	0.15
Pensions, remittances unemployed	proportion	0.08***	0.01***	0.01	0.02*	0.03
Wage employment	proportion	0.47***	0.06***	0.34***	0.11***	0.20
Access to community services						
District hospital	proportion	0.28***	0.12	0.03**	0.01***	0.11
Piped water in yard	proportion	0.74**	0.82***	0.66	0.54***	0.68
Tap water	proportion	0.37***	0.69***	0.30***	0.43**	0.48
Wholesale/retail market	proportion	0.56*	0.53	0.88***	0.38***	0.51

Comparing means for households in each group with all other households: * significant at 10%; ** significant at 5%; *** significant at 1%

(1) Dependency ratio is the share of members below 15 and above 60 years old on household size.

(2) 50 percent of respondents did not report on any wealth item.

(3) At the survey year (2007), 1000J$ were equal to 23.9US$.

Source: Computed by authors

Table 3. Characteristics of vulnerable households in St Lucia

	Unit	Urban poor	Hotel workers	Construction	Farmers	Fisher folks	Total
Number of sampled households	units	285	158	111	138	37	729
Demographic structure							
Age of head	years	46.09**	39.12***	41.45**	50.78***	42.57	44.58
Female headed hh	proportion	0.43***	0.42***	0.09***	0.29	0.08***	0.33
Hh size	units	3.88**	3.41	3.00***	3.97**	3.32	3.63
Education level of hh head	years	5.92***	7.56***	6.57	5.81***	5.48**	6.33
Dependency ratio (1)	proportion	0.45***	0.30***	0.27***	0.39	0.26**	0.37
Hh belongs in association	proportion	0.06***	0.18**	0.00***	0.90***	0.43**	0.25
Financial characteristics							
Bank account	proportion	0.65***	0.90***	0.64***	0.80*	0.92**	0.74
Hh owes money	proportion	0.33	0.47***	0.35	0.38	0.11***	0.36
Received remittances	proportion	0.24***	0.13**	0.09***	0.16	0.38***	0.18
Weekly income (2)							
<200EC$	proportion	0.42***	0.02***	0.09***	0.14**	0.24	0.22
200EC$-399EC$	proportion	0.25	0.25	0.19	0.28	0.16	0.24
400EC$-699EC$	proportion	0.25***	0.54***	0.54***	0.37	0.49	0.39
700EC$-1099EC$	proportion	0.06***	0.14	0.16*	0.16*	0.05	0.11
>1100EC$	proportion	0.01**	0.05	0.02	0.05	0.05	0.03
Wealth (2)							
Household wealth (3)	000$EC	37.61***	151.86***	98.22	118.70***	42.49**	85.34
Share from house	percent	39.84	40.56	36.95	39.11	31.99**	39.00
Share from land	percent	40.67	40.72	39.00	39.58	32.48**	39.8
Share from trees	percent	4.95	1.28***	5.04	7.07**	2.52	4.60
Share from vehicles	percent	6.67	10.56*	8.35	8.61	1.11*	7.79
Share from small animals	percent	1.26	0.03	1.70	0.59	0.63	0.93
Share from big animals	percent	0.99	0.10	1.50	0.65	0.09	0.79
Share from boats	percent	0.61	0.19	0.49	0.00	6.16***	0.65
Share from other equipment	percent	5.00	6.56	6.98	4.39	25.04***	6.44
Sector of employment							
Farm employment	proportion	0.11***	0.01***	0.01***	0.92***	0.00***	0.22
Fishing	proportion	0.02***	0.00***	0.00***	0.00***	0.86***	0.05
Self employed business	proportion	0.31	0.17***	0.85***	0.03***	0.03***	0.29
Pensions, remittances unemployed	proportion	0.06***	0.02	0.05	0.00**	0.03	0.04
Wage employment	proportion	0.50***	0.80***	0.10***	0.05***	0.08***	0.4
Access to community services							
District hospital	proportion	0.16	0.29***	0.11**	0.15	0.16	0.18
Piped water in yard	proportion	0.68***	0.85***	0.62***	0.83***	0.65	0.74
Tap water	proportion	0.52***	0.89***	0.73**	0.61	0.49**	0.64
Wholesale/retail market	proportion	0.33***	0.52	0.60***	0.62***	0.59	0.48

Comparing means for households in each group with all other households: * significant at 10%; ** significant at 5%; *** significant at 1%

(1) Dependency ratio is the share of members below 15 and above 60 years old on household size.

(2) 9 percent of respondents did not report on any wealth item.

(3) At the survey year (2006), 1000EC$ were equal to 377.4US$.

Source: Computed by authors

The higher vulnerability of those particular groups in St. Lucia is evident, not only from the weak income and financial base but from their poor asset base as well. Urban poor and fishermen report on average the equivalent value of about 40 thousand $EC in terms of assets which is less than half of what is reported by an average household in the sample. Construction workers on the other hand, are relatively better, reporting wealth of 98 thousand $EC, which is somewhat above the country sample average of 85 thousand $EC. In terms of specific wealth items, house and land ownership contribute mostly to household wealth as above 75 percent of wealth comes from these items in all household groups. In Saint Lucia above 10 percent of the sampled households do not report any wealth item.

Again in terms of household wealth, it has to be noted that for Jamaica, the corresponding variable is of limited reliability, given that only 50 percent of the sampled households report any asset. Only 4 percent of the inner city vulnerable group reported any wealth item, while for the other groups the proportion is around 55 percent for fishermen and sugarcane farmers and 75 percent for subsistence farmers. As can be seen in the table, from the households reporting any asset, major contributors to wealth, are housing and land ownership, exceeding 40 percent in most of the cases, followed by other equipment (productive capital mainly).

In terms of community assets (infrastructure), it is noteworthy the relatively smaller access of the urban group to hospitals and tap or piped water relative to fishermen in Jamaica and all other groups in Saint Lucia. This rather surprising outcome may signify some degree of exclusion of the urban vulnerable populations, from public infrastructure and health services, rather than absolute lack of the corresponding infrastructure.

In table 4 we tabulate income earnings, shock aggregates as well as food insecurity and coping indicators, by the gender of the household head, in an effort to trace associated differences in the livelihoods of the sampled households. While differences in wealth between male and female headed households seem to be statistically insignificant in Jamaica, in St Lucia, wealth of female headed households is valued at around 80 percent of male headed households' wealth. Nonetheless, differences in terms of income earnings are more evident and significant as 4 and 9 percent more female than male headed households, belong to the poorest income group in Jamaica and Saint Lucia respectively. At the same time, a smaller proportion of female headed households belong to the richer income groups.

Thus female headed households appear to be more vulnerable than male headed ones and this situation is further reflected in the food insecurity incidence variables. As can be seen from the table, the incidence of aggregate or idiosyncratic shocks is rather similar across households. However, especially in Jamaica feeling vulnerable (defined as worrying about food), skipping meals of adults and finally severe food insecurity (defined as skipping meals of children), mostly characterise female than male headed households. In most of the cases these mean differences are statistically significant.

Table 4. Characteristics of households tabulated by gender of household head[1]

Jamaica	Male	Female	**St Lucia**	Male	Female
Household wealth (in 000J)	1191.55	710.47	Household wealth (in 000EC)	91.16*	73.19*
income <3000J$	0.06**	0.10**	income <200EC$	0.19**	0.28**
income 3000J$-6000J$	0.27	0.31	income 200EC$-399EC$	0.22	0.28
income 6000J$-9000J$	0.42	0.39	income 400EC$-699EC$	0.42**	0.34**
income 9000J$-12000J$	0.17	0.13	income 700EC$-1099EC$	0.13*	0.08*
income >15000$	0.07	0.06	income >1100EC$	0.03	0.02
Idiosyncratic shock	0.73	0.72	Idiosyncratic shock	0.50	0.53
Covariate shock	0.96	0.97	Covariate shock	0.16	0.12
Reduce meal quality	0.43	0.45	Reduce meal quality	0.20	0.23
Reduce adult meals	0.30	0.30	Reduce adult meals	0.15	0.15
Reduce children meal	0.10*	0.14*	Reduce children meal	0.05	0.05
Feeling vulnerable	0.42***	0.55***	Feeling vulnerable	0.16	0.17
Skipping meals	0.31***	0.40***	Skipping meals	0.10	0.12
Severe insecurity	0.19*	0.24*	Severe insecurity	0.06**	0.10**
Body mass index (in kg/m^2)	25.36***	27.71***	Body mass index (in kg/m^2)	26.77**	27.85**

[1] Aside the first and the last rows of the table, all other rows refer to proportions of households.
Comparing means for households in each group with all other households: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

A final observation from table 4 is drawn after noting the average body mass index of the household heads, are reported in the last row. During the survey the body mass index was actually measured for a member of the household (usually the head). It is observed that in the more vulnerable female headed households, the index is higher and this difference is always statistically significant at 1 percent level. This rather paradoxical result, which will be further analysed later on, is documented more and more frequently in the literature, and is associated with the changing nature of vulnerability along with consumption patterns in high and low income countries. Major ideas that try to explain such outcomes usually refer to the low cost of energy dense food items for poorer households as well as to more sedentary work and

living patterns, hyperbolic consumer preferences and rationally addictive consumption behaviour in modern societies.

3 Household Food Security

For St. Lucia (table 6) urban poor, farmers and fisher folks, appear as the livelihoods that face the most severe income constraint with respect to buying food, as 20 to 30 percent of the households within each of these livelihoods spends all or almost all their income on food. On the other hand, less than 4 percent of the households working on construction indicated that they spend most or almost all of their income on food. Hotel workers, is the group with the highest proportion of households spending half or less than half of their income on food (nearly 80 percent).

Table 5: Household Income spent on food by livelihood (% of households)

Jamaica	Almost all	Most of it	About half	Less than half	No response	Total
Inner city	5.00	20.42	41.25	12.92	20.42	100
Fisher folk	4.28	8.22	29.28	40.13	18.09	100
Sugar workers	6.25	12.50	47.50	22.50	11.25	100
Subsistence farmers	4.42	11.43	27.27	45.45	11.43	100
All	4.66	12.69	32.80	34.29	15.56	100

Source: Computed by authors

Table 6: Household Income spent on food by livelihood (% of households)

St. Lucia	Almost all	Most of it	About half	Less than half	No response	Total
Urban poor	16.84	14.04	37.89	27.37	3.86	100
Hotel workers	3.16	13.92	33.54	44.30	5.06	100
Construction workers	0.00	3.60	31.53	40.54	24.32	100
Farmers	4.35	23.91	17.39	41.30	13.04	100
Fisher folks	10.81	13.51	24.32	43.24	8.11	100
All	8.64	14.27	31.41	36.49	9.19	100

Source: Computed by authors

Looking at the numbers for Jamaica (table 5), less than 5 percent of the households across all livelihoods, spend almost all of their income on food. Inner city poor is the only group in the country, that above 25 percent of the households spend most or all of their income flows to cover their food needs.

While the share of income spent on food could be an indicator regarding how poor these households are or even how able they are to adapt to changes in food prices or other shocks, the next tables (tables 7 and 8) indicate how many households actually have not been able to acquire (buy or produce) enough food the last year. In St. Lucia (table 8), the urban poor, is the livelihood that has the highest share of households (nearly 20 percent) that indicated that they did not have enough to eat either sometimes or often. This is something to be expected as this livelihood had the highest share of households spending almost all of their income on food. At the same time, this livelihood also has limited possibilities for producing food for self-consumption, given their residence in the cities.

Interestingly, 20 percent of the construction working households indicated that they did not have enough food sometimes or often the last year even though the livelihood had the highest share of HHs spending less than half of their income on food.

Table 7: Consumed food the last 12 months, by livelihood (% of households)

Jamaica	Always have enough of all kinds	Have enough but not always the kinds	Not enough to eat sometimes	Not enough to eat often	No response	Total
inner city	29.17	44.58	20.42	2.92	2.92	100
fisher folks	14.47	53.29	26.64	4.61	0.99	100
sugarcane farmers	6.25	53.75	36.25	1.25	2.50	100
subsistence farmers	20.00	58.70	16.10	2.60	2.60	100
All	19.43	53.32	21.90	3.17	2.18	100

Source: Computed by authors

Table 8: Consumed food the last 12 months, by livelihood (% of households)

St. Lucia	Always have enough of all kinds	Have enough but not always the kinds	Not enough to eat sometimes	Not enough to eat often	No response	Total
Urban poor	29.12	48.42	15.79	3.86	2.81	100
Hotel workers	48.10	40.51	5.06	2.53	3.80	100
Construction	22.52	54.95	18.02	0.90	3.60	100
Farmers	21.01	63.04	10.87	4.35	0.72	100
Fisher folks	40.54	43.24	13.51	0.0	2.70	100
All	31.28	50.21	12.76	3.02	2.74	100

Source: Computed by authors

The total share of vulnerable households in Jamaica and St. Lucia that do not eat enough often, is a little bit higher than 3 percent. However, there is a significant difference in the share reporting that they didn't have enough food to eat sometimes. For St. Lucia this share is 13

percent of all vulnerable households while it is 22 percent for the vulnerable households in Jamaica. This is interesting as the previous set of tables, showed that the households in the two countries have roughly the same distribution of households when looking at the income shares spent on food. This means that even though the Jamaican households roughly spend the same share of income on food as the St. Lucian households, a significantly higher proportion of Jamaican households experienced a lack of food at some point.

Across the two countries, a similar proportion of the urban or inner city poor (about 20-25 percent), report that they do not have enough to eat sometimes or often. On the other hand, 14 percent of the fisher folks in St. Lucia stated that they did not have enough to eat sometimes while 27 percent of Jamaican fisher folks reported the same while 5 percent said that they lacked food often.

Table 9: Reasons for not getting enough food (% of households)

Jamaica	inner city	fisher folks	sugarcane farmers	subsistence farmers	All
1. Not enough money for food	69.17	64.8	77.5	52.73	62.24
2. Kinds of food we want not available	5.83	6.58	7.50	13.51	9.12
3. Not enough time for shopping or cooking	5.42	8.22	3.75	15.06	9.81
4. Difficult to get to the store or market place	0.42	2.63	1.25	8.31	4.16
5. Other	3.33	0.66	1.25	1.04	1.49
6. Options 1 & 3	1.67	3.62	0.00	0.52	1.68
7. No response	14.17	13.49	8.75	8.83	11.50

Source: Computed by authors

Table 10: Reasons for not getting enough food (% of households)

St. Lucia	Urban poor	Hotel workers	Construction	Farmers	Fisher folks	All
1. Not enough money for food	45.61	19.62	40.54	73.19	29.73	43.62
2. Kinds of food we want not available	14.04	27.22	11.71	18.84	16.22	17.56
3. Not enough time for shopping or cooking	12.98	27.22	10.81	1.45	27.03	14.27
4. Difficult to get to the store or market place	4.56	0.63	0.00	0.72	2.7	2.19
5. Other	0.35	2.53	3.6	0.00	2.7	1.37
6. Options 1 & 3	0.7	0.00	0.00	0.00	0.00	0.27
7. No response	21.75	22.78	33.33	5.8	21.62	20.71

Source: Computed by authors

It is important to examine which constraints are reported from the sampled households to understand the major reasons behind the inadequate quantities of food consumed, or the feeling of food insecurity. These factors are tabulated by the different livelihoods and the

results are reported in tables 9 and 10. For Jamaica, across all livelihoods, a cash constraint (lack of money) is identified as the major factor for not consuming enough food. On average, above 60 percent of all households, report that they do not have enough money to buy food. On the other hand about 20 percent of the households report that either the kind of food items they would like to consume are not available to them, or that there is not enough time for shopping. This latter percentage maybe somewhat larger if option 6, which considers both not having money and time for shopping is subsumed.

Table 11: Assessing the quality of consumed food (% of households)

Jamaica	inner city	fisher folks	sugarcane farmers	subsistence farmers	All
Excellent	20.42	6.91	2.50	11.95	11.69
Good	50.00	52.63	51.25	48.83	50.45
Neutral	9.17	8.22	11.25	16.10	11.69
Not so good	10.00	28.95	32.50	16.88	20.12
Poor	4.58	2.63	1.25	3.12	3.17
No response	5.83	0.66	1.25	3.12	2.87

Source: Computed by authors

Table 12: Assessing the quality of consumed food (% of households)

St. Lucia	Urban poor	Hotel workers	Construction	Farmers	Fisher folks	All
Excellent	15.09	20.89	9.91	5.07	16.22	13.72
Good	49.47	58.23	54.95	78.26	59.46	58.16
Neutral	14.39	11.39	25.23	8.7	10.81	14.13
Not so good	14.04	6.33	8.11	4.35	10.81	9.47
Poor	3.86	2.53	0.90	0.72	2.70	2.47
No response	3.16	0.63	0.90	2.90	0.00	2.06

Source: Computed by authors

In Saint Lucia, again lack of cash, is pointed as the major reason behind inadequate food consumption by all livelihoods but hotel workers. However, on average 32 percent of all households; report that either the food they would like to consume is not available or that there is no time to go shopping. The high importance of those non-cash factors across all vulnerable groups and in both countries is likely associated with the changing consumption patterns of the sampled households, which on their turn modify the nature of vulnerability in Jamaica and Saint Lucia.

We try to shed some more light on the hypothesis that the nature of vulnerability in Jamaica and Saint Lucia may be moving away from the conventional thinking that poverty and vulnerability are associated with insufficient nutrition. The sampled households were

requested to assess the quality of the food they consume and the responses, tabulated by their livelihood, are reported in tables 11 and 12. In Jamaica above 30 percent of fishermen and sugarcane farmers claim that the quality of their food is rather poor, while in Saint Lucia 18 percent of the urban poor claim the same. Overall, nearly 24 and 12 percent of households in Jamaica and Saint Lucia, respectively, express some complaint with respect to the quality of their food. These numbers indicate that a significant part of the sampled populations, are subject to different than the conventional explanations of food insecurity which focus on the lack of resources and insufficient food.

