

## Food Prices and Health Outcomes in Pacific Island Countries

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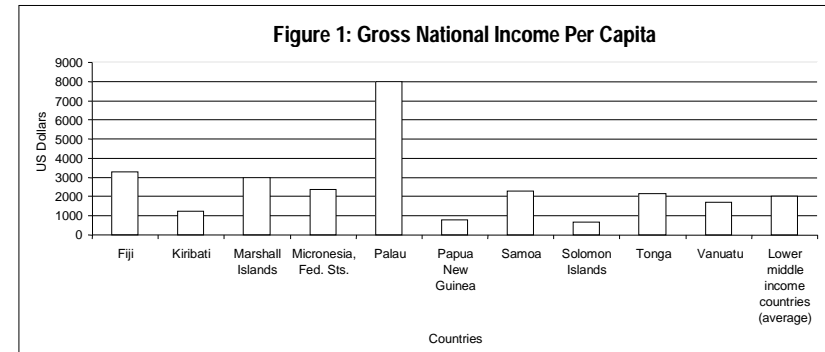
### Abstract

*This paper investigates the effect of food prices on health using published data for Pacific Island countries. The empirical results show that while food prices are positively correlated with infant mortality and crude death rates, they are statistically insignificant. However, the results do confirm that rising food prices are strongly associated with falling life expectancy, rising incidence of diseases, and crude death rates. It also confirms that the level of immunisation matters and is strongly associated with under five mortality rates.*

### Introduction

Pacific Island countries are a mixture of low and lower-middle-income category of countries and are part of the 157 countries globally that make the low and lower-middle-income category. Per capita incomes in 2005 have ranged from US\$680 in Solomon Islands to US\$7,990 in Palau with majority of the countries falling in the US\$1,000 to US\$3,000 per capita income bracket (Figure 1). In some countries, per capita incomes are even below the average of the lower-middle-income category of countries. The economic performances of several Pacific Island countries have been poor for a number of years (see the World Bank, 2006a; Duncan and Chand, 2002; and Chand, 2005). Several countries do not fare well in terms of their human development achievements. On the basis of the human development index (HDI), the Pacific Island countries fall in the low and medium human development category (UNDP, 2006: Table 1). Several other measures of human well-being reveal an unimpressive picture. For example, in a recent report titled *Opportunities to Improve Social Services in Pacific Islands*, the World Bank (2007) notes

that 'human development in the Pacific Islands have stagnated and public health systems, having yet to eradicate communicable diseases such as Malaria, Leprosy and Tuberculosis, are now challenged by increasing rates of STIs and the emergence in the region of HIV/AIDS'.



Source of data: World Bank (2006b).

**Table 1. Selected Health Outcome Indicators, 2005**

Countries	Infant mortality (per 1,000 live births)	Under 5 mortality per 1,000 life births	Crude deaths per 1,000 people	Life expectancy at birth (total years)
Fiji	15.7	17.9	5.5	68.3
French Polynesia	...	...	5.1	73.8
Guam	...	...	4.5	75.2
Kiribati	48.0	65.0	6.9	63.0
Marshall Islands	51.0	58.0	...	...
Micronesia	33.7	41.8	5.5	68.1
New Caledonia	...	...	6.1	75.2
Northern Mariana Is.	...	...	...	...
Palau	10.3	11.4	7.0	...
Papua New Guinea	55.2	74.4	9.8	56.4
Samoa	24.0	29.0	6.1	70.7
Solomon Islands	23.6	28.7	4.5	62.9
Tonga	20.0	24.0	7.5	72.1
Vanuatu	31.0	38.0	5.2	69.5
Low income countries	75.3	114.6	...	59.0
Lower middle income countries	31.0	39.8	...	70.6

Note: ... indicates data not available.  
(Source: World Bank, 2006b).

