Food Demand in Rural and Urban Sectors of Papua New Guinea

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Abstract

Data from a nationally representative household survey in 1996 are used to describe the structure of food demand in the rural and urban sectors. The average share of household budgets devoted to each of 36 major food types is reported, as is the proportion of the population consuming the most important of these foods. Items with the highest budget shares include sweet potato, banana, rice and betelnut in the rural sector and rice, chicken, tinned meat, fish and banana in the urban sector. Regression models are used to estimate the impact that changes in household incomes (as measured by total expenditure) have on the demand for each of the 36 major food types. Items whose consumption should increase more than proportionately as household incomes rise include alcohol, pork, chicken, flour, tinned meat and fish in the rural sector, and fish, beer and Irish potato in the urban sector.

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INTRODUCTION

Knowing how the demand for foods responds to changes in household incomes is fundamental to food and nutrition policy analysis (Timmer, *et al.*, 1983). For example, if agricultural planners are to allocate scarce research and extension funds amongst the many foods that can be grown, information about the demand prospects for those foods is required. In particular, it may be helpful to forecast future consumption patterns of foods under alternative scenarios of economic growth and development (Sarma and Gandhi, 1990). Examining demand patterns can help agricultural planners identify market opportunities by showing (i) which foods have large existing demand, and (ii) which foods will be most heavily demanded in future as incomes change.

Various concepts can be used to measure existing food demand. Two of these are:

1. The proportion of the population who consume the item.
2. The average share of household budgets spent on the item.

All else the same, policy interventions that affect the supply or price of a food will have wider effects, the greater is the proportion of the population who consume that food. Similarly, items with a large average share in household budgets will have a larger effect on consumers and producers because of the large expenditures (including the imputed value of own-production) that households make. However the average budget share can be inflated when a minority of the population have an intense demand for an item, while the remainder do not consume it at all. In this case, demand may be vulnerable to what happens to this small group of consumers and this possibility can be allowed for once the proportion who consume is known.

Two economic concepts for predicting future demand under changing incomes are:

1. The income elasticity of demand.
2. The marginal budget share.

The income elasticity of demand measures the percentage by which the quantity demanded of an item increases following a one percent increase in household income. When the demand increases by more than one percent, an item is known as a "luxury good", when the demand increases by between zero and one percent, it is a "normal good", and when the demand goes down as incomes rise, it is an "inferior good" (Sadoulet and de Janvry, 1995). The marginal budget share measures how a household allocates any additions to its budget, in contrast to the existing division of the budget. For example, if a household's income rose by K100 per year, the marginal budget share for a particular food shows how many Kina or toea from that K100 would be spent on the food. Hence, the marginal budget share is a good measure of the value of future demand.

In addition to being useful for predicting future food demand, income elasticities can be combined with information on the nutritional importance of foods to predict the effect of various policies on the nutritional status of the population. For example, Pinstrup-Andersen, de Londono, and Hoover (1976) use data on demand patterns to see how reallocating the agricultural research budget would affect the nutrition of the urban poor in Colombia.

Previous attempts to predict future food demand in Papua New Guinea have been hampered by lack of information on either the current structure of food consumption or the income elasticities of food demand. The purpose of this paper is to report new evidence on food demand in Papua New Guinea, using nationally representative household survey from 1996. These data are used to estimate four different measures of demand: the proportion of the population who consume the food, the average and marginal budget shares and the income elasticity of demand. The results are presented separately for urban and rural sectors but most attention is paid to the rural sector because previous evidence on food demand in urban areas has been reported by Gibson (1998).

METHODS AND DATA SOURCES

The calculation of average budget shares and proportions of the population who consume each item are straightforward and need no further description. But methods of estimating income elasticities are less well known so are described below.

Income elasticities are typically calculated from regression equations where either the quantity consumed of a particular food or the share of the budget devoted to that food are regressed on household incomes and other control variables. As a practical matter, the consumption quantities and budget shares take into account consumption from own-production, while household income is typically measured by total expenditure (again with imputed values for own-production) because expenditures are a better guide to the long-run standard of living of the household (Deaton, 1989).