In order to be able to explore the food security status of the individual household this study used 5 recall questions that focused on the respondent's perception of the food access situation in the past 12 months. Each household answered these questions subjectively and by having different understanding of the questions, the answers could actually turn out to be different for two households that have experienced the same situation.

It has previously been shown that when subjective indicators of food security are being compared to more objective indicators such as caloric consumption or anthropometry, the subjective indicators are at best poorly correlated with the more objective ones (Migotto et al, 2005). However, it should also be noted that several studies also have found that the psychological aspects of food insecurity can be just as important as the more measurable physiological side of food security. The consequences of subjective experience of food insecurity include impaired learning for children, productivity loss and an increased need for health care (Coates, 2004).

The five recall questions, described in table 13, can be grouped into three categories which focus on various aspects of the food security situation within the household. The first category includes one question which relates to whether the households have worried about running out of food. This question could serve as a proxy for whether the household has felt vulnerable to food insecurity regularly, but not whether the household has actually experienced an actual shortage of food. The next category includes two questions asking households if the adults within the households have been cutting or skipping meals because there wasn't enough food. These questions relates to the actual experience of lacking food and thus of food insecurity. Therefore, these question can be used a proxy for experienced food insecurity.

Table 13: Defining food insecurity

		Never	Occasionally	Some months	Almost every month
Indicator 1: Feeling food insecure	F5: Worry about whether food would run out	Not worried	Not worried	Worried	Worried
Indicator 2: Skipping meals of adults	F7: Cut or skip meal for adults	Not skipped regularly	Not skipped regularly	Skipped regularly	Skipped regularly
	F9: Whole day without food for adults	Not skipped regularly	Skipped regularly	Skipped regularly	Skipped regularly
Indicator 3: Skipping meals of children	F11: Cut or skip meal for children	Not skipped	Skipped	Skipped	Skipped
	F13: Whole day without food for children	Not skipped	Skipped	Skipped	Skipped

The last two questions focus on whether the children within the households have been cutting or skipping meals. Commonly, this strategy is seen as the last option in order to cope with food shortage as adults are likely to first sacrifice their food consumption in order to protect the children. However, various studies suggest that adults in the household are not necessarily a cohesive group uniformly making sacrifices on behalf of their children. Nevertheless, no studies have so far found evidence to suggest that mothers would eat while leaving their children without food, but in the case where the household depends on the ability of the income earner in order to ensure the next meal, the trade-offs may not be so straightforward (Coates, 2004).

Each group of questions is converted into a binary indicator, which takes the value 1 if the household worries or skips meals for adults either for some months or almost every month. However, if the household skips even occasionally a children meal, then is considered severely food insecure. Thus, three food security indicators are constructed that are assumed to approximate the severity of the food insecurity condition of the sampled household.

Looking at the indicators tabulated by the livelihoods (tables 14 and 15), it is obvious that the Jamaican households feel much more vulnerable to food insecurity compared with the St. Lucian households, as almost half (45 percent) of the Jamaican households have worried about running out of food, compared with 16 percent of the households in St. Lucia. The share of households, where adults have been cutting or skipping meals regularly, is also quite high in Jamaica which is 33 percent compared with 11 percent in St. Lucia. Finally, regarding

the share of household that have been cutting or skipping meals to children, only 7 percent of the vulnerable households in St. Lucia report this, while an sizeable 20 percent of the households in Jamaica do the same.

Table 14. Food insecurity incidence by livelihood

Jamaica		Inner city	Fisher-folks	Sugarcane farmers	Subsistence farmers	Total
Feeling vulnerable	proportion	0.39**	0.47	0.47	0.47	0.45
Skipping meals	proportion	0.31	0.32	0.36	0.35	0.33
Severe insecurity	proportion	0.15**	0.29***	0.13*	0.18	0.20
Body mass index	kg/m^2	26.66**	25.29***	24.35***	26.49**	25.99

Comparing means for households in each group with all other households: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

Table 15. Food insecurity incidence by livelihood

St Lucia		Urban poor	Hotel workers	Construction	Farmers	Fisher folks	Total
Feeling vulnerable	proportion	0.26***	0.03***	0.19	0.12	0.08	0.16
Skipping meals	proportion	0.18***	0.05***	0.08	0.04***	0.14	0.11
Severe insecurity	proportion	0.12***	0.03**	0.05	0.07	0.05	0.07
Body mass index	kg/m^2	27.39	27.28	26.67	26.85	26.89	27.13

Comparing means for households in each group with all other households: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

In St. Lucia the urban poor clearly have the highest share (26 percent) of households that have worried about running out of food in the last year. This fits well to the previous findings, as it was also this livelihood that had a higher proportion of households using almost all their income on food and thereby is at higher risk of experiencing food shortage due to a negative income or other shock. On the other hand, one fifth of the construction working households indicate that they have worried about running out of food even though they belong to the livelihood that spends the smallest share of income on food. Hotel workers clearly seem to be the livelihood that worries the least about running out of food with only 3 percent of the households within this livelihood indicating this. This could be explained if hotel workers benefit from having access to food at their work and therefore are guaranteed some, each working day.

Regarding the actual experience of lack of food, the urban poor in St. Lucia still have the highest share (18 percent), of households that have reported that the adults have been cutting or skipping meals on a regular basis over the last year due to food shortages. Interestingly, only 8 percent of the construction working households have indicated that the adults have skipped or cut meals compared to 19 percents within this livelihood that have worried about running out of food. Finally, 12 percent of the urban poor households report that, at least once the last year, they have cut or skipped a meal meant for children in their household.

In Jamaica inner city poor seem to be the livelihood that worries the least about running out of food in comparison with the other livelihoods, as 39 percent answered that they had worried about it the last year. For all the other livelihoods the share is nearly 50 percent. In view of the earlier discussion, looks like inner city poor in Jamaica, are subject in a relatively smaller degree to food insecurity, irrespective of their higher poverty status. When it comes to the share of households that have actually experienced food insecurity in the form of cutting or skipping meal all the livelihoods are similar as around 35 percent reported that they have cut or skipped meals meant for adults regularly the last year.

In the last row of tables 14 and 15, is reported the average body mass index of the household heads. In that way some preliminary hypotheses can be made regarding the relation between food insecurity and actual weight. In Saint Lucia differences in the body mass index appear to be statistically insignificant across vulnerable groups. Thus the incidence of overweight seems not to be related with the livelihood. In contrast, in Jamaica, heads of inner city households, which were previously identified as those with relatively binding income constraints, as well as the subsistent farmers group, appear to have significantly higher body mass index than the rest of the household groups. On the other hand, the index is significantly lower for fishermen and sugarcane farmers, and this outcome is consistent with the expression of stronger concerns regarding their food security status.

The determinants of food insecurity (multivariate analysis)

As the three food security indicators have been structured in such a way that they have two discrete outcomes each, it is possible to discuss on the correlation between each of the indicators and the various household characteristics using multivariate analysis (probit regression). This allows analyzing which characteristics are correlated with a higher probability of becoming food insecure.

However, given the fact that the sampled households are not selected at some geographical or other strata which can be considered exogenously determined; but emerged after consultations with local and other experts, in the context of efforts to identify vulnerable groups, any descriptive or analytical results cannot be easily generalised at country level. In particular inference and predictions maybe biased and inconsistent and thus cannot be considered to represent the population but are specific to the sample. Spanos, 1986 (chapter 22), discusses the issue, the consequences and potential solutions, focusing in time series data. In his discussion, Spanos suggests that re-specification of the regression model along different "time windows" may provide some confidence in the regression results.

We follow a similar strategy running regressions on the full sample as well as by livelihood[7]. In the latter case some degree of confidence maybe established as households are supposedly selected randomly within each livelihood. However, even in this latter case, reliability is still limited since livelihood may not be considered a deterministic characteristic of the household while other factors may affect the selection process within each livelihood (for instance the high proportion of female headed households in urban areas may imply some sampling bias). Finally multivariate analysis by livelihood means that the degrees of freedom are significantly reduced.

We can model this probability using the indicator of cutting or skipping a children meal as an example in the following way:

$$P(\textit{cutting or skipping a children meal}) =$$
$$P(\textit{cutting or skipping a children meal}/X_1,...,X_k) = \Phi(\mathbf{x\beta})$$

where $\mathbf{x} = X_1,...,X_k$ is a vector of independent variables (i.e. the household characteristics) and $\boldsymbol{\beta}$ the vector of coefficients. However, the vector $\boldsymbol{\beta}$ of coefficients in a probit regression does not measure the change in the probability to cut or skip meals, but rather the partial change resulting from a change in the independent variable. The marginal effect of a change in an independent variable (X_1) on the probability of cutting or skipping children's meal is defined

[7] In order to cope with the problem of losing degrees of freedom, (i) sugar cane with (ii) subsistent farmers in Jamaica and (i) urban poor, with (ii) hotel and with (iii) construction workers, as well as, (i) fishermen with (ii) farmers in Saint Lucia, were assumed to form one group, respectively. So in the regressions by livelihood, 3 groups in Jamaica and 2 in Saint Lucia are considered. It needs not be neglected that this aggregation is re-iterating the selection problem.

as $\frac{\partial \Phi}{\partial x_1} = \phi(xb)b_1$, where ϕ is the normal density and b the vector of estimated coefficients, and measures the change in the probability for a minimal change in a continuous independent variable and for a discrete change for dummy independent variables.

The probit regression results, on the determinants of the different indicators of food insecurity, are presented in the tables 16 and 17 at a full sample level and in the Annex tables 3 and 5 at livelihood level, for Jamaica and Saint Lucia respectively. The probit results on the determinants of the psychological concern for inadequate quantity and quality of food are presented in the first columns of tables 16 and 17. In the second column of the same tables, the determinants of food insecurity, as approximated by reducing meals of adults, are presented, and finally the third column of each table reports the results concerning severe food insecurity (cutting meals of children). The format is similar in the regressions by livelihood in the Annex.

The analysis of the results will be short, focusing only in general regularities (or important irregularities), given the limited ability to generalise the results beyond the current sample. We explore the determinants of food insecurity (no matter if this is approximated as a feeling or actual reduction of food intake), using five generic groups of variables, namely: demographic variables which include livelihood dummy variables (called also preference shifters), income and assets which include financial aspects (like saving accounts) and remittances, frequencies of different food items consumed and finally incidence of shocks.

As far as it concerns demographic variables, it is observed that larger households as well as female headed households are more likely to feel or be food insecure in both countries and across most of the livelihoods. Especially in Jamaica, a higher proportion of economically inactive household members and households with older heads are also more likely to feel or actually be food insecure. A higher level of education of the household head is associated with lower extreme food insecurity in both countries. Still however, more educated households in Jamaica are feeling more vulnerable (positive sign), in contrast with Saint Lucia where the sign is as usually expected, negative. This result may identify household concerns with respect to other than simply quantity, attributes of food insecurity in Jamaica.

When different livelihoods are accounted for in the form of dummy variables, we observe that in Saint Lucia all livelihoods are associated with lower food insecurity relative to the control group of urban poor inhabitants. This is consistent with the results from the descriptive analysis. Nonetheless, opposite results are taken for Jamaica, as the probit regressions indicate that all livelihoods, in comparison with the inner city inhabitants, are associated with higher probabilities of feeling or experiencing food insecurity.

In all regressions is included as an exogenous variable, the body mass index of the respondent for each household. The body mass index is considered to represent the long run nutrition state of the person interviewed (the household head in most of the cases). Conventionally is considered that the higher the body mass index the smaller should be the likelihood for feeling or experiencing food insecurity. If this is the case, then the sign between food insecurity and the body mass index is expected to be negative.

The high incidence of overweight and obesity in the sampled households (above 50 and 60 percent in Jamaica and Saint Lucia, respectively, as can be seen in tables 24 and 25), which are considered to represent mostly vulnerable households, indicates that the conventional idea about this relation needs to be explored in more depth in order to understand the seemingly paradoxical coexistence of overweight and food insecurity. Later discussion will address the issue in detail, drawing ideas from an extensive literature on the issue.

The food security regression results indicate a weak negative relation between the body mass index and food insecurity in the Jamaica sample (this relation is much stronger for the fishermen regression in Jamaica). For Saint Lucia, a week positive association between these variables is found when fishermen and farmers regressions are considered.

Table 16. Food insecurity probit regressions in Jamaica. Marginal effects reported.

	(1) Feeling vulnerable	(2) Skipping meals of adults	(3) Skipping meals of children
Adult bmi	0.0025	-0.0056	-0.0007
	(0.72)	(1.78)*	(0.30)
Dependency ratio	0.1274	0.0486	0.1278
	(1.74)*	(0.75)	(2.92)***
Age of head	0.0039	-0.0071	-0.0134
	(0.43)	(0.96)	(2.67)***
Age of head squared	-0.0001	0.0000	0.0001
	(1.15)	(0.34)	(1.89)*
Education level of hh head	0.0247	0.0049	-0.0249
	(2.18)**	(0.49)	(3.36)***
Female headed hh	0.1353	0.0969	0.0357
	(3.14)***	(2.56)**	(1.33)
Adult equivalent household size	-0.0144	0.0070	0.0512
	(0.93)	(0.52)	(5.58)***
Household weekly income per ae (est)	-0.0460	-0.0462	-0.0238
	(4.26)***	(4.50)***	(2.92)***
Hh belongs in association	-0.0577	0.0304	0.0236
	(0.93)	(0.55)	(0.68)
Bank account	-0.2073	-0.1830	-0.0100
	(4.38)***	(4.31)***	(0.33)
Received remittances	-0.0453	-0.0896	-0.0330
	(1.09)	(2.52)**	(1.31)
House owned (rooms) per ae	0.0150	-0.0682	0.0020
	(0.58)	(2.39)**	(0.09)
Land size per ae	0.0193	0.0652	-0.0065
	(0.96)	(3.04)***	(0.33)
No of trees per ae	-0.0016	-0.0128	-0.0048
	(0.86)	(2.15)**	(1.56)
No of vehicles per ae	-0.2944	-0.0293	-0.0295
	(1.78)*	(0.21)	(0.27)
No of small animals per ae	-0.0006	-0.0014	-0.0008
	(0.73)	(1.40)	(1.01)
No of big animals per ae	0.0047	0.0084	-0.0027
	(0.54)	(1.02)	(0.26)
No of boats per ae	0.0043	-0.1319	0.0267
	(0.21)	(1.42)	(1.84)*
Value of other prod capital per ae	0.0006	-0.0004	0.0004
	(1.33)	(0.59)	(0.89)
Flood shock	0.0841	0.0477	0.0799
	(1.87)*	(1.22)	(2.76)***
Storm shock	0.1334	0.1180	0.0558
	(2.03)**	(2.12)**	(1.46)
Drought shock	0.0158	-0.0544	0.0628
	(0.31)	(1.26)	(1.97)**
Crop loss shock	0.0087	0.0530	-0.0731
	(0.19)	(1.30)	(2.84)***
Political unrest	0.0530	0.0492	-0.0102
	(0.67)	(0.68)	(0.21)
Violence	0.0279	0.0279	-0.0518
	(0.44)	(0.49)	(1.42)
Unemployment shock	0.1720	0.0971	0.0127
	(3.10)***	(1.95)*	(0.38)
Death shock	0.0728	0.0582	0.0340
	(1.26)	(1.06)	(0.87)
Hh suffered theft	0.0858	0.0101	0.0607

	(1.66)*	(0.22)	(1.86)*
Disease (perm/temp)	0.1152	0.0361	-0.0055
	(2.93)***	(1.06)	(0.23)
Ground provisions	0.0114	0.0230	0.0504
	(0.66)	(1.48)	(4.25)***
Vegetables	-0.0142	-0.0124	-0.0468
	(0.75)	(0.76)	(3.93)***
Fruits	-0.0319	-0.0037	0.0022
	(2.84)***	(0.39)	(0.34)
Fresh meat	-0.0620	-0.0454	-0.0080
	(4.91)***	(4.20)***	(1.04)
Canned meat	0.0446	0.0344	0.0187
	(3.25)***	(2.89)***	(2.21)**
Chicken	0.0433	0.0070	0.0030
	(2.58)**	(0.46)	(0.29)
Fish	-0.0078	-0.0295	-0.0113
	(0.44)	(1.88)*	(1.05)
Cereals	0.0334	0.0664	0.0278
	(1.66)*	(3.65)***	(2.19)**
Sugar	-0.0234	-0.0224	0.0042
	(1.59)	(1.83)*	(0.49)
Peas and beans	0.0165	0.0163	-0.0110
	(1.19)	(1.28)	(1.25)
Livelihood: fisher folks	0.1713	0.1749	0.0343
	(2.42)**	(2.55)**	(0.71)
Livelihood: sugarcane farmers	0.1714	0.1471	-0.0409
	(1.94)*	(1.70)*	(0.79)
Livelihood: subsistence farmers	0.1621	0.0829	-0.0223
	(2.29)**	(1.23)	(0.49)
Observations	1009	1009	1009
Pseudo R-squared	0.16	0.16	0.23
Log likelihood	-582.43	-538.39	-389.08

Robust z statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

Table 17. Food insecurity probit regressions in St Lucia. Marginal effects reported.