The development achievements in Pacific Island countries is of concern as low levels of development can threaten human security (through crime, violence and accident, and political instability). This poses a major developmental challenge for them, for example, in terms of achieving the targets of the Millennium Development Goals (MDG). In formulating the MDGs, launched a decade ago with a vision for a better world, (UN, 2000 and 2006), leaders from every country agreed on a vision for the future – a world with less poverty, hunger and disease, greater survival prospects for mothers and infants, better educated children, equal opportunities for women, a healthier environment, and a world in which developing countries worked in partnership for the betterment of all (UN, 2006). Eventuating from this declaration are the MDGs, a set of time bound and quantified targets for reducing extreme poverty and extending universal rights by 2015, provide the benchmarks for measuring progress. This vision was formulated into eight MDGs, which forms the framework for development and time-bound targets by which MDG achievements can be measured. The MDGs four and five are important as far as health outcomes are concerned. Goal four is to reduce the mortality rate by two thirds among children under five, and goal five is to reduce the maternal mortality ratio by three quarters.

Data show that several Pacific Island countries have poor health outcomes (Table 1) and may fall short of meeting the desired Millennium Development targets by 2015. The health outcome statistics is poor for some countries as some of the health outcome indicators are worse than the average achievements in the low and lower-middle-income category of countries (Table 1). Poor health outcomes should be of concern to Pacific Island governments and regional policy makers. Attention needs to be focussed on injecting more resources in improving various health outcome indicators. It is known that countries devoting more resources towards health care are able to achieve higher quality of health and health related services. Better quality health care translates into better health outcomes such as lower mortality and higher life expectancies. Longer life expectancies allow larger investments in human capital which in turn can contribute towards raising per capita incomes (Stark, 1995). Longer life expectancies can also encourage entrepreneurs to make larger investments in the production sector (Gupta and Mitra, 2004).

A factor that may influence health outcomes is food security; this is defined as access by all people at all times to enough food for an active healthy life (World Bank, 1986). The MDG health outcomes (goals four and five) can be directly influenced by ensuring food security, among

other factors. If food is readily available, households are secure in terms of avoiding any hunger or starvation, both likely to directly influence infant and child mortality rates. Food insecurity can equate to nutrient insecurity, which can lead to deaths. Nutrient security focuses on the body's ability to utilise food for satisfactory physical and cognitive achievement. The growth in under nourishment is largely due to food accessibility and availability constraints. Nutrient and mineral deficiencies such as Vitamin A, iron and iodine can have serious consequences for health, mental and physical functions.

Among other factors, food security is directly influenced by food prices. Low food prices mean easier access to food and high levels of consumption. Thus, if more food is available, the better fed the population is, leading to lower incidence of malnutrition and even deaths. Garrett and Ruel (1999) note that the access that a household has to food depends on whether the household has enough income to purchase food at prevailing prices or has sufficient land and other resources to grow its own food. Thus, food security can be ensured only if two conditions are met: food must be available and households must have the ability to acquire it (The World Bank, 1989). Hence, if food is readily available, households are secure in terms of avoiding any hunger or starvation, both likely to directly influence human health.

Available statistics indicate that in the Pacific Island countries, food production has been falling while food prices have been rising. Thus, when agriculture is weakened, it can have a serious effect on food security and eventually health outcomes. Accordingly, this paper investigates whether food prices matter for health outcomes in the Pacific Island countries. The next section discusses the trends in food production and prices. Section three presents a discussion of the analytical framework relating to food prices and health outcomes. Data and variable measures are discussed in section four. Section five discusses the findings.

### **Some Aspects of Food Production and Prices**

Several of the Pacific Island countries seem to face food insecurity with varying magnitudes. Food production data reveals that while food production increased over the 1990-97 period, many countries experienced falling or stagnating food production since 1998 (Figure 2). Fiji and Vanuatu reveal large drops in their food production compared to other countries (Figure 2).

With falling and stagnating domestic food production, the numbers of undernourished people are likely to have increased. This is expected to

have more adversely affected women and children, given food accessibility and availability constraints. At the time when food production has been falling or stagnating, the Pacific Island countries' populations have been rising. Population growth for the 1990-2005 period averaged 1.0 percent in Fiji; 2.1 percent in Kiribati; 2.2 percent in Marshall Islands; 1.0 percent in Micronesia; 2.4 percent in Papua New Guinea; 0.9 percent in Samoa; 2.7 percent in Solomon Islands; 0.5 percent in Tonga; and 2.3 percent in Vanuatu. This trend in population growth is certain to have placed demand pressures for food.