The regression equations used in this paper are of the "share-log" functional form, where the budget share of the *i*th food (w_i) is regressed on the logarithm of household income (x) plus other variables. One advantage of this functional form is that it can be estimated when a household has zero consumption of a particular food, which is not possible if the logarithm of quantity is used as the dependent variable. The regression model is:

$$w_i = a_i + b_i \ln x + Q_{ij}.z_j + u_i, \qquad (1)$$

where z_j is the vector of control variables, a_i, b_i and Q_{ij} are parameters to be estimated, and u_i is a random error term. The coefficient b_i gives the rate at which the budget share for the *i*th food changes as the logarithm of income changes, $\partial w_i / \partial \ln x$, and this can be transformed into the elasticity of the budget share with respect to income, $\partial \ln w_i / \partial \ln x$, by dividing by w_i (because $\partial \ln w_i = \partial w_i / w_i$). The fact that the budget share is the product of price, p_i, and quantity, q_i, divided by total expenditure, x (and hence $\ln w_i = \ln p_i + \ln q_i - \ln x$) means that

$b_i / w_i = [\partial \ln q_i / \partial \ln x] - 1$ (because $\partial \ln p_i / \partial \ln x = 0$). Thus, the income elasticity of the quantity demanded of the *i*th food, e_i can be calculated from the formula:

$$e_i = \frac{\partial \ln q_i}{\partial \ln x} = \frac{b_i}{w_i} + 1 \ . \qquad (2)$$

Because budget shares vary by household, the income elasticity calculated with equation (2) also varies. For example, the estimated sago demand of rich households can be less income elastic than the sago demand of poor households, because sago has a bigger budget share for poor households. This is consistent with the empirical pattern usually found (Timmer, Falcon and Pearson, 1983). However, in the results presented below the elasticities are evaluated at a single point for each sector – the mean budget share – because otherwise there would be too much detail to allow easy interpretation.

The marginal budget share is estimated by multiplying the income elasticity of demand for the *i*th food by the average share that food *i* has in household budgets. These marginal budget shares must obey the "adding-up" condition that they sum to one. In other words, the value of all extra demands, following a rise in income, must exactly equal the value of the extra income (Deaton and Muellbauer, 1980). This condition provides a cross-check on the plausibility of the estimates.

Data

Data used in this paper come from the Papua New Guinea Household Survey (PNGHS), which is a nation-wide household consumption survey carried out as part of a World Bank poverty assessment. The survey covered a random sample of 1200 households, residing in 120 rural and urban communities ("clusters"), who were interviewed between January and December 1996. The clusters were selected in a stratified manner from the

enumeration areas of the 1990 Census and came from all provinces except North Solomons. A set of household weights were derived from the variation between the 1990 Census estimates of the size of each cluster and the actual size found during the survey, and from the deviation of the actual number of households surveyed in each cluster from the target number. These sampling weights allow the results reported to be representative of PNG in 1996. The results reported are estimated from the 1144 households who had complete information on their consumption, with 830 of these households in the rural sector and 314 in the urban sector.

The survey interviewed each household twice, with the start of the recall period (which was typically two weeks) signalled by the first interview. Expenditure data were collected on all food (36 categories) and other frequent expenses (20 categories) during the recall period. The expenditure estimates include the imputed value of own-production,[2] net gifts received, and stock changes, so they should be a good measure of consumption during the recall period. An annual recall covered 31 categories of infrequent expenses. An inventory of durable assets was used to estimate the value of the flow of services from these assets, including rental services from owner-occupied dwellings. All of these components are added together to give the estimate of household total expenditure which is used here in the calculation of the budget shares for each food and in the estimation of the income elasticities of demand.

In addition to marking the beginning of the consumption recall, the first visit to each household was also used to collect details on demographic characteristics, including age, gender, main income sources and schooling levels. These data are used to create control variables for the food budget share regressions. Amongst these control variables are the size of

[2] The monetary values for self-produced foods were the values used by respondents. Estimates of average expenditure are unchanged if these respondent-reported unit values are replaced by either cluster medians of the unit values or cluster averages of market prices (Gibson and Rozelle, 1998).

the household and the share of household members who fall into various age and gender groups, the characteristics of the household head (under the assumption that this person has some influence over family diets) and the region in which the household is located. A further question asked on the first visit to the household was "what did the family eat yesterday?" and this provides the data for estimating the share of the population consuming each of 18 major food types.[3]

RESULTS AND DISCUSSION

The major differences in the structure of rural and urban diets are apparent from Table 1, which indicates that, on any given day, sweet potato is consumed by two-thirds of the rural population but only one-third of the urban population. On the other hand, almost 90 percent of urban residents may be found eating rice while the rate for rural residents is only one-quarter. A similarly large difference in the composition of rural and urban diets occurs with wheat products, which are consumed by only 15 percent of the rural population on any given day but by 75 percent of the urban population. Other items that occur frequently in urban diets but much less frequently in rural diets are tinned meat, fresh fish, chicken and tinned fish.