	(1) Feeling vulnerable	(2) Skipping meals of adults	(3) Skipping meals of children
Adult bmi	0.0022	0.0005	0.0006
	(1.33)	(0.36)	(1.56)
Dependency ratio	0.0335	0.0198	0.0137
	(0.93)	(0.70)	(1.58)
Age of head	-0.0046	-0.0025	-0.0004
	(1.31)	(0.92)	(0.43)
Age of head squared	0.0000	0.0000	0.0000
	(1.17)	(1.00)	(0.20)
Education level of hh head	-0.0106	-0.0029	-0.0022
	(2.16)**	(0.78)	(1.75)*
Female headed hh	-0.0071	-0.0141	0.0044
	(0.36)	(0.88)	(0.88)
Adult equivalent household size	0.0040	-0.0037	0.0021
	(0.66)	(0.79)	(1.80)*
Household weekly income per ae (est)	-0.2184	-0.1580	-0.0622
	(2.36)**	(2.14)**	(2.43)**
Hh belongs in association	0.0594	-0.0498	0.0036
	(1.39)	(1.78)*	(0.37)
Bank account	-0.0414	-0.0796	-0.0146
	(1.89)*	(3.86)***	(2.39)**
Received remittances	-0.0222	0.0312	0.0021
	(0.98)	(1.45)	(0.38)
House owned (rooms) per ae	0.0145	-0.0039	-0.0110
	(1.20)	(0.35)	(2.83)***
Land size per ae	-0.0011	0.0024	-0.0079
	(1.01)	(2.79)***	(1.35)
No of trees per ae	0.0008	-0.0002	-0.0004
	(0.55)	(0.25)	(0.98)
No of vehicles per ae	-0.1890	-0.0582	-0.0343
	(1.98)**	(0.89)	(1.63)
No of small animals per ae	-0.0022	-0.0030	-0.0002
	(0.83)	(1.38)	(0.28)
No of big animals per ae	-0.0076	0.0056	0.0040
	(0.56)	(0.89)	(2.11)**
No of boats per ae	0.1127	0.1357	
	(1.05)	(1.52)	
Value of other prod capital per ae	-0.1718	-0.1031	-0.0153
	(1.45)	(1.33)	(0.82)
Flood shock	-0.0403	-0.0390	-0.0035
	(1.20)	(1.47)	(0.40)
Storm shock	-0.0685		0.0680
	(1.72)*		(2.15)**
Drought shock	0.0900	0.0261	0.0020
	(1.08)	(0.42)	(0.14)
Crop loss shock	0.0730	0.1138	0.0041
	(1.30)	(2.06)**	(0.39)
Political unrest	-0.0143		
	(0.16)		
Violence	0.0697	-0.0085	-0.0084
	(1.56)	(0.33)	(1.33)
Unemployment shock	0.1436	0.0698	0.0265
	(4.01)***	(2.57)**	(2.68)***
Death shock	-0.0301	-0.0008	0.0112
	(1.14)	(0.04)	(1.41)
Hh suffered theft	0.0518	0.0358	0.0059

	(0.83)	(0.88)	(0.56)
Disease (perm/temp)	-0.0050	0.0137	0.0065
	(0.23)	(0.77)	(1.25)
Ground provisions	-0.0084	-0.0048	0.0003
	(1.25)	(0.93)	(0.22)
Vegetables	-0.0151	-0.0041	-0.0019
	(2.02)**	(0.78)	(1.21)
Fruits	-0.0014	-0.0042	0.0016
	(0.22)	(0.92)	(1.08)
Fresh meat	-0.0025	-0.0076	-0.0024
	(0.41)	(1.71)*	(1.69)*
Canned meat	0.0040	0.0038	0.0016
	(0.76)	(0.90)	(1.39)
Chicken	0.0090	0.0072	-0.0016
	(1.50)	(1.43)	(1.43)
Fish	0.0151	-0.0051	-0.0010
	(1.99)**	(0.94)	(0.65)
Cereals	-0.0148	-0.0019	-0.0025
	(1.49)	(0.23)	(1.06)
Sugar	-0.0020	0.0052	0.0023
	(0.29)	(0.90)	(1.54)
Peas and beans	0.0076	0.0026	-0.0000
	(1.22)	(0.50)	(0.01)
Livelihood: Hotel workers	-0.0933	-0.0130	-0.0028
	(3.86)***	(0.58)	(0.45)
Livelihood: Construction	-0.0098	-0.0366	0.0001
	(0.33)	(1.81)*	(0.01)
Livelihood: Farmers	-0.0558	-0.0139	-0.0008
	(1.54)	(0.41)	(0.08)
Livelihood: Fisher folks	-0.0594	0.0927	-0.0005
	(1.83)*	(1.71)*	(0.04)
Observations	729	729	729

Robust z statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

Most important observation coming from all regressions and across countries, is that higher income earnings consistently and significantly reduce the probability of feeling food insecure or actually compromising food intake by reducing the number of meals (in both adult and children household members). Thus sufficiently high income flows, do provide some security in terms of nutrition in the sampled households. The result corroborates with the possession of different wealth items that contribute to the built up of a stronger asset base. The size of the house (measured by the number of rooms), the number of trees, the number of vehicles or other assets specific to each livelihood (like number of boats for fishermen), reduce the probability of feeling or being food insecure irrespective of how the food security variable is specified.

Nevertheless, possession of some assets is positively and significantly associated with food insecurity. In particular in some case we observe land size to significantly increase food

insecurity by reducing the number of meals that adult household members eat both in Jamaica and Saint Lucia. The result holds when regressions by livelihood are run, for farmers and fishermen in Jamaica (but not in Saint Lucia). This outcome may signify higher levels of vulnerability for the households whose specific asset characterises their livelihood. In other words, farming maybe associated with higher vulnerability and this becomes obvious for households strongly dependent in farming as a higher land size would indicate.

Another observation that consistently comes out from the regressions is the negative impact on food insecurity that has the possession of a bank account. By livelihood, the importance of a savings account is evident for fishermen and farmers in Jamaica and urban poor, hotel and construction workers in Saint Lucia. Remittances appear as reducing food insecurity in Jamaica mostly, and to farmers when the livelihood regression is considered in both countries.

With respect to the shock variables it is observed that in Jamaica floods and storms are the shocks that have the most significant positive impact on food insecurity. These covariate shocks affect mostly households which gain their livelihood from farming and fishing as can be seen in the associated regressions and in this case the result is significant for Saint Lucia as well. As far as it concerns idiosyncratic shocks, incidence of illness or deaths of economically active household members are also associated with higher food insecurity. These kinds of shocks however, are particularly important for urban households.

The most important shock that consistently affected the sampled households in both countries and across most of livelihoods is unemployment. The unemployment rate was around 10 and above 16 percent in Jamaica and Saint Lucia during the collection of the data (St Lucia Statistical Department 2007 and Statistical Institute of Jamaica, 2007). These official rates were partly reflected in the data presented in tables 1 and 2 of the annex. The tables tabulate a range of different shocks that impacted the sampled households by livelihood, and show that 11 percent of the households in the sample, in both countries, were hit by unemployment. Among them the hardest hit are fishermen in Jamaica and construction workers in Saint Lucia.

Table 18. Frequency of consumption of different food items tabulated by food security status

Jamaica	Feeling vulnerable		Skipping meals		Severe insecurity	
	No	Yes	No	Yes	No	Yes
Ground provisions	5.19	5.18	5.16	5.22	5.12***	5.42***
Vegetables	4.41**	4.25**	4.36	4.28	4.39***	4.11***
Fruits	4.93***	4.58***	4.78	4.76	4.80	4.68
Fresh meat	3.94***	3.47***	3.84***	3.49***	3.73	3.7
Canned meat	3.64*	3.83*	3.68	3.82	3.74	3.69
Chicken	3.95***	4.21***	4.02*	4.16*	4.03**	4.23**
Fish	3.96	3.92	3.96	3.89	3.95	3.89
Cereals	5.15	5.17	5.10***	5.28***	5.15	5.22
Milk	5.60*	5.39*	5.51	5.49	5.5	5.53
Sugar	6.44*	6.30*	6.39	6.34	6.37	6.4
Oil	6.13***	5.92***	6.09*	5.93*	6.08**	5.85**
Peas and beans	4.53	4.6	4.52	4.66	4.61**	4.38**
Eggs	4.23	4.17	4.18	4.23	4.2	4.21
Body mass index (kg/m^2)	25.75	26.3	26.20*	25.60*	26.03	25.88

Comparing means for households in each group with all other households: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

Table 19. Frequency of consumption of different food items tabulated by food security status

St Lucia	Feeling vulnerable		Skipping meals		Severe insecurity	
	No	Yes	No	Yes	No	Yes
Ground provisions	5.61**	5.23**	5.60***	5.13***	5.56	5.44
Vegetables	5.07***	4.26***	5.02***	4.27***	4.98**	4.43**
Fruits	5.60***	5.19***	5.59***	5.10***	5.54	5.43
Fresh meat	3.61	3.47	3.64**	3.17**	3.63**	3.04**
Canned meat	2.95	3.26	3.01	2.92	2.99	3.04
Chicken	4.56*	4.87*	4.59	4.74	4.6	4.65
Fish	3.9	3.76	3.93***	3.43***	3.90*	3.56*
Cereals	5.37*	5.19*	5.36*	5.13*	5.35	5.15
Milk	6.00***	5.45***	5.96**	5.46**	5.92	5.81
Sugar	6.53	6.34	6.5	6.51	6.49	6.59
Oil	5.94	5.87	5.93	5.9	5.91	6.24
Peas and beans	5.53	5.29	5.53*	5.19*	5.51	5.28
Eggs	4.40*	4.09*	4.39*	4.05*	4.34	4.5
Body mass index (kg/m^2)	27.02	27.68	27.16	26.9	27.04	28.18

Comparing means for households in each group with all other households: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

Finally a set of variables that refer to the frequency of the different food items consumed, is utilized to identify along with the economic, the qualitative patterns of the diets that the sampled households follow. These variables refer to the consumption of vegetables, ground

provisions (tubers mainly), fresh and canned meat, fruits, chicken, fish, cereals, beans and peas, and sugar.

In both countries and especially when the regressions are run by livelihood the most important result that is consistently observed, refers to the positive and significant impact that consumption of canned meat has on the different definitions of food insecurity. A similar result is observed for cereals in Jamaica. On the other hand increased frequency in the consumption of vegetables, fruits and especially fresh meat are associated with declining probabilities of food insecurity. The results vary little by livelihood. Obviously, the sampled households adjust their diets to account for their economic weakness tying at the same time to accommodate the necessary energy requirements even if the quality of food may be compromised.

In tables 18 and 19 we tabulate the frequencies of consumption of the different food items, by the food insecurity indicators. The higher the number the most frequently the food item is consumed (the lowest value of the variable is 1 meaning no consumption at all, and the highest is 7, meaning daily consumption). From the tables is obvious that food insecure households consume more frequently energy dense but relatively cheaper items like canned meat, chicken and cereals, and less frequently fresh meat, vegetables and fruits, in comparison with the food secure households.

Coping with difficult situations in relation to feeding the family

When a household experiences a negative income shock the household will use the options available to them in order to try to ensure that the household will sustain a minimum welfare level e.g. minimum food consumption. One possible coping strategy is to cut or skip meals in order to make the available food last longer and the previous section looked at the factors that could increase or decrease a household's probability of having to rely on such coping strategies in order to deal with food shortages. Other coping strategies include using up savings, selling assets or rely on credit. The probit regressions showed that especially the income flows, access to savings and assets are some of the main factors in determining whether a household is at risk of having to cut or skip meals in order to deal with a lack of food.

The following tables tabulate the coping strategies employed by households when facing a difficult financial situation i.e. a negative income shock. Tables 20 and 21, show how many households in proportion, within specific income ranges, use the various coping strategies in Jamaica and Saint Lucia respectively. From the tables becomes obvious that the wealthier households rely more on formal coping strategies such as use of savings and formal credit in form of bank loans compared to poorer households. The poorer household on the other hand use more informal strategies such as informal credit (borrowing from friends and relatives), seeking assistance from welfare organizations and begging.

Table 20. Share of household using various coping strategies in difficult financial situations tabulated by household income groups.

Jamaica	Use up savings	Loan from commercial banks	Borrow from friends or relatives	Sell livestock or other physical assts	Request assistance from relatives abroad
Less than 200$	53.33	1.33	70.67	22.67	14.67
200-399	69.82	4.56	58.25	21.05	20.35
400-699	70.04	2.25	53.93	19.48	28.09
700-1099	72.12	1.82	57.58	21.21	32.73
1100$ or more	77.94	13.24	47.06	32.35	23.53
Total	69.53	3.72	56.98	21.63	24.88
	Reduce the quality of meals	Fewer meals for adults	Fewer meals for children	Seek assistance from welfare organizations	Beg
Less than 200$	57.33	50.67	12.00	17.33	21.33
200-399	41.75	25.26	8.42	5.26	7.37
400-699	41.20	29.59	10.11	4.49	2.62
700-1099	30.30	18.18	9.09	4.24	1.82
1100$ or more	36.76	29.41	25.00	4.41	2.94
Total	40.35	27.79	10.7	5.81	5.70

Source: Computed by authors

It is also worth noting that the wealthier households in Jamaica are less likely to reduce the quality of meals as a way of coping with financial difficulties while no such clear trend is evident for the households in St. Lucia. However, the total share of St. Lucian households (22 percent) that indicate that they are using such as strategy is much lower that the total share of Jamaican households (41 percent) indicating the same.

Table 21. Share of household using various coping strategies in difficult financial situations tabulated by household income groups.

St. Lucia	Use up savings	Loan from commercial banks	Borrow from friends or relatives	Sell livestock or other physical assts	Request assistance from relatives abroad
Less than 200$	50.00	3.70	49.38	10.49	20.37
200-399	59.66	3.98	40.91	5.68	13.07
400-699	68.72	10.57	40.53	9.25	12.78
700-1099	80.49	14.63	25.61	6.1	15.85
1100$ or more	78.26	21.74	8.7	17.39	17.39
Total	63.58	8.06	39.85	8.51	15.22
	Reduce the quality of meals	Fewer meals for adults	Fewer meals for children	Seek assistance from welfare organizations	Beg
Less than 200$	27.78	21.6	6.79	7.41	9.88
200-399	19.32	14.77	3.98	1.70	1.70
400-699	18.06	12.33	4.85	0.88	1.32
700-1099	24.39	14.63	6.1	1.22	0.00
1100$ or more	26.09	8.7	0.00	4.35	0.00
Total	21.79	15.37	5.07	2.84	3.28

Source: Computed by authors

Table 22. Share of household using various coping strategies in difficult financial situations tabulated by livelihood.

Jamaica	Use up savings	Loan from commercial banks	Borrow from friends or relatives	Sell livestock or other physical assts	Request assistance from relatives abroad
Inner city	60.00	2.50	60.00	3.75	29.58
Fisher folk	79.61	3.29	47.37	9.87	28.95
Subsistence farmers	87.50	1.25	55.00	28.75	10.00
Sugar workers	69.35	4.94	63.90	40.26	22.86
Total	71.66	3.57	57.28	21.51	25.27
	Reduce the quality of meals	Fewer meals for adults	Fewer meals for children	Seek assistance from welfare organizations	Beg
Inner city	20.42	11.25	3.75	3.75	7.08
Fisher folk	46.38	36.51	13.49	5.92	1.97
Subsistence farmers	52.50	25.00	1.25	1.25	3.75
Sugar workers	54.03	37.40	16.62	7.53	8.57
Total	43.61	29.93	11.40	5.65	5.85

Source: Computed by authors

Another way of looking at the use of different coping strategies is to divide the households by their livelihood instead of income group and thereby see which strategies are commonly used by each livelihood. We do this in tables 22 and 23. The urban poor in St. Lucia and Jamaica

are for example less likely to use saving and more likely to use informal credit as coping strategy in comparison with the other livelihoods. However, while the urban poor in St. Lucia are more likely to change their food consumption (reduce quality of meals or fewer meals) as a response to a financial difficulty, the urban poor in Jamaica is the livelihood that is least likely to employ such a strategy. The explanation can be that the urban poor in Jamaica have better access to informal credit or other assistance (e.g. remittances) when needed.

Table 23. Share of household using various coping strategies in difficult financial situations tabulated by livelihood.

St. Lucia	Use up savings	Loan from commercial banks	Borrow from friends or relatives	Sell livestock or other physical assts	Request assistance from relatives abroad
Urban poor	55.44	6.32	43.51	9.82	21.75
Hotel workers	63.29	3.16	20.89	1.27	5.70
Construction	69.37	13.51	58.56	11.71	10.81
Farmers	67.39	11.59	32.61	10.14	11.59
Fisher folks	81.08	2.7	37.84	2.70	18.92
Total	62.83	7.54	38.55	7.96	14.54
	Reduce the quality of meals	Fewer meals for adults	Fewer meals for children	Seek assistance from welfare organizations	Beg
Urban poor	28.77	23.16	8.77	5.61	6.32
Hotel workers	20.25	6.96	1.27	0.00	0.00
Construction	15.32	12.61	3.60	1.80	2.70
Farmers	10.14	7.25	1.45	0.72	0.72
Fisher folks	24.32	16.22	2.70	0.00	0.00
Total	21.12	14.68	4.66	2.61	3.02

Source: Computed by authors

For the vulnerable farmers in the two countries the tables also shows that 11.6 percent of those households in St. Lucia use formal credit (bank loans) as a coping strategy, while 32.6 percent rely on informal credit (borrowing from friends and relatives. In Jamaica only 5 percent of the farming households use formal credit while 64 percent use informal credit (remittances).

4 Obesity and overweight

In both surveys the Body Mass Index (BMI), of an adult living in the household (not necessarily the household head[8]) was measured as well. The most striking result occurring from the descriptive analysis of the BMI in both countries, is the significant proportion of adults that are overweight (body mass index above 25), or obese (body mass index above 30). As can be seen from tables 24 and 25, while 4 percent of these adult individuals have below normal body mass index, above 27 percent in both countries are overweight and moreover above 18 and 25 percent of the households in Jamaica and Saint Lucia respectively, are obese. In the following pages, we will try to overview the overweight and obesity literature in order to provide some ideas that may help in explaining the increased incidence especially in poorer populations.