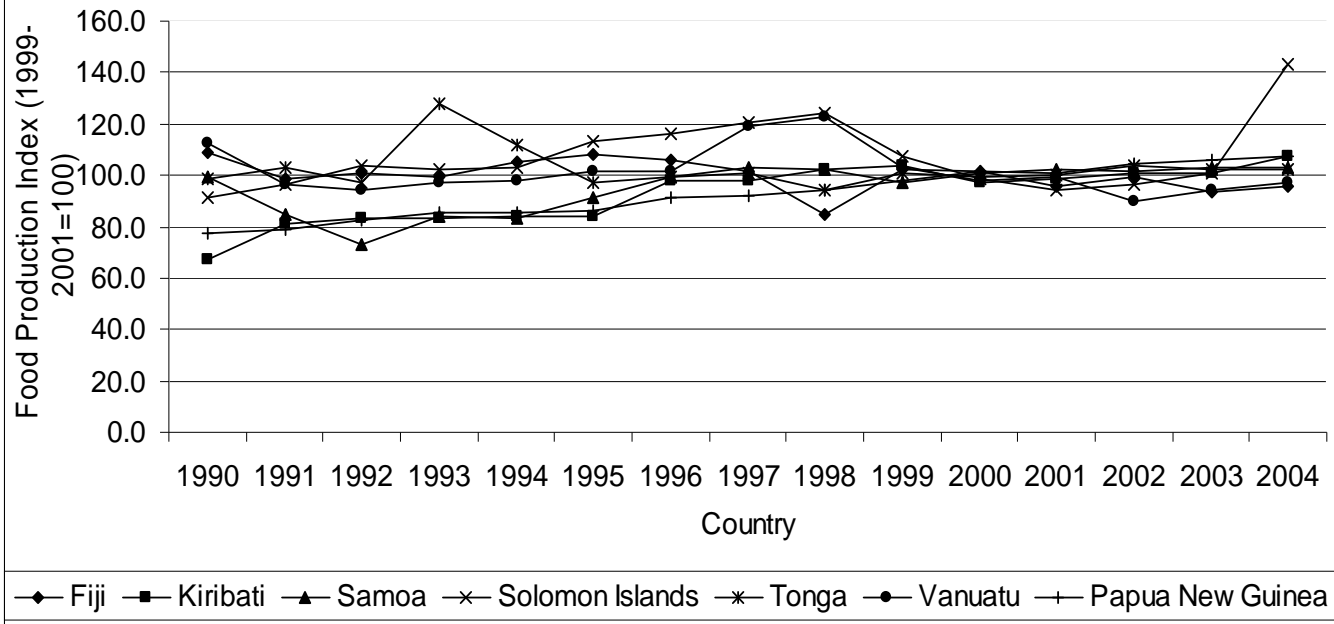
Population pressures are also likely to have an impact on the availability of arable land; the latter does not exceed 23% of total land area (Figure 3). None of the Pacific Island countries show any significant increase in arable land over the 1990-2003 period. Further, the decline in the value of agricultural sector, added as a percent of GDP since 1990, is not surprising (Figure 4). It is possible that the decline in arable land together with a rising population, would have negatively contributed to the current state of poverty as poverty levels are also considered to be high in many countries.

Falling food production and agricultural value added to GDP as depicted in Figures 2 and 4 lead to the issue of whether the Pacific Island countries are secure in terms of domestic food production. It is to be noted that two key aspects of food security are availability of sufficient food and access to food. One factor that can directly affect health is food prices. Increase in food supply mean lower food prices, easier access to food, and higher levels of consumption, all resulting in a healthier, well fed population. Figures 5 and 6 depict the trends in food prices for the Pacific Island countries; the long term trends are obvious. Marshall Islands, Tuvalu, Palau, Fiji, Papua New Guinea, Solomon Islands, Tonga, and Vanuatu experienced notable increases in their food prices.

With rising food prices, food consumption is likely to have been affected negatively. Thus, food price is expected to be negatively correlated with human health outcomes: rising food prices would mean rising mortality and falling life expectancies.