The three remaining measures of demand (average and marginal budget shares and income elasticities) for each of the 36 foods (including betelnut and beverages) are reported in Table 2 for the rural sector and Table 3 for the urban sector. Measures for the aggregate non-food group (containing all other goods and services) are provided for comparison. If interest is in average levels of expenditure, rather than expenditure shares, the desired information can be derived from Tables 2 and 3 by noting that average expenditure per household (including imputed values of self-

[3] A similar question was asked by the 1982-83 National Nutrition Survey, although care must be taken in comparing the results of the two surveys because the sampling procedures and weighting methods differed.

produced items, net gifts and services from durables) in 1996 was approximately K4,400 in the rural sector and K11,900 in the urban sector.[4]

In the rural sector the items with the largest average shares of household budgets are sweet potato, banana, taro,[5] rice, betelnut (including lime and mustard), and pork. These six items comprise over one-third of the total consumption of rural households, noting once again that the consumption estimate includes imputations for self-production, gifts and the services from durable assets and dwellings. The importance of sweet potato is evident from the fact that its average budget share (0.12) is twice as high as for the next most important food.

In the urban sector the items with the largest average shares of household consumption are rice, chicken, tinned meat, beer, fish (other than tinned fish), and meals consumed outside the home (e.g., kai bars, clubs and restaurants). The greater diversity of urban diets is apparent from the fact that these leading six items comprise less than one-fifth of the average urban budget, whereas the six most important items contributed over one-third in the rural sector. The most important of the locally produced items – excluding those that are based heavily on imported inputs – in urban diets are fish, banana, betelnut and sweet potato. Another important feature of the urban sector is that food as a whole is a smaller element of the total budget, being just under 50 percent whereas in the rural sector the average food share is two-thirds.

The income elasticities and marginal budget shares in Tables 2 and 3 are derived from 72 different regression equations, so rather than report all of this detail the regression results for a

[4] Urban household expenditures are higher both because per capita expenditure levels are higher on average (K1930 vs K730) and household size is larger (6.6 versus 5.7 residents).
[5] One weakness of the survey was that Chinese taro and taro *tru* were combined into one group for the consumption recall, so there is no way to disaggregate results for these two separate foods.

single food (sweet potato) are reported in Table 4 to illustrate the approach. The key regression coefficient is b, which shows that in the rural sector the budget share of sweet potato declines by 3.2 percentage points for every unit increase in the natural logarithm of total expenditure (which corresponds to almost a tripling of household total expenditures). The results for the other variables in the regression equation show that the budget share of sweet potato is greater in larger households, who presumably have sufficient family labour available to ensure economies in preparation time (this also applies to other root crops). The budget share of sweet potato is lower in the rural sector for female-headed households and for households where the head's main source of income is non-agricultural, while in the urban sector the budget share is lower for households whose head is younger. Controlling for incomes and household characteristics, the share of household consumption devoted to sweet potato is significantly higher in the Highlands and in Momase (urban sector only) than in the base regions.

Although the *share* of expenditure devoted to sweet potato falls there is still a rise in the *quantity* of sweet potato consumed as household income rises. Using the results from Table 4 and the average budget shares reported in Table 2, the income elasticity of demand for sweet potato in the rural sector is given by the formula in equation (2): $[-0.032/0.1197]+1=0.73.$ Thus, a ten percent increase in household income (as measured by total expenditures) should cause a seven percent increase in the quantity of sweet potato consumed in the rural sector. Carrying on the same illustrative example, the marginal budget share of sweet potato can be calculated as: $0.73\times 11.97 = 8.78,$ so a K100 rise in total household expenditure for a rural household would produce K8.78 of additional expenditure on sweet potato (noting, again, that this expenditure includes the imputed value of self-produced items).