Table 24. Frequency of consumption of different food items tabulated by body mass index group

Jamaica	underweight (bmi<18.5)	normal (18.5<bmi<25)	overweight (25<bmi<30)	obese (bmi>30)	Total
Percent of hhs	3.98	45.35	32.18	18.49	100
Body mass index	17.03***	22.41***	27.29***	34.51***	25.99
Ground provisions	4.92	5.18	5.18	5.18	5.17
Vegetables	4.39	4.3	4.35	4.32	4.32
Fruits	4.44	4.71	4.91*	4.71	4.76
Fresh meat	3.31*	3.7	3.89**	3.64	3.73
Canned meat	3.33	3.59***	4.00***	3.74	3.74
Chicken	4.09	3.99*	4.16*	4.06	4.06
Fish	3.87	4.03**	3.94	3.79**	3.95
Cereals	5.22	5.18	5.22	5.01**	5.16
Milk	6.00*	5.48	5.58	5.30*	5.50
Sugar	6.33	6.39	6.46	6.23*	6.38
Oil	5.82	6.01	6.11	5.99	6.03
Peas and beans	4.87	4.55	4.54	4.48	4.55
Eggs	4.28	4.11	4.35**	4.07	4.19

Comparing means for households in each group with all other households: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

During the past decades fattening used to be considered health promoting as it increased longevity when the majority of people had below medical standards weights. In recent decades, however, increasing evidence from several countries indicates that weights overpass

[8] 25 and 33 percent of the individuals whose BMI was measured, were not household heads in Jamaica and Saint Lucia respectively.

medical standards from above. This evidence comes mostly from developed countries (several countries but particularly from USA), as well as from developing countries. For the latter, Harrison (2006), reports on Iran and South Africa, Martorell et. al. (1998), on Haiti and Dominican Republic, while Monteiro et. al. (2004), provide evidence of obesity for women in 37 developing countries and FAO (2006) in six developing countries.

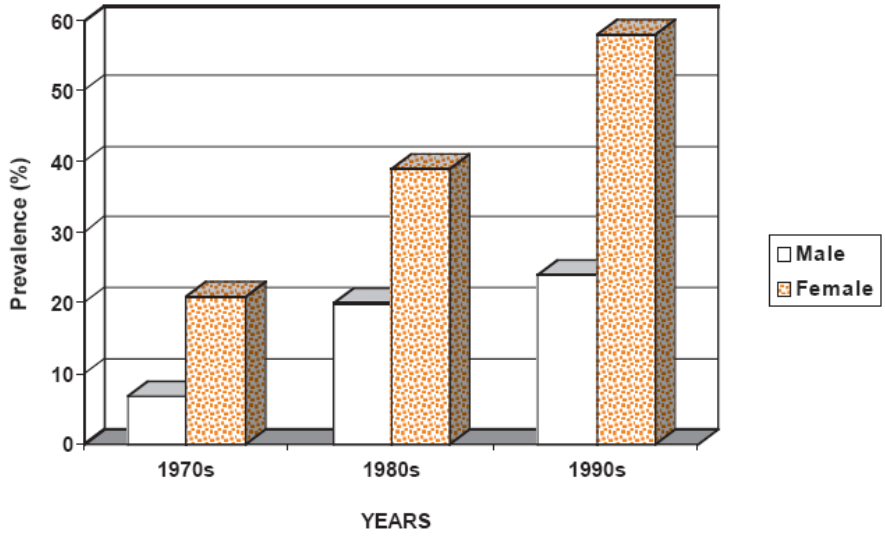
Henry (2004) and Alleyne (2005), provide evidence on increased obesity rates in the Caribbean. In figure 4 is striking the observation that the proportion of overweight or obese adults nearly tripled approaching 24 and 60 percent males and females respectively, in about 30 years (from the 1970s to the 1990s). This seems to be more an outcome of increased energy and fat availability (figures 5 and 6), and less a result of sugar availability as presented in a similar graph by Henry (2004).

Table 25. Frequency of consumption of different food items tabulated by body mass index group

St Lucia	underweight (bmi<18.5)	normal (18.5<bmi<25)	overweight (25<bmi<30)	obese (bmi>30)	Total
Percent of hhs	4.07	33.87	36.34	25.73	100
Body mass index	17.06***	22.24***	27.47	34.65***	27.13
Ground provisions	5.71	5.32***	5.70*	5.66	5.55
Vegetables	4.76	4.9	4.94	5.06	4.94
Fruits	5.29	5.47	5.5	5.77**	5.53
Fresh meat	2.89**	3.56	3.6	3.61	3.59
Canned meat	3.18	2.95	3.06	2.88	3.00
Chicken	4.75	4.64	4.58	4.66	4.61
Fish	3.38**	3.82	4.04**	3.86	3.87
Cereals	5.04*	5.31	5.4	5.36	5.34
Milk	5.04***	5.76	6.04	6.02	5.91
Sugar	6.57	6.42	6.52	6.49	6.5
Oil	5.96	5.99	5.85	6.06	5.93
Peas and beans	5.39	5.59	5.53	5.4	5.49
Eggs	3.86	4.33	4.44	4.34	4.35

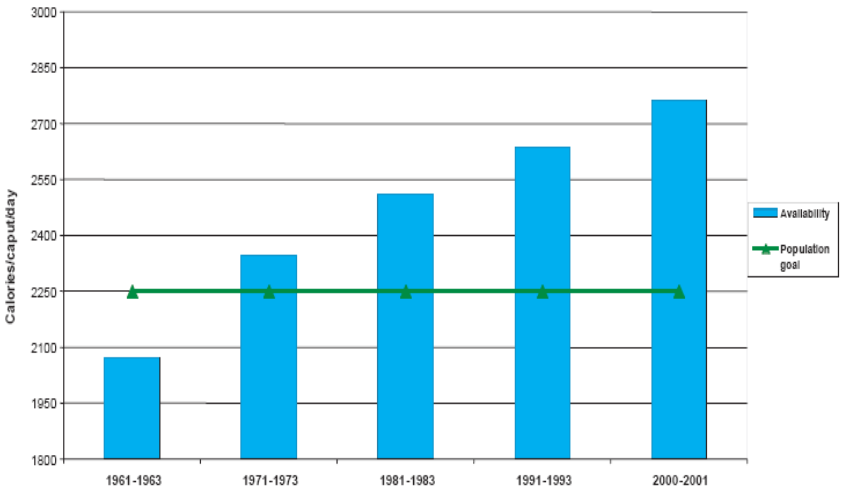
Comparing means for households in each group with all other households: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

Figure 4: Trends in adult Overweight/Obesity in the Caribbean



Source: Henry 2004

Figure 5: Trends in energy availability by decade in the Caribbean



Source: Henry 2004

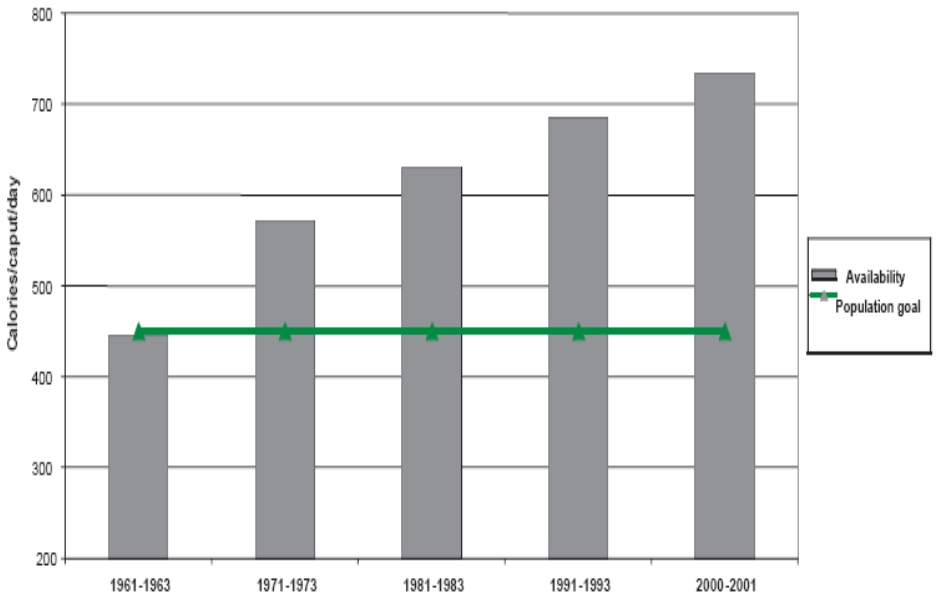
We follow Cutler et al (2003), who provide evidence on overweight and obesity in the USA, in order to sketch a picture on what may be driving above normal food consumption patterns and abnormal BMIs in modern societies[9]. The authors observe the increased proportion of overweight and obese in the USA across time as well as the increases in the median BMI. They further observe a positive association of the BMI with (married) women, but the correlation is negative with the education level, while the relation is consistently insignificant

[9] In their book, Acs and Lyles (2007), are able to cover a wide range of issues on the interaction between cultural factors, the modern way of living and the economic environment in order to explain obesity and poverty as well as the role of public policy interventions in fighting obesity.

for men. On the ground of this descriptive evidence the authors assess that higher incomes (as proxied by higher levels of education) should be expected to negatively correlate with abnormal weights.

Initially and from an accounting perspective overweight may be driven either by increased intake of calories or by decreased expenses of them. The authors provide evidence that caloric intake[10] in the US has increased by about 268 calories for men and 143 calories for women per day, between the 1970's and the 1990's. Further evidence indicates that these increases come from more meals per day that include mostly snacks (but no super size food portions). As far as it concerns fast food meals, there seems to be an increase in calorie intake which pretty much offsets the decline in the calories consumed inside the house (in that way fast food meals become formal meals). Lastly agricultural production data, transformed to calories (adjusted for exports, imports and wastage), also indicate the increased availability of food especially after 1960's.

Figure 6: Trends in fat availability by decade in the Caribbean



Source: Henry 2004

On the other hand expenses of calories, as measured from time allocation diaries, appear to have declined, as indicated from increased time spent watching TV, lower amounts of energy

[10] Food diaries data are employed which are considered that severely under-report the amount of food intake.

spent on the job, higher time spent in the car. Nevertheless, the decline in calorie expenses seems to be of less significance relative to the increased calorie availability and intake.

Philipson and Posner (1999), employ a similar line of arguments, however they also note the significant contribution of technology in lowering the cost of caloric intake, while raising the cost of expended calories, hence contributing to greater obesity in both ways. The authors further suggest that in poorer populations, eating or weighing more may still be an indication of prosperity, while thinness may signal insufficient wealth. Empirical evidence on these arguments is provided by Lakdawalla and Philipson (2002) using data for USA.

Lu and Goldman (2010), examine the impact of the change in relative food prices on body weight and fat using health and nutrition longitudinal data from 1991 to 2006 for China. Their evidence however, indicates that consistent declines in the relative price of energy dense but cheap food items is mostly correlated with increased body fat rather than body weight.

Several hypotheses may lie behind the increase in calorie intake. Increased incomes and lower relative food prices maybe one case. Nevertheless, evidence shows a negative correlation of incomes with obesity, and relatively similar price increases of both food and non-food items. Secondly the increasing rates of women at wage earning works and the subsequent need to eat more out of house maybe another argument, but no evidence supports that eating at restaurants is unhealthy[11].

Technological advances in the food chain, seems to be the most plausible factor according to most of the authors, explaining increased food intake through lower prices. In particular, past decades, new technology and returns to scale in food preparation through massive expansion in the capacity to produce; prepare; process; and package food, has led to major time as well as price savings in food consumption. Similarly at the users end, there were major advances in food preparation as well as in cooking and cleaning. Such technological advances have as implications the reduction in both fixed and variable costs, by exploiting the extraordinary division of labour resulting from them.

[11] Anderson et. al. (2003), attribute obesity and overweight incidence in children, to increased employment rates of women and the lower level of attention that parents pay to children dietary habits resulting.

These implications generate some hypotheses according to which, firstly, time savings in food preparation increase the variety of consumed food items (mainly snacks), secondly, consumption of items that have been subject to such technological advances should increase as well (this is corroborated by declining farm value shares, greater value shares on branded and pre-processed items) and thirdly, households or countries that have access to the new technologies should present the higher increases in the rates overweight and obesity, since these innovations have greatly reduced the time and the resources needed to go from hungry to full.

Cutler et. al. (2003), indeed show that each ½ hour of time saved in food preparation is associated with 0.5 units increase in the BMI. This result is considered to explain higher obesity rates in women since nowadays they spend more time out (men already did), they cook less, and food variety has increased as well. At country level the authors show that in a sample of developed countries, those with higher access to mass food preparation technology, have higher obesity rates.

Over-consumption of food: rational addiction or else?

Economic theory modelled habits such as eating, smoking or alcohol drinking[12] in non-optimal rates, considering that these types of behaviour constitute, the outcome of a utility maximisation process. That is, rational consumers which maximise their stable preferences, demand non-optimal quantities of goods to the consumption of which are somehow addicted. Becker and Murphy (1988) in a seminal article, setup the theory of rational addiction which accommodates this kind of habits.

According to the theoretical model such behaviour is consistent with rational consumers, as long as three conditions are met: *reinforcement*, in that the more somebody consumes of the addictive commodity, the more wants to consume, *tolerance*, in that the more somebody consumes the addictive commodity the lower is the future utility given the stock built and the unhealthy impact of this and *withdrawal*, which indicates the disutility from reducing or stopping the consumption of the addictive commodity. In this model individuals recognise that the consumption choices they make are addictive, but continue to consume the

[12] Working, watching television, exercising and other habits that are consumed beyond normal or healthy standards are accommodated from rational addiction theory as well.

commodity as the subjective benefits from the current consumption exceed the costs stemming from future addiction[13].

The condition of reinforcement implies that current consumption is complementary both with the past and the future consumption. Empirical research, initiated from this article of Becker and Murphy, tries to test mainly the condition of reinforcement, examining the consumption of addictive commodities as function of their past and future prices (Becker et al 1994 and several other authors).

Nevertheless, conceptual as well as empirical problems are recognised in rational addiction theory and its empirical implementation. In particular consistency of preferences through time in rational addiction theory implies that, consumers are somehow happy with their situation and they wouldn't change it.

Recent advances in behavioural economics indicate that in human behaviour dynamic inconsistencies maybe more appropriate in order to explain addictive consumption. In that case, hyperbolic discounting of preferences, have to be considered (Laibson 1997 and Angeletos et al 2001). According to those models, current consumption behaviour, conflicts with future preferences and leads to overeating and postponing diets. In that way obesity can be explained. Inconsistent human behaviour through time and self-control problems, are pointed as well, from Cutler et. al. (2003) and Gruber and Koszegi (2001), in order to explain overeating and obesity.

Endogeneity issues with respect to the use of past prices as well as the assumption that individuals appropriately forecast prices raise some important difficulties to empirically model rationally addictive behaviour. Auld and Grootendorst (2004), show that the empirical implementation of the rational addiction theoretical predictions, generates spurious results as applying the same methodology in non-addictive commodities (milk, oranges and eggs), provides evidence of addictive behaviour as well.

If satiation is a physiological state, then overeating signifies that something goes wrong in the physiology of a particular person and then addictive behaviour is set in motion. Wang et. al.

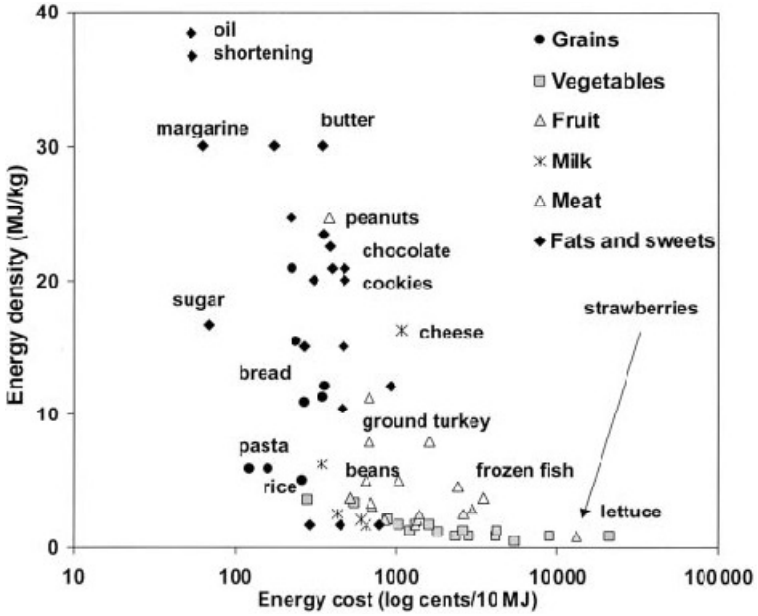
[13] Adjustments in the theoretical model are able to accommodate, multiple equilibria, cycles of consumption and "cold turkey" decisions as well.

(2000) provide clinical evidence through positron emission tomography, which indicates that brain signals from cocaine addicts, are similar with brain signals from obese persons after they were stimulated with food. Other authors suggest that psychological rather than physiological factors lie behind overeating (Mela and Rogers, 1988), while other authors from the nutrition literature suggest that chemical composition of nutrients may cause abnormal dependencies (Coluntuoni et. al. 2002).

Relating food insecurity and poverty with overweight and obesity.

Another important issue in this literature is the commonly observed incidence of overweight or obesity in poorer or food insecure populations. The same outcome is observed in the present data for Jamaica and Saint Lucia, which moreover, sample specifically vulnerable and food insecure households. Several authors report such evidence, both in developed as well as in developing countries even though analysis has focused mainly in the developed ones. Boumtje et. al. (2005), examine the incidence of obesity in school-age children in USA and find evidence that Black, Hispanic and poorer children are subject to a higher risk of obesity. In Miljkovic et al (2007) and Chou et. al. (2004), is shown that education is inversely correlated with BMI levels.