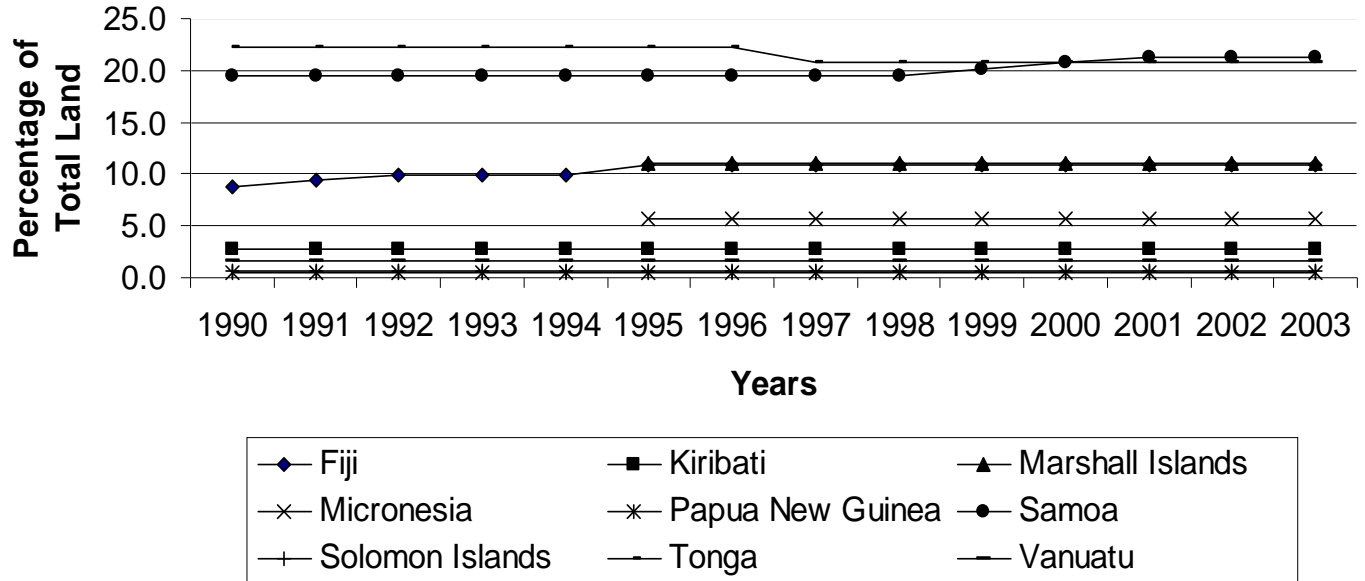
The theoretical relationship between food price and health indicators are discussed further in section three. Falling food production together with rising food prices can also contribute to malnutrition. Malnutrition can have profound implications: damaging health and leading to lifelong physical or cognitive disabilities that reduce chances of survival (UNDP, 2006b).

**Figure 2: Food Production**



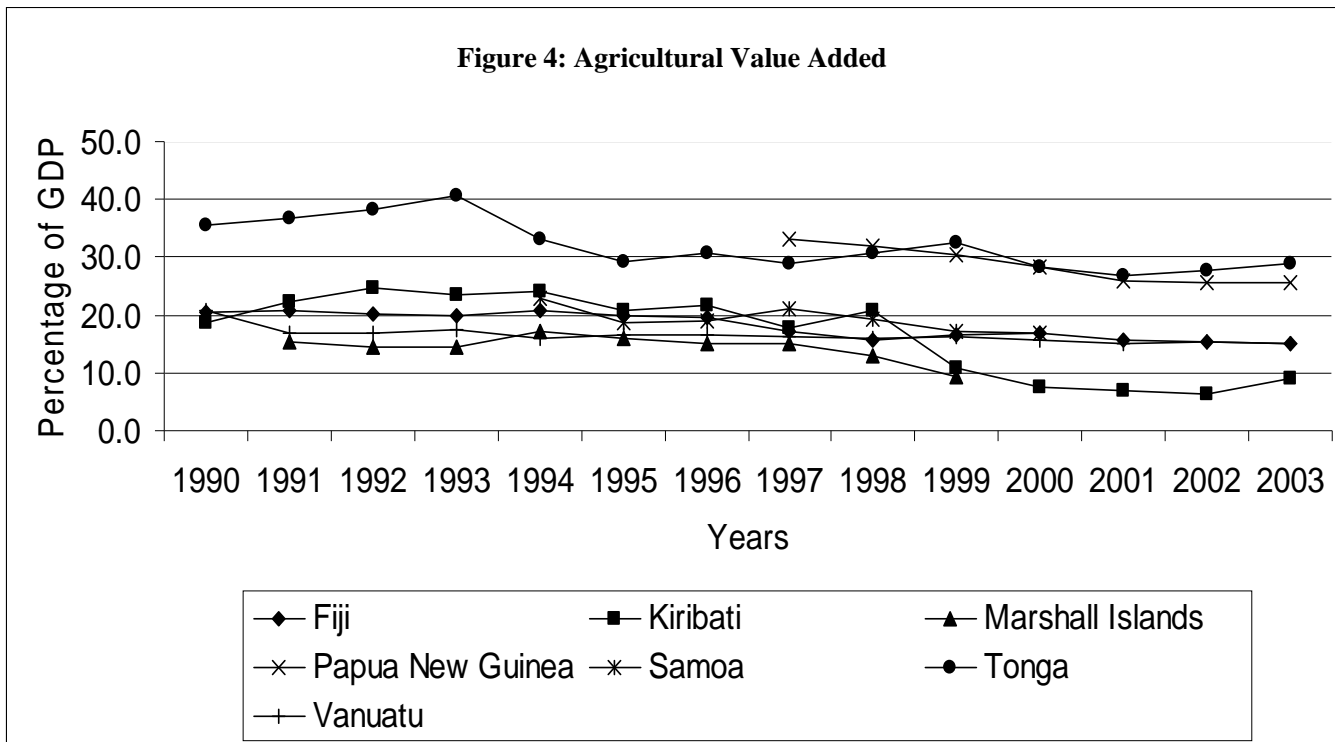
(Data source: World Bank, 2006b).