The income elasticities of demand, and associated standard errors, are reported in the third

column of Tables 2 and 3. The items with the largest income elasticities in the rural sector are beer (2.47±0.36), other alcohol (2.36±0.45), pork (2.07±0.20), chicken (1.65±0.11), soft drink (1.61±0.09), milk (1.58±0.18), snack food (1.47±0.17), flour (1.41±0.13), tinned meat (1.40±0.10), and fresh and dried fish (1.36±0.18). Several other items would also be classified as luxury goods, with demand expected to rise more than proportionately as rural household incomes rise. The food with the lowest income elasticity in the rural sector is sago (0.21±0.30), and the hypothesis that the demand for sago is unresponsive to changes in rural household incomes $(\text{i.e. } e_i = 0)$ cannot be ruled out. Thus in times of hardship, when household incomes are falling, sago consumption is unlikely to fall while there will be proportionately large declines in the consumption of the luxury goods.

Most of the items identified as luxury goods in the rural sector are normal goods in the urban sector, which partly reflects the generally higher living standards of urban households who come to expect these 'luxuries' as items that can be consumed more heavily and regularly. The items with the largest income elasticities in the urban sector are fresh fish (1.46±0.24), beer (1.41±0.19), Irish potato (1.30±0.28), taro (1.26±0.53), and meals consumed away from home (1.24±0.29). But once the sampling errors are taken account of, the hypothesis that these items are normal goods can only be ruled out for fish and beer, as well as for the aggregate non-food group (e_i=1.26±0.02). No inferior goods were identified but some important foods had income elasticities in the urban sector that were fairly low, e.g., sugar (0.08±0.22), flour (0.13±0.35), sweet potato (0.25±0.28), banana (0.28±0.32) and rice (0.40±0.22).[6] Rising urban incomes will not lead to big percentage increases in the demand for these basic foods, although they will remain important commodities because their

[6] The elasticities for the urban sector are surrounded by wider standard errors than those for the rural sector because of the much smaller size of the urban sample. For the same reasons, these estimates of urban income elasticities are less precise than those reported by Gibson (1998) but they are otherwise in broad agreement.

existing budget shares are high.

The final column of Tables 2 and 3 gives the marginal budget shares for each item. This is the amount of extra spending on an item if the household had an extra K100 income available. The "adding-up" condition that the sum of extra expenditures exactly equals K100 holds for both sectors, and this confirms the plausibility of the results. The items that would capture the biggest shares of increased consumption by rural households are sweet potato, pork, banana, rice, betelnut, taro and Chinese taro, beer, and chicken. The items that would gain the biggest share of increased spending by urban consumers include beer, fish (other than tinned), chicken, takeaway meals, rice, betelnut, and bread.

Discussion

The information in Tables 1-3 on consumption rates, budget shares and income elasticities allows a ranking of food crops that may be helpful in guiding research and extension priorities (although other factors, such as compatibility with existing farming systems and environmental suitability cannot be neglected). A variety of different criteria can be used to allocate research efforts across crops. One way is to allocate research resources to the foods consumed by the largest proportion of the population so that any improvements in quality or reduction in price (or the opportunity cost of production for producer-consumers) benefit the greatest number of consumers. An alternative criteria would consider the existing value (or share) of consumption because innovations in the production, processing and marketing of such foods would have the largest effects on national welfare level.[7]

[7] If an explicit poverty focus is taken, a ranking of foods a ranking of foods according to those whose consumption is concentrated most heavily on the poor can be used (Gibson, 1998a).

The long lags between the start of a research effort and the eventual diffusion of, say, an improved crop variety means that planners must also have an eye to the future structure of food demand when making their research allocations. Both the income elasticities and marginal budget shares can help in predicting future food demand but the marginal budget share is the most useful concept because it gives a measure of the item's monetary importance. For example, Irish potato appears to be a luxury good in the rural sector (ε=1.25), so it might be concluded that producers should concentrate on this item because its demand will rise rapidly with increases in incomes. But Irish potato is such a minor consumption item that a rural household with an extra K100 would allocate only 20 toea to extra consumption. Even though sweet potato has a lower income elasticity, the same household would allocate K8.78 to extra sweet potato consumption so the future research payoff is likely to be greatest from sweet potato.

The other important factor to consider when using the results reported here to guide research decisions is that the structure of food demand differs dramatically between urban and rural areas. It is not surprising that the consumption rates for various foods and their average budget shares differ across sectors because food marketing costs are high and there is also a considerable gap in living standards between average households in urban and rural areas. But there are also considerable differences in the pattern of income elasticities across the urban and rural sectors, so future growth rates in the consumption of particular foods will differ even if rural and urban households benefited equally from economic growth.