Figure 7. Relation between energy density (MJ/kg) and energy cost ($/MJ) for selected food items.



Source: Drewnowski and Specter (2004)

Drewnowski (1998) and Drewnowski and Specter (2004), observe again in USA, that the incidence of obesity is higher among population groups with lower levels of education and higher poverty rates. The authors try to explain this result by analysing the relationship between energy density and energy cost. They provide some evidence that energy density (MJ/kg) and energy cost ($/MJ) are inversely related (figure 7). Thus, food items composed from refined grains, added fats and sugar may constitute the best option for poorer households.

As long as food insecurity and poverty are associated with low expenditures on fruits, vegetables and low quality diets, then the positive correlation between obesity and poverty may be justified. Furthermore, as long as high density commodities provide the energy required in relatively smaller quantities, consumption of larger quantities becomes necessary to satiate individuals.

The arguments that Drewnowski (1998) and Drewnowski and Specter (2004) raise, seem to be in line with the importance that Cutler et. al. (2003) and Philipson and Posner (1999), put on technology advances in food preparation, as technical change made widely available food items and low quality diets, like canned meat or snacks.

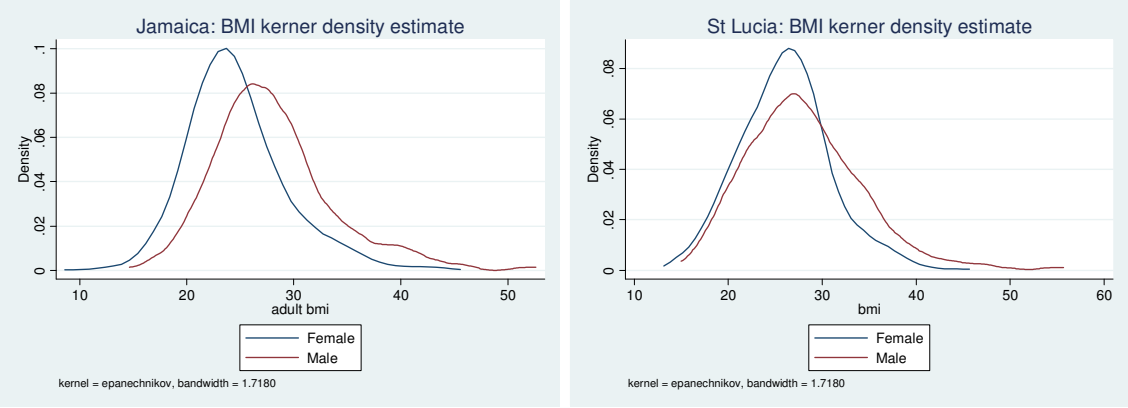
The review of the literature in the previous sections identifies some starting routes that may finally guide to the explanation of the higher incidence of overweight and obesity nowadays. Nevertheless these ideas as well as the supportive evidence are far from arguing that the issues have been adequately explained in developed countries and much less in the developing ones, where interaction of obesity with poverty, requires more discussion and supportive evidence on how to approach the issue. A thorough analysis of the relation between energy density and energy costs for a representative number of commodities and countries, as well as analysis of the consumption patterns and the socio-economic status of individual consumers is required in order to understand in full depth overweight and obesity in modern societies.

Obesity and overweight in Jamaica and Saint Lucia.

In the present subsection, some descriptive evidence is provided for the counties at study, regarding the average Body Mass Index, after tabulating it with gender, as well as the income earnings and the livelihood of the household. In figure 8 the densities of the BMI are graphed by the gender of the individual respondent. Overweight and obesity is predominantly a female

characteristic in both countries and much more in Jamaica. 32 percent of men and 70 percent of women are overweight or obese in Jamaica. In Saint Lucia the proportions are 60 and 67 percent for male and female individuals respectively. Even if there exists some selection issues regarding the choice of the individual whose BMI was measured, it is obvious that in both countries abnormal weights for heights, is predominantly a female issue.

Figure 8. Distribution of the Body Mass Index by gender.



Source: Computed by authors

Things become more interesting when we measure the proportion of overweight and obese individuals by food insecurity indicator and income or livelihood group. The results are presented in tables 26 to 29 for both countries. In each cell of the table the proportion of overweight or obese is reported by livelihood (or income group) and by food insecurity status.

Table 26. Overweight and obesity incidence by livelihood and food security indicator (proportion of overweight or obese and average BMI within each group)

Jamaica		**Worrying about food**		**Skipping meals of adults**		**Skipping meals of children**		**All**
		no	yes	no	yes	no	yes	
Inner city	prop.	0.56*	0.65	0.55	0.69	0.58*	0.70	
	BMI	26.19	27.40	26.23	27.64	26.37	28.25	26.19
Fisher folk	prop.	0.38***	0.41	0.43***	0.32	0.44***	0.28	
	BMI	25.12**	25.49	25.85	24.12	25.75	24.15	25.12
Subsistence farmers	prop.	0.40	0.37	0.47	0.24	0.40**	0.30	
	BMI	24.42*	24.27	25.27	22.73	24.49**	23.37	24.42
Sugar workers	prop.	0.57**	0.64	0.61***	0.59	0.58**	0.71	
	BMI	26.22*	26.79	26.66*	26.17	26.34	27.15	26.22
All	prop.	0.50	0.55	0.53	0.50	0.53	0.50	
	BMI	25.75	26.30	26.20	25.60	26.03	25.88	25.99

Source: Computed by authors

Table 27. Overweight and obesity incidence by income earnings and food security indicator (proportion of overweight or obese and average BMI within each group)

Jamaica		Worrying about food		Skipping meals of adults		Skipping meals of children		All
		no	yes	no	yes	no	yes	
Less than 3000$	prop.	0.46	0.53	0.49	0.53	0.56	0.38	
	BMI	25.62	26.49	25.71	26.66	26.27	26.06	25.62
3000-6000	prop.	0.48	0.49	0.51	0.44	0.48	0.48	
	BMI	25.42	25.22	25.65	24.85	25.23***	25.67	25.42
6000-9000	prop.	0.49	0.53	0.52	0.49	0.52	0.47	
	BMI	25.43	25.99	25.88	25.27	25.84	25.11	25.43
9000-12000	prop.	0.49	0.66	0.53	0.63	0.53	0.63	
	BMI	25.84	28.40	26.46	27.74	26.52	27.69	25.84
15000$ or more	prop.	0.66**	0.81	0.68**	0.89	0.68**	0.88	
	BMI	28.19***	30.24	28.95***	27.98	28.74***	29.43	28.19
All	prop.	0.50	0.55	0.53	0.50	0.53	0.50	
	BMI	25.75	26.30	26.20	25.60	26.03	25.88	25.99

Source: Computed by authors

For instance, in table 26, 56 percent of inner city folks in Jamaica that do not worry about food, are overweight or obese (average BMI 26.2). This proportion is significantly lower than the 65 percent of the same subgroup, that is overweight or obese and worry about food. Actually for several subgroups in Jamaica, the overweight or obese proportion of individuals that are food insecure by some indicator is significantly higher than the corresponding one on the food secure group. Such an outcome that directly links food insecurity with abnormal weight is observed only for construction workers in Saint Lucia (table 28).

Table 28. Overweight and obesity incidence by livelihood and food security indicator (proportion of overweight or obese and average bmi within each group)

St. Lucia		Worrying about food		Skipping meals of adults		Skipping meals of children		All
		no	yes	no	yes	no	yes	
Urban poor	prop.	0.60	0.68	0.61	0.69	0.61	0.76	
	BMI	27.21	27.90	27.40	27.36	27.22	28.68	27.21
Hotel workers	prop.	0.66	0.50	0.67	0.50	0.67	0.40	
	BMI	27.33	25.55	27.28	27.25	27.34	25.36	27.33
Construction	prop.	0.72**	0.62	0.72	0.56	0.71	0.60	
	BMI	26.88	25.77	26.78	25.43	26.78	24.39	26.88
Farmers	prop.	0.61	0.75	0.63	0.67	0.62	0.78	
	BMI	26.35	30.63	26.86	26.63	26.68	29.22	26.35
Fisher folks	prop.	0.62	0.00	0.63	0.20	0.57	0.50	
	BMI	27.26	22.77	27.26	24.53	26.62	31.75	27.26
Total	prop.	0.64	0.66	0.64	0.63	0.64	0.70	
	BMI	27.02	27.68	27.16	26.90	27.04	28.18	27.13

Source: Computed by authors

Table 29. Overweight and obesity incidence by income earnings and food security indicator (proportion of overweight or obese and average bmi within each group)

St. Lucia		Worrying about food		Skipping meals of adults		Skipping meals of children		All
		no	yes	no	yes	no	yes	
Less than 200$	prop.	0.55**	0.65	0.57*	0.62	0.55***	0.76	
	BMI	25.93**	27.36	26.41	26.27	26.01**	28.87	25.93
200-399	prop.	0.65	0.69	0.65	0.72	0.64	0.74	
	BMI	27.14	28.88	27.30	28.88	27.31	28.67	27.14
400-699	prop.	0.66	0.63	0.66	0.59	0.66	0.58	
	BMI	27.08	26.78	27.10	26.48	27.07	26.64	27.08
700-1099	prop.	0.66	0.67	0.67	0.00	0.66	0.50	
	BMI	27.74	28.89	27.82	24.74	27.84	25.50	27.74
1100$ or more	prop.	0.77	1.00	0.78		0.78		
	BMI	28.54	29.24	28.57		28.57		28.54
Total	prop.	0.64	0.66	0.64	0.63	0.64	0.70	
	BMI	27.02	27.68	27.16	26.90	27.04	28.18	27.13

Source: Computed by authors

As far as it concerns income classes (tables 27 and 29) the very same pattern is observed for the richer households in Jamaica and the poorest in Saint Lucia. In all tabulations where statistically significant differences exist, the incidence of overweight or obesity is higher in food insecure in comparison with food secure households. This relatively consistent result partly validates the conjectures discussed in the literature review, but it remains to be seen if multivariate analysis is able to provide further verification.

The determinants of the of the Body Mass Index

In the present subsection we try to identify the correlates of the Body Mass Index using multivariate regression analysis. As in the regressions on the determinants of food insecurity, the results cannot be generalized, due to the non random sampling of the data. Reliability reduces even more given the particular nature of the dependent variable; the Body Mass Index is usually considered to represent the long run outcome state of the body, while inheritance factors maybe at play as well. In that way panel data for several periods are more appropriate in order to conduct more valid analysis.

Nonetheless, multivariate analysis may trace some of the basic channels through which preferences, assets and income flows affect weight of the sampled individuals. In this analysis

frequency of consumption of the different food items is considered to approximate a range of characteristics (preferences, incomes or even technology in line with the arguments of Cutler et. al. 2003 and Philipson and Posner, 1999). On the other hand, the incidence of shocks is not taken into account.

For this part of the analysis, quantile regression is employed[14] (OLS results are reported as well). Quantile regression estimates the impact of the covariates on the quantiles of the distribution of the Body Mass Index. Appropriate inference necessitates the use of this method as the Body Mass Index is a variable which along its distribution, is split in three parts, namely the underweight the normal and the overweight or obesity part. Ordinary least squares approximate the impact of the independent variables on the conditional mean of the dependent variable. The positive (or negative) impact of any independent variable on the BMI, may arise from any part of its distribution when using least squares. Nonetheless, the inference is different if the effect is positive (or negative) for the underweight, the normal and the overweight or obesity parts of the BMI distribution.

Thus the q^{th} quintile regression estimator of β, can be obtained by minimizing its sample counterpart, which is the average of the asymmetrically weighted absolute errors with weight q on positive errors and weight (q − 1) on negative errors or:

$$V_N(\beta;q)=\frac{1}{N}\left[q\sum_{i:y_i\geq x_i\beta}|y_i-x_i\beta|+(1-q)\sum_{i:y_i<x_i\beta}|y_i-x_i\beta|\right],$$

where N is the number of observations and i the i^{th} observation.

For q=0.5, solving for β gives the estimate of the median coefficient or Least Absolute Deviation (LAD) estimator. In tables 30 and 31, the mean (from least squares) and the median (from quantile regression) estimators are reported. The set of figures included in the present subsection, graph the impact of each independent variable (and the confidence intervals), and along the full distribution of the Body Mass Index (figures 9 to 16).

[14] Another methodological option would be to use probit analysis in order to estimate the probability of having below or above normal weight. This type of analysis requires setting thresholds which are usually considered to be simply informative and not definitive for analytical purposes.

Table 30. Jamaica: Determinants of BMI

	(1) Adult bmi (OLS)	(2) Adult BMI (quantile regression)
Dependency ratio	0.5065	0.1989
	(0.80)	(0.41)
Age of head	0.1999	0.1590
	(2.90)***	(2.86)***
Age of head squared	-0.0021	-0.0017
	(3.12)***	(3.16)***
Education level of hh head	0.1134	0.0032
	(1.02)	(0.04)
Female headed hh	2.3001	1.9427
	(5.57)***	(6.72)***
Adult equivalent household size	0.5433	0.3923
	(3.39)***	(3.85)***
Household weekly income per ae (est)	0.1503	0.1035
	(1.77)*	(1.72)*
Hh belongs in association	-0.4677	0.2115
	(0.76)	(0.50)
Bank account	0.3947	0.2005
	(0.91)	(0.62)
Received remittances	-0.2511	-0.0244
	(0.65)	(0.09)
House owned (rooms) per ae	0.9061	0.7947
	(3.25)***	(4.43)***
Land size per ae	-0.2610	-0.0728
	(2.02)**	(0.77)
No of trees per ae	0.0031	-0.0104
	(0.20)	(1.32)
No of vehicles per ae	0.0436	0.5558
	(0.04)	(0.68)
No of small animals per ae	-0.0089	-0.0082
	(2.00)**	(1.90)*
No of big animals per ae	0.0794	0.0885
	(1.43)	(1.41)
No of boats per ae	-0.0747	0.1037
	(0.55)	(1.30)
Value of other prod capital per ae	0.0103	0.0057
	(1.98)**	(2.01)**
Ground provisions	0.2280	0.0416
	(1.50)	(0.36)
Vegetables	0.0056	0.1350
	(0.03)	(1.04)
Fruits	-0.0334	0.0355
	(0.34)	(0.47)
Fresh meat	0.0320	-0.0440
	(0.26)	(0.52)
Canned meat	0.2225	0.2555
	(1.82)*	(2.80)***
Chicken	-0.0109	0.0501
	(0.08)	(0.44)
Fish	-0.3766	-0.3082
	(2.52)**	(2.53)**
Cereals	-0.3840	-0.2807
	(2.22)**	(2.05)**
Sugar	-0.0799	0.0076
	(0.58)	(0.08)
Peas and beans	-0.0905	-0.1693
	(0.72)	(1.81)*

Livelihood: fisher folks	-0.7754	-1.3354
	(1.53)	(3.56)***
Livelihood: sugarcane farmers	-1.3990	-1.5836
	(1.90)*	(2.95)***
Livelihood: subsistence farmers	-0.0645	0.0092
	(0.13)	(0.02)
Constant	19.9138	21.0336
	(8.71)***	(11.56)***
Observations	1009	1009
R-squared	0.13	0.09
	Robust value of t-statistics in parentheses	Absolute value of t-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

Table 31. St Lucia: Determinants of BMI

	(1) Adult bmi (OLS)	(2) Adult BMI (quantile regression)
Dependency ratio	0.9707	0.4829
	(1.11)	(0.62)
Age of head	0.2919	0.1371
	(3.50)***	(1.66)*
Age of head squared	-0.0030	-0.0013
	(3.57)***	(1.53)
Education level of hh head	-0.0711	-0.0802
	(0.63)	(0.77)
Female headed hh	1.1382	1.0729
	(2.27)**	(2.36)**
Adult equivalent household size	0.3971	0.1843
	(2.48)**	(1.35)
Household weekly income per ae (est)	3.1632	1.4589
	(1.55)	(0.93)
Hh belongs in association	-0.1080	-0.3880
	(0.14)	(0.56)
Bank account	0.8720	0.0356
	(1.78)*	(0.07)
Received remittances	-0.4233	-0.4650
	(0.72)	(0.87)
House owned (rooms) per ae	0.0890	-0.1571
	(0.36)	(0.65)
Land size per ae	-0.0037	-0.0027
	(0.25)	(0.24)
No of trees per ae	-0.0195	-0.0167
	(1.08)	(1.20)
No of vehicles per ae	-0.3457	-0.3841
	(0.26)	(0.32)
No of small animals per ae	-0.0063	-0.0068
	(1.34)	(1.95)*
No of big animals per ae	-0.1026	-0.0707
	(1.30)	(1.02)
No of boats per ae	4.3475	4.1303
	(1.51)	(1.24)
Value of other prod capital per ae	-0.2433	-0.2385
	(3.17)***	(2.96)***
Ground provisions	0.1987	0.3123
	(1.33)	(2.13)**
Vegetables	-0.0859	-0.1112
	(0.53)	(0.72)
Fruits	0.2962	0.1801
	(2.01)**	(1.29)
Fresh meat	0.2547	0.2736
	(2.16)**	(2.34)**
Canned meat	-0.2147	-0.0812
	(1.82)*	(0.73)
Chicken	-0.0155	-0.0503
	(0.11)	(0.40)
Fish	0.0827	0.1011
	(0.46)	(0.62)
Cereals	0.0759	0.0363
	(0.32)	(0.16)
Sugar	-0.0720	0.0263
	(0.43)	(0.17)
Peas and beans	-0.1754	-0.2923
	(1.24)	(2.02)**