Figure 3: Arable Land

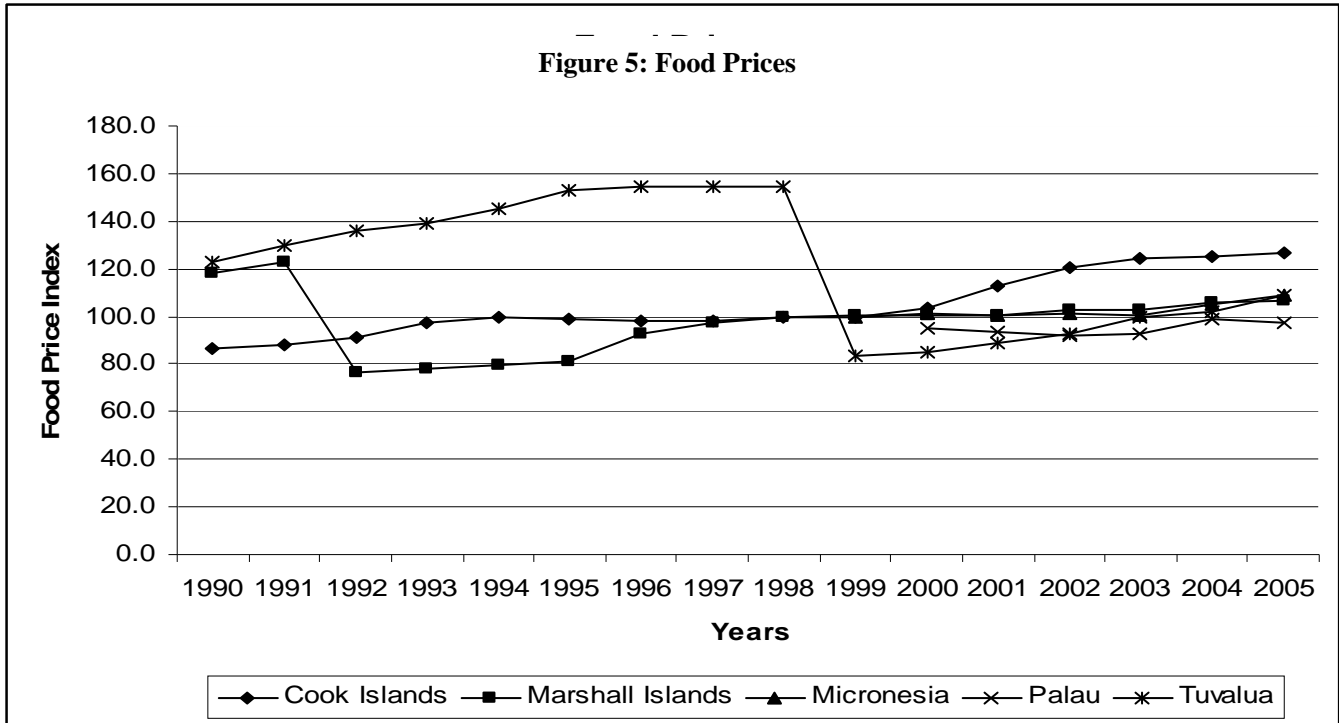


(Data source: World Bank, 2006b).