CONCLUSIONS

Income elasticities of demand and average and marginal budget shares were estimated for 36 food items in the rural and urban sectors of Papua New Guinea. The proportion of the population consuming each of 18 main food groups was also estimated. The ranking of items

according to consumption rates, income elasticities and budget shares may provide useful economic criteria for the setting of research and extension priorities.

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Table 1: Proportion of the Population Consuming Each Food

	Rural	Urban	Papua New Guinea
Greens	74.3	78.9	75.0
Sweet Potato	65.0	33.6	60.2
Rice	25.8	87.4	35.1
Banana	33.6	38.7	34.3
Coconut	28.4	34.2	29.2
Biscuit/Bread/Flour/Scone	14.4	74.6	23.5
Taro and Chinese Taro	23.9	9.6	21.7
Sago	13.3	18.9	14.2
Tinned Meat	5.9	51.7	12.8
Legumes	12.7	7.8	12.0
Tinned Fish	9.1	24.5	11.4
Yams	12.5	4.8	11.3
Fresh Fish, Shellfish	7.1	28.2	10.3
Chicken	4.1	26.5	7.5
Pork, Beef, Other meat	6.4	9.9	6.9
Cassava	6.9	4.3	6.5
Lamb and Mutton	5.0	13.7	6.3
Bush Meat	1.8	1.5	1.7

Table 2: Demand Characteristics for Foods in Rural Sector of Papua New Guinea (Ranked by marginal shares of total expenditure)

	Average share of total expenditure %	Expenditure elasticity ± std. err.	Marginal share of total expenditure %
Sweet potato	11.97	0.73 ± 0.09	8.78
Pork	3.12	2.07 ± 0.20	6.48
Banana (cooking and sweet)	6.72	0.81 ± 0.12	5.46
Rice	3.93	1.14 ± 0.07	4.49
Betelnut, lime and mustard	3.66	1.10 ± 0.10	4.02
Taro and Chinese Taro	5.30	0.75 ± 0.10	3.97
Beer	1.26	2.47 ± 0.36	3.11
Chicken	1.71	1.65 ± 0.11	2.83
Other greens, vegetables and nuts n.e.s.a	3.02	0.73 ± 0.08	2.21
Yams	2.19	0.97 ± 0.14	2.12
Meals consumed away from home	2.03	0.93 ± 0.12	1.89
Fish (fresh, frozen, dried, incl. shellfish)	1.31	1.36 ± 0.18	1.77
Tinned meat	1.17	1.40 ± 0.10	1.64
Tinned fish	1.66	0.96 ± 0.10	1.59
Coconut	1.54	0.87 ± 0.11	1.34
Soft drink	0.78	1.61 ± 0.09	1.26
Bush meat and other unspecified meat	1.24	0.96 ± 0.23	1.19
Cassava	1.30	0.91 ± 0.13	1.18
Sugar	0.93	1.24 ± 0.09	1.14
Lamb and mutton	0.94	1.13 ± 0.20	1.06
Flour	0.65	1.41 ± 0.13	0.93
Butter, margarine, cooking oil & dripping	0.88	0.96 ± 0.14	0.85
Biscuits	0.67	1.25 ± 0.12	0.84
Sugar cane	1.31	0.64 ± 0.12	0.84
Peanut	0.77	1.03 ± 0.29	0.79
Fresh fruit (excluding bananas)	0.87	0.79 ± 0.12	0.68
Aibika	1.01	0.56 ± 0.11	0.56
Tea, coffee and milo	0.43	1.30 ± 0.13	0.56
Alcoholic drinks (except beer)	0.19	2.36 ± 0.45	0.46
Milk (liquid, powdered, canned)	0.28	1.58 ± 0.18	0.44
Sago	2.11	0.21 ± 0.30	0.44
Salt, pepper, spices, sauces	0.46	0.84 ± 0.14	0.39
Snack food (Twisties, chewing gum, etc.)	0.18	1.47 ± 0.17	0.27
Bread	0.20	1.21 ± 0.26	0.24
Irish potato	0.16	1.25 ± 0.29	0.20
Other diary and cereal products and eggs	0.18	1.11 ± 0.16	0.20
Non-food	33.86	1.00 ± 0.04	33.79

Note: Results are estimated from a representative sample of 830 households in 73 Census Units, with the effect of population weights, stratification and two-stage sampling controlled for in the analysis.