Livelihood: Hotel workers	-0.3280	-0.5942
	(0.49)	(0.98)
Livelihood: Construction	-0.4590	-0.4767
	(0.65)	(0.69)
Livelihood: Farmers	-1.1630	-0.9799
	(1.21)	(1.20)
Livelihood: Fisher folks	-0.6341	-0.6952
	(0.54)	(0.68)
Constant	16.4938	21.5384
	(5.70)***	(8.16)***
Observations	729	729
R-squared	0.08	0.05
	Robust value of t-statistics in parentheses	Absolute value of t-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

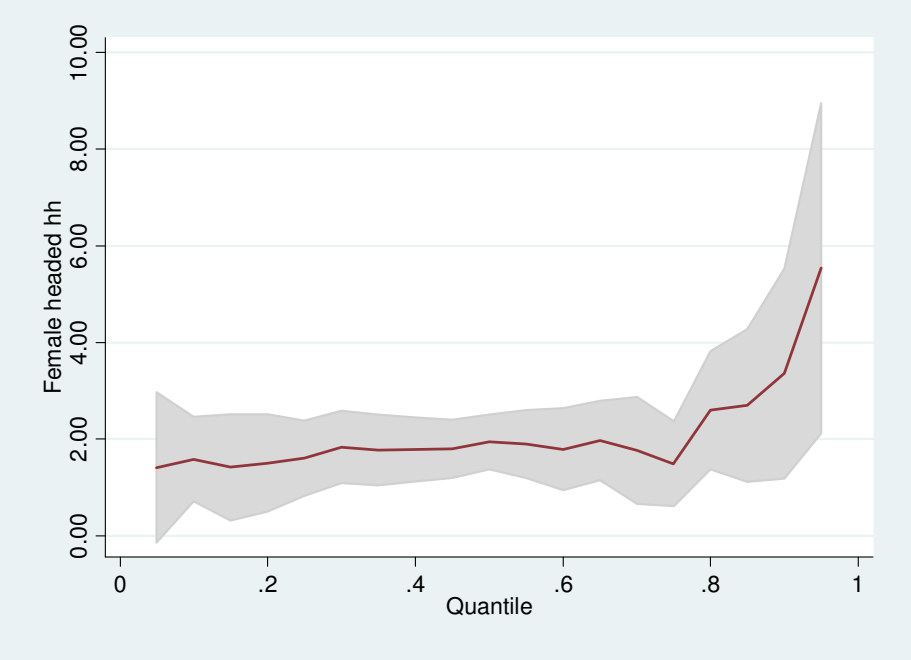
From the demographic variables, age and adult equivalent household size in both countries and along the whole distribution positively affect the BMI. In other words the older the household head or the larger the household, the more likely it is the BMI to increase along its whole distribution. For instance in Jamaica one member increase of the adult equivalent household size, is associated with nearly 0.25 units increase of the BMI in the first quintile, and nearly 0.9 units in the fifth quintile. Surprisingly education of the household head does not seem to have any impact on the BMI, with the exception of a weak positive effect on the BMI of inner city folks in Jamaica.

In both countries female headed households are significantly more likely to be overweight or obese. Only in Saint Lucia, at the first quintile of the BMI distribution, the impact is negative, indicating that probably wealth or income constraints bind for female headed households and correlate negatively with the BMI. In particular a female head in the household is associated with declining BMI by more than 0.5 units in the first quintile of the distribution, while in all other parts of the distribution, female headship increases the BMI by more than 1 units. In regressions by livelihood, the same variable is mostly positive and significant for inner city folks in Jamaica and for farmers in both countries.

With respect to income flows, the quantile regression results indicate a weakly significant positive association with the BMI in Jamaica. This effect is much stronger when regressions for fishermen are considered. On the other hand the effect of income flows as well as most of the asset variables is positive but insignificant in all regressions for Saint Lucia. For Saint Lucia the number of small animals and mainly the value of other capital items negatively

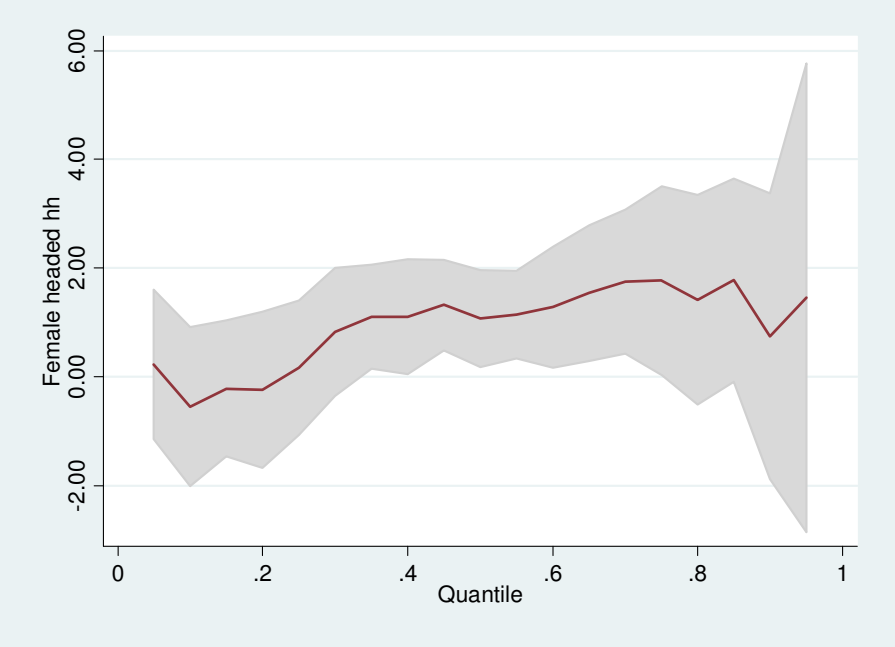
affect the BMI, providing some evidence that relatively richer households follow healthier diets. For Jamaica the effect of assets (dwelling size in rooms), is positive mainly for fishermen and farmers.

Figure 9. Jamaica: Impact of gender along quintiles of bmi



Source: Computed by authors

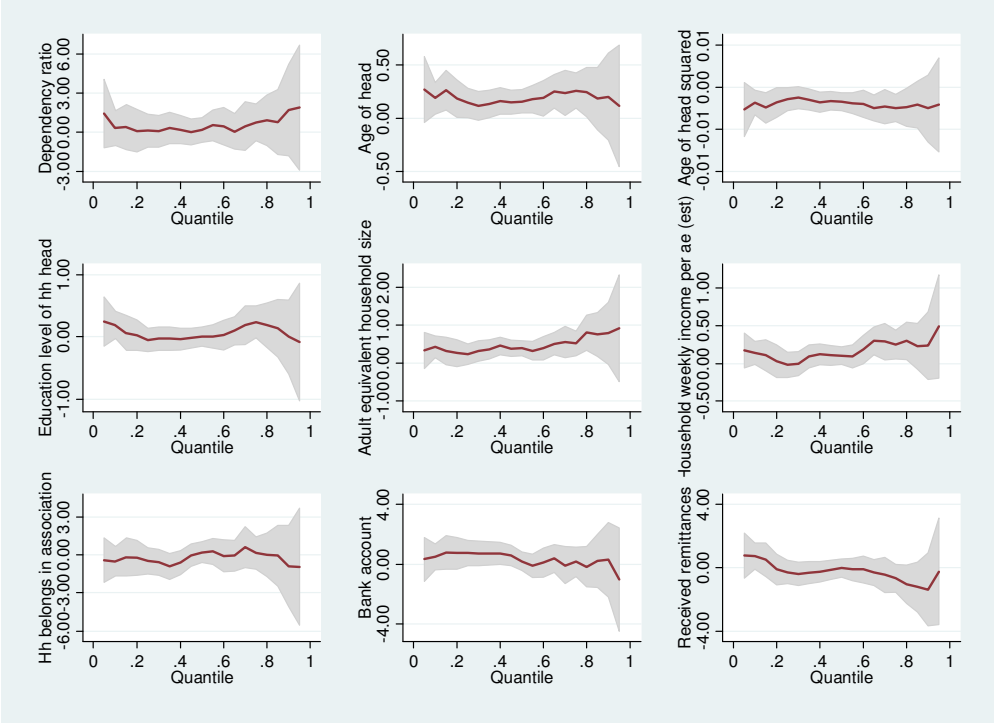
Figure 10. St Lucia: Impact of gender along quintiles of bmi



Source: Computed by authors

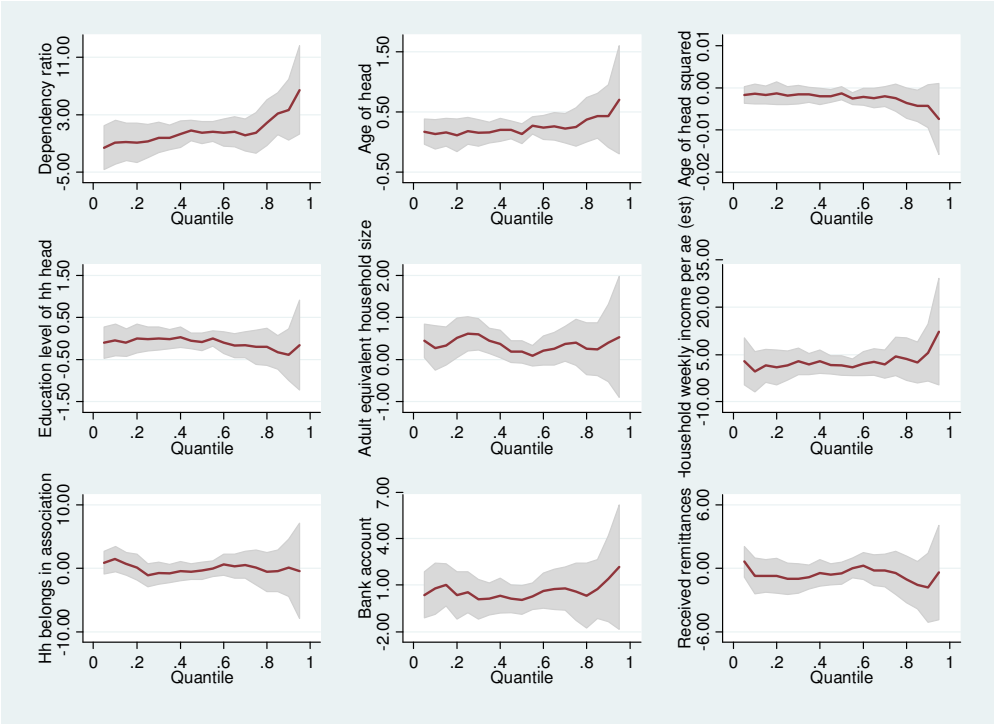
Finally, and as far as it concerns consumption habits (approximated by the frequencies of the consumed items), is striking the positive and significant impact of the canned meat consumption on the BMI in Jamaica. The effect is negative only below the 5th, and above the 95th quintiles of the BMI. As long as canned meat consumption is associated with technological advances in the conservation of energy dense easily prepared and cheap food, there is some justification of the argument provided by Cutler et. al. (2003), as discussed previously. In the same country the frequency of eating fish is negatively correlated with the BMI, along the whole distribution. More frequent fish consumption is negatively correlated WITH the BMI, and the level of this reduction increases steadily along quintiles. Frequency of cereals' consumption is also negatively correlated with the BMI, at variable rates along the distribution.