**Figure 4: Agricultural Value Added**

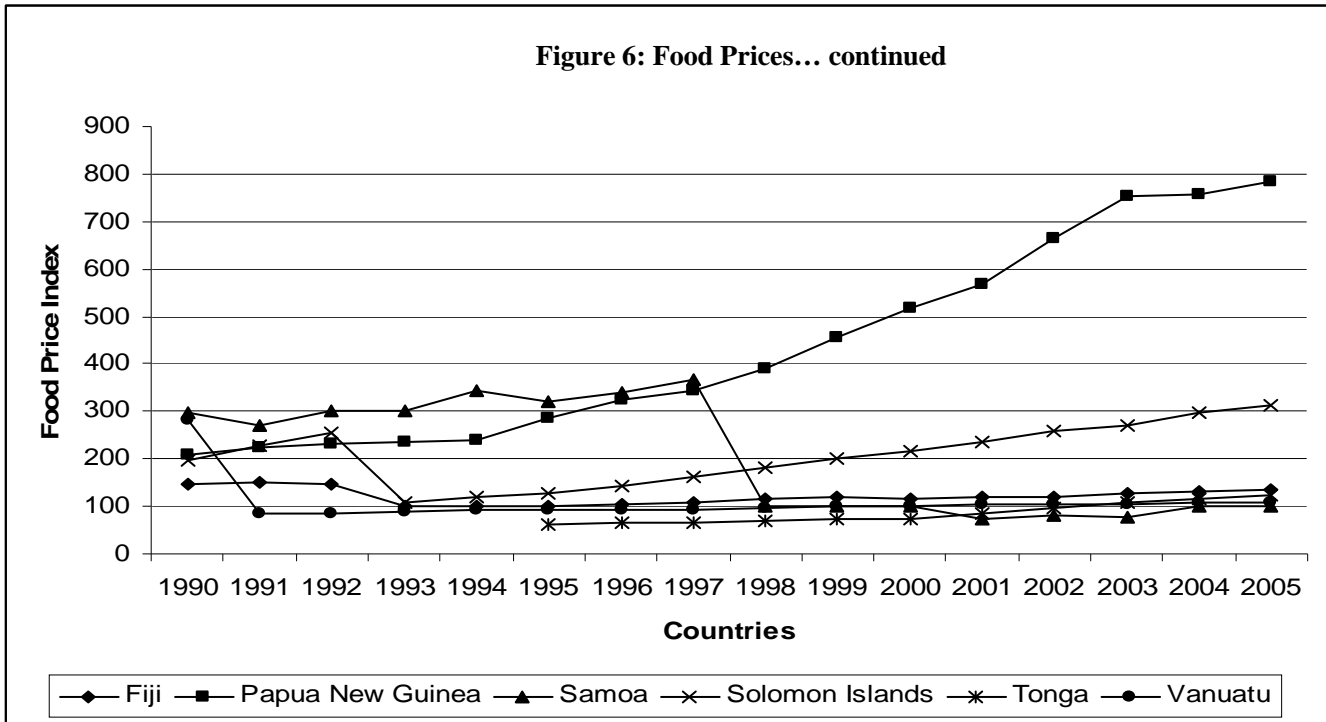


(Data source: World Bank, 2006b).