Table 3: Demand Characteristics for Foods in Urban Sector of Papua New Guinea
(Ranked by marginal shares of total expenditure)

	Average share of total expenditure %	Expenditure elasticity ± std. err.	Marginal share of total expenditure %
Beer	2.90	1.41 ± 0.19	4.07
Fish (fresh, frozen, dried, incl. shellfish)	2.60	1.46 ± 0.24	3.80
Chicken	3.16	1.07 ± 0.18	3.37
Meals consumed away from home	2.51	1.24 ± 0.29	3.12
Rice	5.26	0.40 ± 0.22	2.11
Betelnut, lime and mustard	2.09	0.88 ± 0.17	1.84
Bread	1.44	1.09 ± 0.08	1.56
Taro and Chinese Taro	1.21	1.26 ± 0.53	1.53
Tinned meat	3.15	0.46 ± 0.09	1.46
Lamb and mutton	2.12	0.62 ± 0.12	1.32
Tinned fish	2.30	0.43 ± 0.13	0.99
Soft drink	1.87	0.52 ± 0.22	0.98
Coconut	1.03	0.76 ± 0.07	0.79
Biscuits	1.14	0.64 ± 0.10	0.73
Butter, margarine, cooking oil & dripping	0.92	0.73 ± 0.08	0.68
Other diary and cereal products and eggs	0.67	1.01 ± 0.12	0.67
Other greens, vegetables and nuts n.e.s.a	0.88	0.76 ± 0.12	0.67
Banana (cooking and sweet)	2.41	0.28 ± 0.32	0.66
Tea, coffee and milo	0.80	0.74 ± 0.08	0.60
Bush meat and other unspecified meat	0.65	0.86 ± 0.33	0.56
Milk (liquid, powdered, canned)	0.98	0.57 ± 0.16	0.56
Fresh fruit (excluding bananas)	0.68	0.82 ± 0.26	0.55
Sago	1.06	0.49 ± 0.42	0.52
Sweet potato	1.84	0.25 ± 0.28	0.45
Aibika	0.61	0.70 ± 0.19	0.43
Snack food (Twisties, chewing gum, etc.)	0.56	0.65 ± 0.39	0.36
Pork	0.34	0.97 ± 0.27	0.33
Alcoholic drinks (except beer)	0.29	0.95 ± 0.56	0.28
Irish potato	0.20	1.30 ± 0.28	0.26
Yams	0.20	1.09 ± 0.33	0.22
Salt, pepper, spices, sauces	0.33	0.63 ± 0.18	0.21
Sugar cane	0.29	0.58 ± 0.56	0.17
Peanut	0.22	0.69 ± 0.30	0.15
Cassava	0.49	0.31 ± 0.25	0.15
Flour	1.17	0.13 ± 0.35	0.15
Sugar	1.17	0.08 ± 0.22	0.09
Non-food	50.46	1.26 ± 0.02	63.60

Note: Results are estimated from a representative sample of 314 households in 47 Census Units, with the effect of population weights, stratification and two-stage sampling controlled for in the analysis.

Table 4: Budget Share Regressions for Sweet Potato

	Rural Sector		Urban Sector	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic
ln total expenditure	-0.032	3.05	-0.014	2.68
ln household size	0.035	2.96	0.006	1.49
Share of household who are:				
Female, age 15+ years	-0.015	0.59	-0.004	0.35
Female, age 7-14 years	-0.030	0.73	0.012	0.71
Female, age 0-6 years	-0.022	0.58	-0.015	1.40
Male, age 7-14 years	0.008	0.19	-0.004	0.32
Male, age 0-6 years	-0.009	0.26	0.017	0.79
Characteristics of head				
Head's school years	-0.001	0.90	0.000	0.75
Age of head	0.000	0.25	0.000	1.79
Female head	-0.027	1.71	0.005	0.35
Head's main income is wage or formal business	-0.044	3.22	-0.008	1.09
Regional effects				
Papuan	…	…	0.001	0.56
Highlands	0.098	3.31	0.026	7.66
Momase	-0.029	1.02	0.021	2.63
New Guinea Islands	-0.032	1.22	0.003	0.89
Constant	0.304	3.37	0.138	3.97
R^2	0.253		0.241	
Zero slopes *F*-test	$F_{(14,47)}$=6.22		$F_{(12,34)}$=229.14	
Number of observations	830		314	

Note: The excluded demographic group is males age 15+ years, while the Papua region is excluded for the rural sector regression and the NCD is excluded for the urban sector regression. Results correct for the population weighting, stratification and two-stage sampling of the survey.