Figure 11. Jamaica: Impact of preferences and income along quintiles of bmi



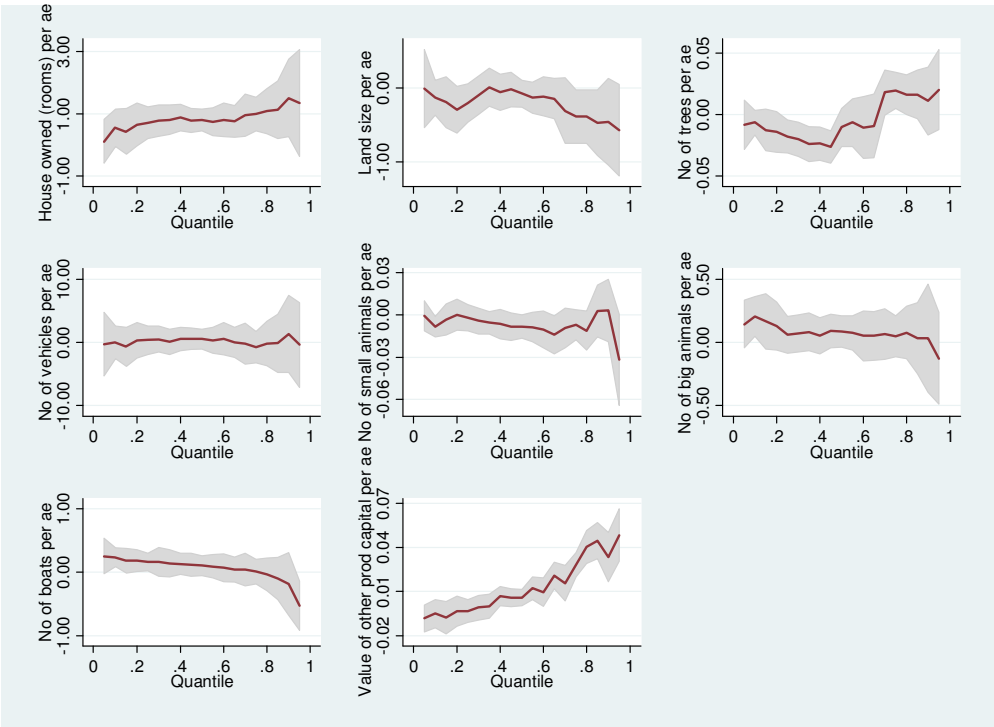
Source: Computed by authors

Figure 12. St Lucia: Impact of preferences and income along quintiles of bmi



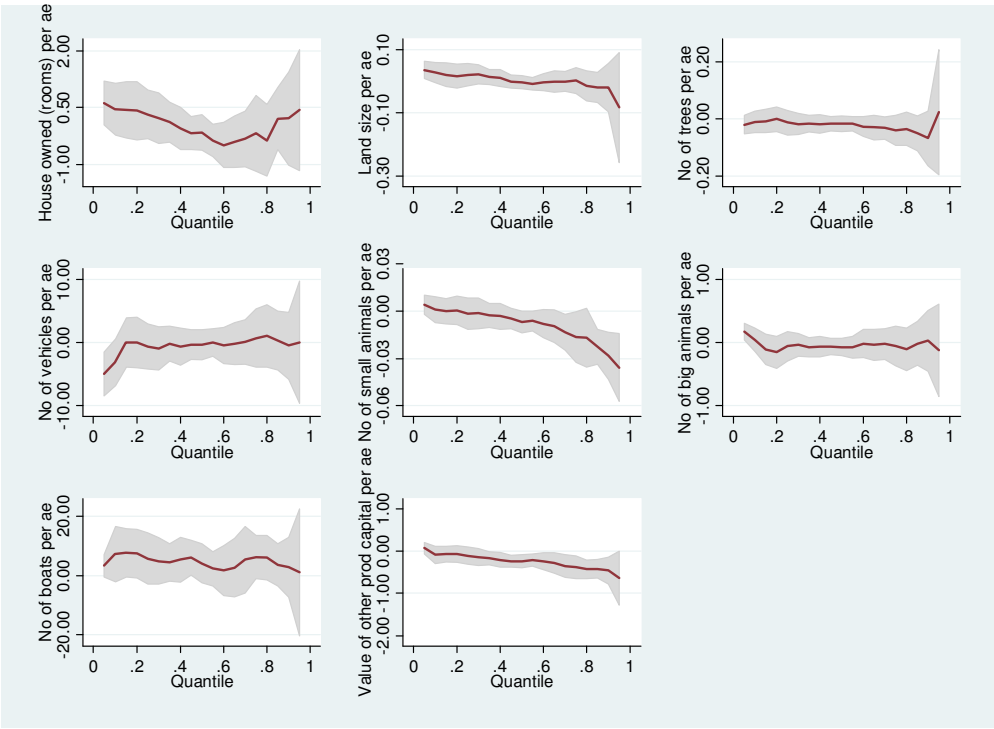
Source: Computed by authors

Figure 13. Jamaica: Impact of assets along quintiles of bmi



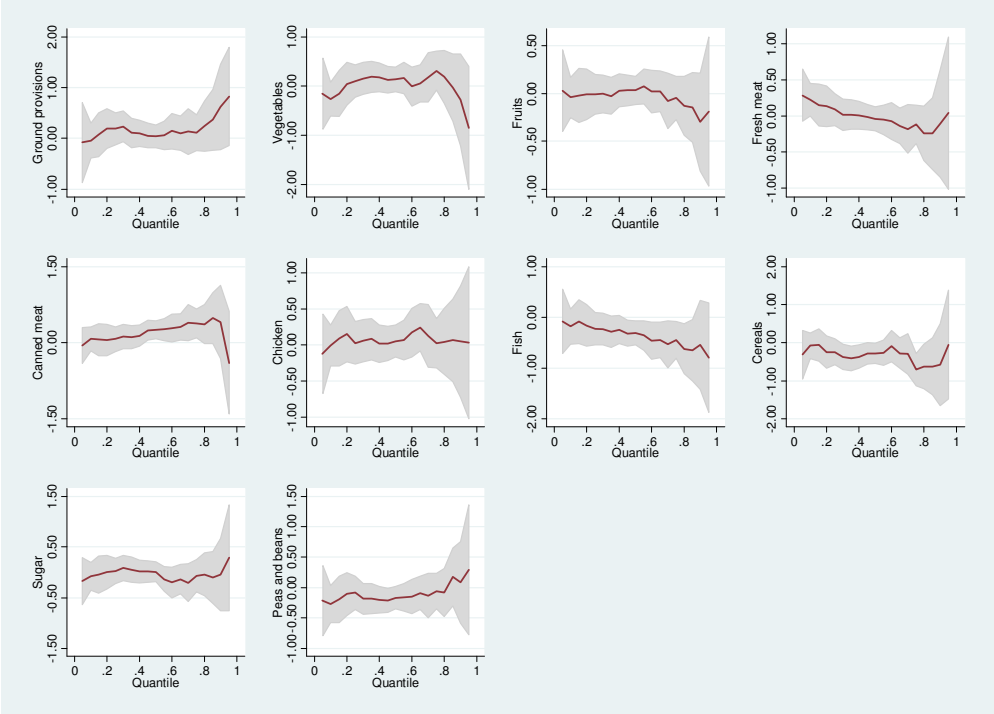
Source: Computed by authors

Figure 14. St Lucia: Impact of assets along quintiles of bmi



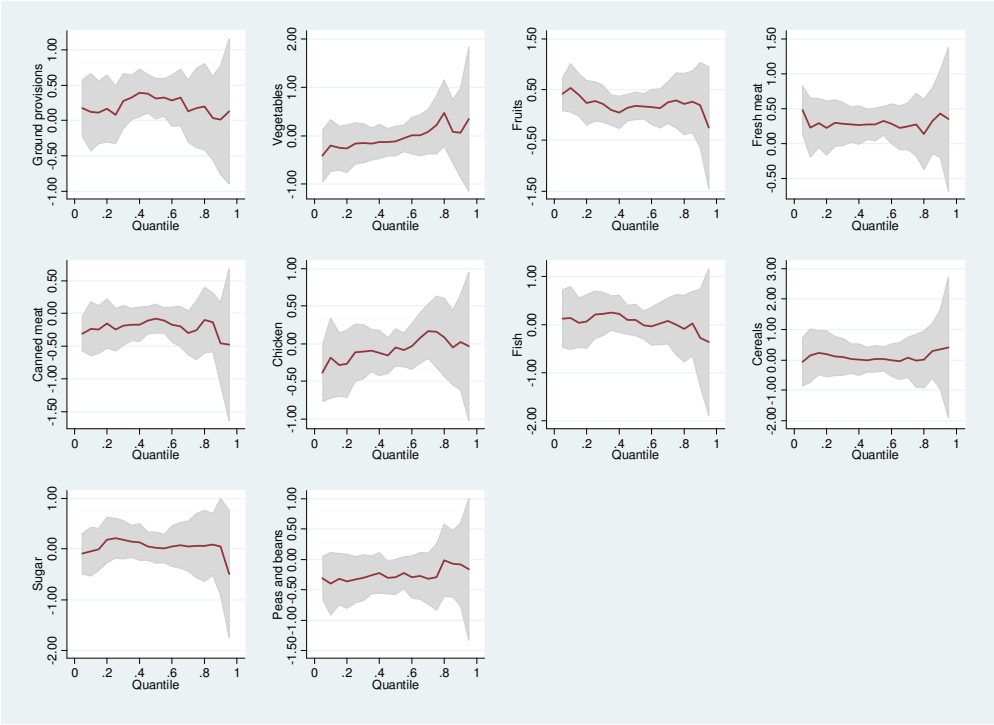
Source: Computed by authors

Figure 15. Jamaica: Impact of food consumed along quintiles of bmi



Source: Computed by authors

Figure 16. St Lucia: Impact of food consumed along quintiles of bmi



Source: Computed by authors

For Saint Lucia, canned meat consumption does not have a significant effect on the BMI. However, increasing the frequency of fresh meat consumption always increases the BMI (less than 0.5 units). Positive is the impact of roots and tubers (ground provisions) on the BMI as well. Regressions by livelihood in Saint Lucia complicate inference (negative impact of sugar and canned meat, and positive of fresh fruits on the BMI). It is rather difficult to explain this result. It may be argued that in Saint Lucia frequencies of consumed items are not able to effectively approximate consumption preferences or that other factors beyond consumption habits, lie behind the high proportion of the population that is overweight or obese.

5 Conclusions and Policy implications

The present paper, offers an extensive discussion on the issues of food insecurity and overweight, that characterise vulnerable population groups in two small island economies of the Caribbean, namely Jamaica and St. Lucia. Evidently food insecurity patterns in both countries, depend strongly on the household livelihood. Nonetheless it needs not be forgotten that the surveys targeted vulnerable households in each country, so even if one group appears

as better off relative to the others it cannot be claimed, that attention should be addressed to the worst off group only.

Univariate statistical tabulations, based on individual assessment of the household food security condition, indicated that sugar cane farmers in Jamaica and urban poor in both countries are relatively worst off. Cash, credit and asset constraints, appear binding, at various degrees for different livelihoods in order to improve on their food security. Food variety or quality constraints are also reported as major impediments for an improved self-assessment of the food security status.

Multivariate analysis showed that both economic and social factors, affect the likelihood of worrying about or actually experiencing food insecurity, of the vulnerable households in Jamaica and St. Lucia. The majority of the factors that increase food insecurity are closely associated with inadequate flows of incomes, access to savings or weak asset resources. These are by far the largest effects by any of the significant variables that increase the probability of experiencing food insecurity. This association however, justifies a positive correlation between poverty and food insecurity. Among the important demographic variables a significant food security gender component is witnessed, as female headed households appear more food insecure.

Another group of variables that significantly increase the likelihood of food insecurity, refers to the impact of various shocks either covariate or household specific. While idiosyncratic shocks, and especially unemployment do seem to have some real negative impact on the households' food security situation in both countries, some of the covariate level shocks do seem to have an impact primarily in Jamaica. Here the occurrences of storms and floods increased the probability of experiencing food shortages with around one half.

With respect to the dietary patterns of the sampled households, it appears that frequent consumption of energy dense food items, like canned meat, is significantly positively associated with an increased likelihood of food insecurity. On the other hand healthier diets are associated with lower food insecurity. Finally, all livelihood groups are employing both formal and informal coping mechanisms to address food insecurity challenges and some heterogeneity is evident in the type of the mechanism utilized by each one of the groups.

A more challenging issue discussed in the paper, is the high incidence of overweight and obese individuals in both countries. Descriptive analysis indicated that 50 percent of respondents in Jamaica and 63 percent in St. Lucia, have an abnormal body mass index, measured higher than 25 kg/m^2, while a 4 percent of the respondents is measured with a subnormal body mass index (below 18 kg/m^2).

It is rather difficult to explain the high incidence of overweight and obesity especially in association with the vulnerable and food insecure character of the sampled households, in both countries. From the descriptive analysis is striking the positive association of food insecurity with a higher proportion of individuals with abnormal weights. With respect to income flows is also important to notice the positive association of obesity or overweight with income earnings. By livelihood, urban poor in both countries and sugar cane workers in Jamaica, as well as fishermen in Saint Lucia are mainly characterised by higher rates of obesity and overweight. As discussed earlier, these are the livelihoods that food security problems appear to be more serious, relative to the other groups.

From the multivariate analysis, is evident that demographic characteristics that behave as preference shifters, along with food consumption habits (in Jamaica), are critical factors in affecting the Body Mass Index. Female headship (across countries) and unhealthy dietary patterns (in Jamaica) are positively correlated, with the BMI. At the same time, income flows and assets, weakly but still positively affect the BMI.

If female headship is associated with a higher proportion of time that women spend outside the house, and increased canned meat consumption with technological advances in food access and conservation, which lower food prices, then the increased rates of sampled adults that are obese or overweight can be explained in line with the arguments provided by several authors in the relevant literature. On the other hand the negative impact of some assets on obesity can be considered that only partly corroborates, with the argument that wealthier households are following relatively healthier diets.

Policy interventions need to address food insecurity in conjunction with unhealthy dietary patterns in both countries. Conventionally education is suggested as the major public intervention to control obesity. Such education comes in various forms, including nutritional information on labels, advertising of the negative health impacts, nutrition or exercise

education and finally general education. Research in developed countries, has shown that general education (increasing years of schooling for the vulnerable populations) is more promising than other forms of education and information dissemination in order to cope with overeating and obesity.

On the sphere of public intervention a series of other measures are suggested in order to address the more sedentary way of modern life. Investments on parks and facilities that promote physical activity and exercise in urban and rural areas, is one of them. Restricting access to commodities with increased levels of fats and sugars in schools is another. In education systems, the introduction of health and nutrition related courses both for teachers and children, is also recommended.

In developed economies, has been suggested that regressive taxes on food may be able to reduce excess food consumption. Nonlinear taxation (taxing overconsumption), has also been suggested as a more effective tool, but enforceability concerns are raised, since this form of taxation is equivalent to taxing overweight people. Research has also recognised that other forms of linear taxes maybe effective as well. Such forms refer to taxes on particular ingredients, taxes on specific categories of food or value-added taxes on food producers. However, there seems to be some agreement that enforcement costs may turn out to be quite high to make these policies a feasible solution.

Nonetheless the problems of food insecurity in conjunction with obesity have very deep socio-economic roots. What researchers seem to really suggest, is that that the issue is not that food insecure or poorer people are not able to read labels or are not aware of the health impact of obesity, but the fact that vulnerable populations appear to have smaller incentives to invest in a healthy and long life, as the utility they derive from living is relatively lower on average. Thus, promoting socio-economic development along with some degree of individual satisfaction, are expected to provide much better results in terms of fighting the linked problems of food insecurity and obesity.

In order to explain the driving forces behind the high incidence of abnormally weighted individuals in both countries along with food insecurity and suggest feasible solutions, more data and further research is inarguably necessary. Household data across space and time, which examine both consumption patterns and allocation of time across activities, would be

able to provide a clearer picture on the factors that lie behind individual choices and lead to unhealthy dietary patterns and outcomes. This part of the research needs to be associated with a detailed analysis of the trends in the costs of food items along with their energy content and the quantities necessary to satisfy the satiation feeling of individuals. In that way, it will be possible to understand the, so far characterised as paradoxical, relation between food insecurity, poverty with abnormal weight of individuals.

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Statistical Annexes

Table 1. Proportion of households affected by different shocks

Jamaica		Inner city	Fisher-folks	Sugarcane farmers	Subsistence farmers	Total
Flood shock	proportion	0.04***	0.43***	0.39***	0.24	0.26
Storm shock	proportion	0.91	0.96***	0.74***	0.94	0.92
Drought shock	proportion	0.01***	0.30***	0.23	0.23**	0.20
Pest attack	proportion	0.00**	0.03	0.00	0.04**	0.03
Political unrest	proportion	0.15***	0.00***	0.00**	0.06	0.06
Violence	proportion	0.60***	0.03***	0.00***	0.04***	0.17
Crop loss shock	proportion	0.01***	0.18***	0.34	0.56***	0.30
Unemployment shock	proportion	0.12	0.14*	0.04**	0.11	0.11
Death shock	proportion	0.07	0.06**	0.09	0.13***	0.09
Hh suffered theft	proportion	0.04***	0.28***	0.09**	0.2	0.17
Illness shock	proportion	0.04*	0.08	0.04	0.08	0.06
Disease (perm/temp)	proportion	0.45	0.40	0.42	0.42	0.42
HH head absent from work due to illness	days	4.89	7.84	4.25	7.07	6.56
Children irregular school attendance	proportion	0.09	0.09	0.05	0.10	0.09

Comparing each group with all others: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

Table 2. Proportion of households affected by different shocks

St Lucia		Urban poor	Hotel workers	Construction	Farmers	Fisher folks	Total
Flood shock	proportion	0.09***	0.02**	0.02*	0.00***	0.22***	0.05
Storm shock	proportion	0.02	0.00**	0.01	0.07***	0.00	0.02
Drought shock	proportion	0.01	0.01	0.01	0.04**	0.00	0.02
Pest attack	proportion	0.00	0.01	0.01	0.01	0.03	0.01
Political unrest	proportion	0.01	0.00	0.03***	0.00	0.00	0.01
Violence	proportion	0.09***	0.03**	0.05	0.00***	0.19***	0.06
Crop loss shock	proportion	0.03	0.00***	0.01**	0.17***	0.00	0.05
Unemployment shock	proportion	0.14*	0.06**	0.21***	0.04***	0.11	0.11
Death shock	proportion	0.12	0.14	0.11	0.07*	0.11	0.11
Hh suffered theft	proportion	0.06**	0.03	0.05	0.00**	0.03	0.04
Illness shock	proportion	0.08	0.03**	0.09	0.08	0.11	0.07
Disease (perm/temp)	proportion	0.33***	0.18*	0.23	0.10***	0.32	0.24
HH head absent from work due to illness	days	8.37	2.89**	3.26	10.35*	4.27	6.57
Children irregular school attendance	proportion	0.09	0.04*	0.14**	0.04*	0.05	0.08

Comparing each group with all others: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

Table 3. Determinants of food insecurity in Jamaica by livelihood

	Inner city			Fishermen			Farmers		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Feeling vulnerable	Skipping meals of adults	Skipping meals of children	Feeling vulnerable	Skipping meals of adults	Skipping meals of children	Feeling vulnerable	Skipping meals of adults	Skipping meals of children
Adult bmi	0.0034	0.0081	0.0045	-0.0096	-0.0184	-0.0106	0.0065	-0.0050	0.0009
	(0.49)	(1.30)	(1.45)	(1.39)	(3.11)***	(1.91)*	(1.26)	(1.13)	(0.56)
Dependency ratio	0.0739	-0.1057	0.1491	0.5365	0.2948	0.1789	-0.0445	-0.0788	0.0894
	(0.44)	(0.72)	(2.09)**	(3.69)***	(2.80)***	(1.83)*	(0.40)	(0.79)	(2.77)***
Age of head	0.0210	0.0049	0.0126	0.0139	0.0121	-0.0192	-0.0258	-0.0414	-0.0044
	(0.86)	(0.25)	(1.34)	(0.92)	(1.02)	(1.69)*	(1.64)	(3.22)***	(1.00)
Age of head squared	-0.0003	-0.0001	-0.0001	-0.0002	-0.0002	0.0001	0.0002	0.0003	0.0000
	(1.13)	(0.45)	(1.52)	(1.49)	(1.41)	(0.58)	(1.26)	(2.81)***	(0.74)
Education level of hh head	-0.0067	-0.0375	0.0139	0.0374	0.0275	-0.0696	0.0155	0.0122	-0.0080
	(0.27)	(1.70)*	(1.45)	(1.45)	(1.38)	(3.75)***	(0.94)	(0.84)	(1.53)
Female headed hh	0.0855	0.0470	-0.0656	0.1142	0.0583	0.2328	0.1752	0.0995	0.0155
	(1.06)	(0.66)	(1.83)*	(1.23)	(0.78)	(2.95)***	(2.47)**	(1.58)	(0.80)
Adult equivalent household size	-0.0376	0.0257	0.0324	0.0190	-0.0334	0.0585	-0.0157	0.0173	0.0320
	(1.05)	(0.96)	(2.75)***	(0.61)	(1.27)	(2.74)***	(0.63)	(0.84)	(4.96)***
Household weekly income per ae (est)	-0.0464	-0.0401	-0.0022	-0.0492	-0.0298	-0.0175	-0.0457	-0.0637	-0.0177
	(2.04)**	(2.03)**	(0.29)	(2.29)**	(1.83)*	(1.10)	(2.42)**	(3.75)***	(2.40)**
Hh belongs in association	0.2598	0.2651	0.3950	-0.2193	-0.1085	0.1233	-0.0026	0.0927	-0.0220
	(1.10)	(1.19)	(1.99)**	(1.82)*	(1.18)	(1.35)	(0.03)	(1.35)	(1.20)
Bank account	-0.1379	-0.0852	-0.0600	-0.2282	-0.2117	-0.0980	-0.1956	-0.2115	-0.0312
	(1.59)	(1.05)	(1.43)	(1.80)*	(1.97)**	(0.80)	(2.93)***	(3.43)***	(1.41)
Received remittances	0.0637	-0.0482	-0.0562	-0.1170	-0.0728	0.0303	-0.0747	-0.1607	-0.0366
	(0.71)	(0.62)	(1.32)	(1.58)	(1.22)	(0.54)	(1.06)	(3.11)***	(2.34)**
House owned (rooms) per ae	-0.0630	-0.0341	-0.0063	0.0959	-0.0346	0.0201	-0.0088	-0.0732	0.0235
	(0.98)	(0.50)	(0.15)	(1.89)*	(0.79)	(0.44)	(0.21)	(1.73)*	(1.49)
No of vehicles per ae	-1.4814	0.0853	0.8000	-0.0343	0.1791	-0.0038	-0.5041	-0.2920	-0.0536
	(2.01)**	(0.11)	(2.51)**	(0.11)	(0.84)	(0.01)	(2.42)**	(1.53)	(0.70)
Land size per ae				-0.0017	0.1076	-0.0559	0.0132	0.0488	0.0036
				(0.03)	(2.17)**	(0.80)	(0.62)	(1.82)*	(0.44)
No of trees per ae				-0.0180	-0.0173	0.0004	-0.0008	-0.0145	-0.0101
				(1.36)	(1.36)	(0.09)	(0.60)	(1.60)	(2.02)**
No of small animals per ae				0.0016	-0.0095	-0.0015	-0.0013	-0.0009	-0.0004
				(1.27)	(1.71)*	(1.13)	(1.17)	(0.91)	(2.04)**
No of big animals per ae				0.0003	0.0206	-0.0979	0.0040	0.0107	0.0029

				(0.01)	(0.63)	(1.33)	(0.40)	(1.04)	(0.74)
Value of other prod capital per ae				0.0005	-0.0001	-0.0003	-0.0004	0.0001	0.0006
				(0.71)	(0.15)	(0.32)	(0.49)	(0.15)	(3.83)***
No of boats per ae				0.0234	-0.2116	0.0725			
				(1.07)	(1.97)**	(1.41)			
Flood shock	-0.0538	-0.1810	-0.0172	-0.0533	0.0942	0.1280	0.2528	0.0609	0.0124
	(0.24)	(1.45)	(0.24)	(0.73)	(1.53)	(2.37)**	(3.81)***	(1.04)	(0.65)
Storm shock	-0.0499	0.0974	0.0526	-0.0970	0.0108	0.1467	0.2371	0.0606	0.0232
	(0.37)	(0.84)	(1.14)	(0.53)	(0.09)	(2.18)**	(2.47)**	(0.68)	(0.99)
Drought shock	0.3216	0.3989	0.5084	0.2110	0.1773	0.1975	-0.0458	-0.1588	-0.0239
	(0.95)	(1.33)	(1.89)*	(2.15)**	(2.17)**	(2.81)***	(0.66)	(2.85)***	(1.44)
Political unrest	0.0643	0.0441	-0.0429						
	(0.61)	(0.47)	(1.24)						
Violence	-0.0884	-0.0788	-0.0567						
	(1.17)	(1.17)	(1.78)*						
Unemployment shock	0.2242	0.1351	0.0568	0.1779	-0.0550	-0.0999	0.1424	0.2141	0.0052
	(1.88)*	(1.25)	(1.07)	(1.83)*	(0.74)	(1.78)*	(1.55)	(2.60)***	(0.19)
Death shock	0.0209	0.2873	0.0832	-0.0897	-0.0028	0.0113	0.1056	0.0360	0.0189
	(0.16)	(2.06)**	(1.04)	(0.73)	(0.02)	(0.10)	(1.31)	(0.49)	(0.76)
Hh suffered theft	0.1785	0.1039	0.1024	0.1014	0.0074	0.0747	0.0948	0.0428	0.0199
	(0.90)	(0.61)	(1.03)	(1.18)	(0.11)	(1.15)	(1.20)	(0.63)	(0.78)
Disease (perm/temp)	0.3011	0.0644	-0.0014	0.1207	0.0952	0.0719	0.0616	0.0029	-0.0280
	(3.71)***	(0.93)	(0.04)	(1.58)	(1.50)	(1.25)	(1.04)	(0.06)	(1.74)*
Ground provisions	0.0192	0.0203	0.0079	-0.0166	-0.0182	0.0738	0.0614	0.0586	0.0225
	(0.61)	(0.77)	(0.63)	(0.49)	(0.68)	(2.57)**	(2.04)**	(2.07)**	(2.72)***
Vegetables	-0.0295	0.0352	-0.0208	0.0151	-0.0388	-0.0374	-0.0370	-0.0364	-0.0351
	(0.83)	(1.21)	(1.56)	(0.42)	(1.27)	(1.16)	(1.10)	(1.24)	(3.86)***
Fruits	-0.0633	-0.0209	0.0001	-0.0394	-0.0170	0.0055	-0.0099	0.0098	-0.0009
	(2.41)**	(1.01)	(0.01)	(1.84)*	(1.08)	(0.37)	(0.60)	(0.71)	(0.20)
Fresh meat	-0.0721	-0.0527	-0.0278	-0.0473	-0.0533	-0.0342	-0.0713	-0.0571	0.0037
	(2.82)***	(2.43)**	(2.49)**	(1.90)*	(2.82)***	(1.86)*	(3.51)***	(3.34)***	(0.65)
Canned meat	0.0415	0.0365	0.0302	0.0505	0.0292	0.0396	0.0343	0.0484	0.0073
	(1.54)	(1.60)	(2.62)***	(1.84)*	(1.44)	(1.99)**	(1.47)	(2.32)**	(1.10)
Chicken	-0.0032	-0.0575	-0.0118	0.0611	0.0451	0.0462	0.0616	0.0242	-0.0060
	(0.09)	(1.92)*	(0.79)	(1.95)*	(1.88)*	(2.00)**	(2.21)**	(0.99)	(0.79)
Fish	-0.1017	-0.0748	0.0013	0.0340	-0.0226	-0.0284	0.0537	0.0014	-0.0075
	(2.89)***	(2.66)***	(0.10)	(0.82)	(0.68)	(1.01)	(1.87)*	(0.06)	(0.96)
Cereals	0.0737	0.0705	-0.0170	-0.0453	0.0760	0.0176	0.0548	0.0782	0.0179
	(1.74)*	(2.03)**	(0.93)	(1.09)	(2.34)**	(0.61)	(1.75)*	(2.82)***	(2.07)**

Sugar	0.0073	0.0109	0.0242	-0.0023	-0.0295	-0.0137	-0.0613	-0.0570	0.0024
	(0.31)	(0.48)	(2.12)**	(0.08)	(1.34)	(0.72)	(2.14)**	(2.71)***	(0.35)
Peas and beans	0.0317	0.0223	0.0134	0.0172	0.0135	-0.0604	-0.0066	-0.0112	-0.0039
	(1.07)	(0.85)	(1.16)	(0.68)	(0.70)	(2.97)***	(0.27)	(0.52)	(0.63)
Crop loss shock				-0.1949	-0.0856	-0.1137	0.0326	0.0981	-0.0121
				(2.00)**	(1.16)	(1.79)*	(0.57)	(1.98)**	(0.79)
Sugar cane farmer							0.0020	0.0866	0.0070
							(0.02)	(1.18)	(0.32)
Observations	240	240	240	304	304	304	465	465	465
Pseudo R-squared	0.25	0.22	0.32	0.24	0.24	0.44	0.22	0.26	0.30
Log likelihood	-120.41	-116.36	-69.69	-160.40	-145.61	-102.63	-249.47	-223.38	-148.81

Robust z statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

Table 4. Determinants of BMI in Jamaica by livelihood

	Inner city	Fishermen	Farmers
	(1)	(3)	(5)
	Adult bmi	Adult bmi	Adult bmi
Dependency ratio	0.4939	1.6633	-0.2094
	(0.31)	(1.45)	(0.24)
Age of head	0.1076	0.0782	0.3232
	(0.45)	(0.58)	(2.94)***
Age of head squared	-0.0011	-0.0009	-0.0032
	(0.42)	(0.63)	(3.42)***
Education level of hh head	0.4852	0.1813	-0.1362
	(1.81)*	(0.92)	(0.89)
Female headed hh	3.4431	1.6826	1.7130
	(4.65)***	(1.95)*	(2.53)**
Adult equivalent household size	0.4484	0.8538	0.5313
	(1.30)	(2.22)**	(2.49)**
Household weekly income per ae (est)	-0.0261	0.4905	-0.0582
	(0.15)	(3.11)***	(0.51)
Hh belongs in association	8.5604	-0.9492	-0.9623
	(2.34)**	(0.80)	(1.43)
Bank account	-0.0324	-0.0191	0.8013
	(0.04)	(0.02)	(1.27)
Received remittances	0.1122	-1.4633	0.0585
	(0.13)	(2.39)**	(0.10)
House owned (rooms) per ae	0.4665	1.2038	1.0577
	(0.58)	(2.65)***	(3.50)***
Land size per ae		-0.1935	-0.2458
		(0.42)	(2.07)**
No of trees per ae		-0.0826	0.0044
		(2.14)**	(0.33)
No of small animals per ae		-0.0002	-0.0066
		(0.03)	(1.37)
No of big animals per ae		0.1077	0.0987
		(0.44)	(1.61)
Value of other prod capital per ae		0.0085	0.0028
		(1.06)	(0.95)
No of vehicles per ae	16.4995	-0.0664	0.8668
	(2.77)***	(0.03)	(0.63)
No of boats per ae		0.0556	
		(0.35)	
Ground provisions	0.7296	0.4284	-0.1867
	(2.77)***	(1.59)	(0.77)
Vegetables	-0.4601	0.5164	-0.0526
	(1.30)	(1.86)*	(0.20)
Fruits	-0.0729	-0.1235	0.1074
	(0.33)	(0.65)	(0.84)
Fresh meat	0.2938	-0.0143	-0.1764
	(1.04)	(0.08)	(0.99)
Canned meat	0.1250	0.1563	0.2370
	(0.48)	(0.71)	(1.31)
Chicken	-0.2017	-0.1109	0.0183
	(0.60)	(0.48)	(0.08)
Fish	-0.4239	-0.0799	-0.6736
	(1.48)	(0.26)	(2.80)***
Cereals	-0.6063	-0.3424	-0.2065
	(1.59)	(1.04)	(0.78)
Sugar	-0.0996	-0.2820	0.1971
	(0.34)	(1.44)	(1.04)
Peas and beans	0.2939	-0.1953	-0.1297
	(1.22)	(0.94)	(0.63)

Constant	18.8867	18.0098	19.6517
	(3.40)***	(4.57)***	(4.89)***
Observations	240	304	465
R-squared	0.26	0.20	0.13

* significant at 10%; ** significant at 5%; *** significant at 1% Robust t statistics in parentheses
Source: Computed by authors

Table 5. Determinants of food insecurity in St Lucia by livelihood

	Urban, Hotel and Construction Workers			Farmers and Fishermen	
	(1) Feeling vulnerable	(2) Skipping meals of adults	(3) Skipping meals of children	(4) Feeling vulnerable	(5) Skipping meals of adults
Adult bmi	0.0012	0.0009	0.0006	0.0000	-0.0001
	(0.55)	(0.50)	(0.81)	(1.77)*	(0.45)
Dependency ratio	0.0871	0.0411	0.0259	-0.0001	-0.0030
	(1.70)*	(1.04)	(1.46)	(1.90)*	(0.85)
Age of head	-0.0063	-0.0026	-0.0007	0.0000	-0.0005
	(1.37)	(0.75)	(0.42)	(1.41)	(0.76)
Age of head squared	0.0001	0.0000	0.0000	-0.0000	0.0000
	(1.15)	(0.88)	(0.28)	(1.47)	(0.61)
Education level of hh head	-0.0177	-0.0024	-0.0043	0.0000	0.0002
	(2.65)***	(0.50)	(1.69)*	(0.65)	(0.23)
Female headed hh	-0.0011	-0.0199	0.0095	-0.0001	-0.0001
	(0.04)	(0.91)	(0.97)	(2.16)**	(0.03)
Adult equivalent household size	0.0027	-0.0007	0.0048	0.0000	-0.0015
	(0.30)	(0.11)	(2.04)**	(0.10)	(1.56)
Household weekly income per ae (est)	-0.2155	-0.1938	-0.0920	-0.0003	-0.0122
	(1.66)*	(2.01)**	(1.89)*	(2.08)**	(1.01)
Hh belongs in association	0.1268	-0.0372	0.0198	-0.0000	-0.0160
	(1.70)*	(0.80)	(0.84)	(0.07)	(2.63)***
Bank account	-0.0699	-0.1030	-0.0275	0.0000	-0.0058
	(2.24)**	(3.77)***	(2.27)**	(0.08)	(1.43)
Received remittances	-0.0148	0.0279	0.0032	-0.0001	0.0079
	(0.45)	(0.98)	(0.27)	(2.34)**	(1.55)
House owned (rooms) per ae	0.0154	-0.0017	-0.0161	-0.0000	-0.0038
	(0.97)	(0.12)	(2.21)**	(0.86)	(2.22)**
No of vehicles per ae	-0.1887	-0.1210	-0.0605	-0.0004	0.0045
	(1.41)	(1.21)	(1.40)	(2.22)**	(0.41)
No of boats per ae	0.1648	0.1828			
	(1.22)	(1.73)*			
Land size per ae				-0.0000	-0.0013
				(0.01)	(0.89)
No of trees per ae				-0.0000	0.0001
				(1.55)	(2.02)**
No of small animals per ae				0.0000	0.0003
				(0.45)	(0.40)
No of big animals per ae				0.0000	-0.0006
				(1.17)	(0.57)
Value of other prod capital per ae	-0.0810	-0.1206	-0.0210	-0.0004	-0.0226
	(0.93)	(0.68)	(0.65)	(2.09)**	(2.14)**
Flood shock	-0.0778	-0.0623	-0.0063		0.3748
	(2.00)**	(1.92)*	(0.38)		(2.12)**
Storm shock	-0.0042				
	(0.03)				
Drought shock	-0.0093	0.1087	0.0692	-0.0000	
	(0.07)	(0.98)	(1.25)	(0.05)	
Political unrest	-0.0330				
	(0.29)				

Violence	0.0725	-0.0249	-0.0130		
	(1.22)	(0.74)	(1.15)		
Unemployment shock	0.1873	0.1006	0.0859	0.0085	0.0009
	(4.02)***	(2.76)***	(3.69)***	(2.00)**	(0.17)
Death shock	-0.0182	0.0105	0.0358		0.0071
	(0.49)	(0.36)	(2.16)**		(0.91)
Hh suffered theft	0.0069	0.0497	0.0202		
	(0.10)	(0.93)	(0.85)		
Disease (perm/temp)	0.0136	0.0189	0.0105	-0.0000	0.0014
	(0.45)	(0.79)	(1.08)	(1.94)*	(0.42)
Hotel workers	-0.1308	-0.0161	-0.0063		
	(3.71)***	(0.56)	(0.56)		
Construction workers	-0.0102	-0.0459	-0.0084		
	(0.26)	(1.69)*	(0.66)		
Ground provisions	-0.0090	-0.0088	0.0001	-0.0000	0.0003
	(0.97)	(1.27)	(0.04)	(0.54)	(0.32)
Vegetables	-0.0177	-0.0037	-0.0014	-0.0000	-0.0006
	(1.66)*	(0.52)	(0.41)	(1.22)	(0.71)
Fruits	-0.0002	-0.0047	-0.0003	0.0000	0.0002
	(0.02)	(0.77)	(0.11)	(1.36)	(0.22)
Fresh meat	0.0001	-0.0070	-0.0053	-0.0000	0.0006
	(0.01)	(1.17)	(1.79)*	(1.67)*	(1.02)
Canned meat	0.0032	0.0057	0.0018	0.0000	0.0002
	(0.40)	(0.95)	(0.68)	(0.55)	(0.23)
Chicken	0.0149	0.0093	0.0008	0.0000	0.0010
	(1.67)*	(1.31)	(0.37)	(0.09)	(2.13)**
Fish	0.0164	-0.0073	0.0005	0.0000	0.0007
	(1.50)	(1.00)	(0.18)	(1.24)	(0.69)
Cereals	-0.0196	-0.0089	-0.0046	0.0000	0.0021
	(1.38)	(0.80)	(0.94)	(1.76)*	(1.45)
Sugar	0.0018	0.0131	0.0024	-0.0000	-0.0012
	(0.19)	(1.64)	(0.91)	(2.83)***	(1.38)
Peas and beans	0.0082	0.0013	0.0022	-0.0000	-0.0005
	(0.92)	(0.18)	(0.70)	(0.55)	(0.76)
Crop loss shock				0.0002	0.0099
				(1.38)	(1.70)*
Fishermen				-0.0001	-0.0032
				(1.65)*	(1.73)*
Observations	554	554	554	175	175
Pseudo R-squared	0.24	0.23	0.32	0.47	0.35
Log likelihood	-196.72	-161.29	-103.02	-31.72	-26.84

Robust z statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Computed by authors

Table 6. Determinants of BMI in St Lucia by livelihood

	Urban, Hotel and Construction Workers	Farmers and Fishermen
	(1)	(3)
Dependency ratio	1.2911	1.0851
	(1.20)	(0.61)
Age of head	0.3063	0.1131
	(3.15)***	(0.51)
Age of head squared	-0.0033	-0.0011
	(3.32)***	(0.52)
Education level of hh head	-0.0605	-0.0887
	(0.45)	(0.33)
Female headed hh	-1.8553	14.6131
	(1.20)	(3.16)***
Gender of hh head*hh head age	0.0579	-0.2131
	(1.73)*	(2.46)**

Adult equivalent household size	0.3584	0.5110
	(1.99)**	(1.76)*
Household weekly income per ae (est)	4.2238	1.5039
	(1.52)	(0.51)
Hh belongs in association	0.3738	-1.3447
	(0.39)	(0.95)
Bank account	0.7359	-0.0468
	(1.31)	(0.04)
Received remittances	-0.5545	-0.1543
	(0.79)	(0.14)
House owned (rooms) per ae	0.0204	-0.1359
	(0.07)	(0.25)
Land size per ae	-0.0397	0.3077
	(0.56)	(1.00)
No of trees per ae	0.0345	-0.0111
	(0.30)	(0.57)
No of vehicles per ae	-0.1864	-0.2095
	(0.11)	(0.08)
No of small animals per ae	-0.0058	-0.0283
	(1.18)	(0.28)
No of big animals per ae	0.3244	-0.2678
	(1.23)	(3.07)***
No of boats per ae	3.2610	4.2430
	(0.86)	(0.60)
Value of other prod capital per ae	-0.2656	0.6988
	(3.44)***	(1.05)
Ground provisions	0.2529	-0.6208
	(1.61)	(1.50)
Vegetables	-0.1589	0.0958
	(0.86)	(0.27)
Fruits	0.3628	0.2428
	(2.25)**	(0.68)
Fresh meat	0.2881	0.1173
	(2.13)**	(0.46)
Canned meat	-0.2644	0.1492
	(1.97)**	(0.59)
Chicken	-0.0265	0.1002
	(0.15)	(0.40)
Fish	0.0454	0.3365
	(0.22)	(0.86)
Cereals	0.2208	-0.1433
	(0.80)	(0.28)
Sugar	-0.0550	-0.7872
	(0.28)	(2.07)**
Peas and beans	-0.0531	-0.5088
	(0.32)	(1.65)
Hotel workers	-0.4627	
	(0.67)	
Construction workers	-0.8805	
	(1.16)	
Fishermen		-0.2671
		(0.14)
Constant	15.0144	30.7374
	(4.49)***	(3.79)***
Observations	554	175
R-squared	0.10	0.23

* significant at 10%; ** significant at 5%; *** significant at 1% Robust t statistics in parentheses
Source: Computed by authors

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