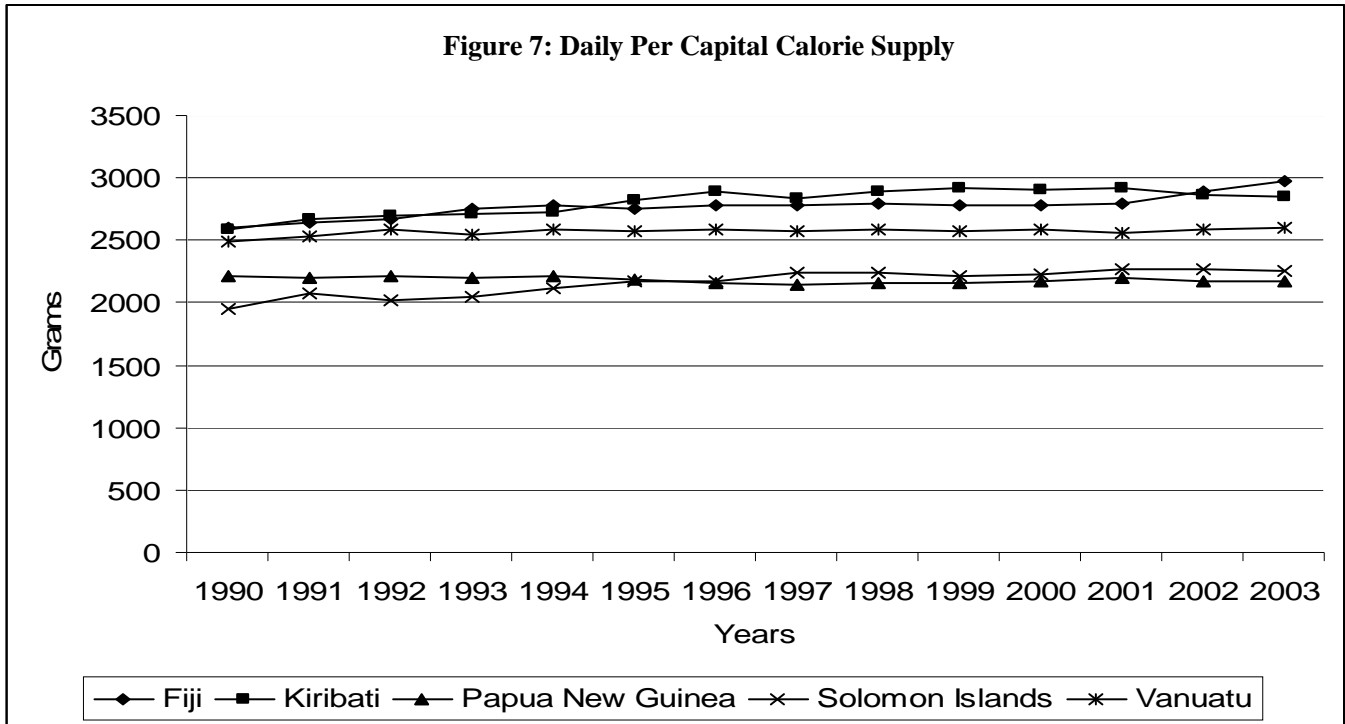


Source of data for Figure 5: Asian Development Bank (2006).

**Figure 6: Food Prices... continued**



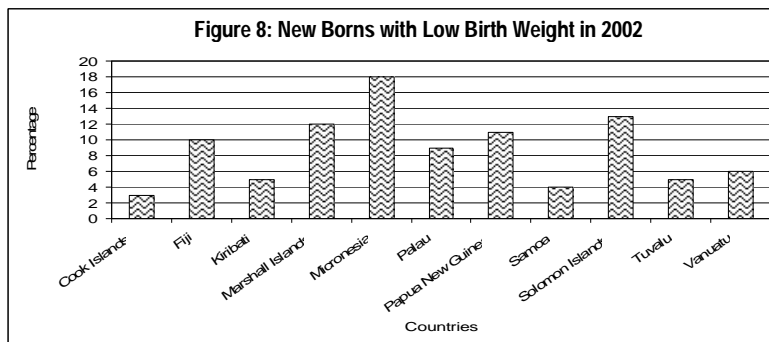




Source of data for Figure 7: World Health Organisation (2006).

Malnutrition is a major source of ill health and premature death in some of the Pacific Island countries. While data on nutritional intake does not exist, data on average caloric intake indicates that it has remained almost stagnant in most countries. Figure 7 reveals that estimated caloric intake exceeded the minimum daily requirement of approximately 2,300 calories for some countries, while for others these have been below the minimum level.

The trends presented in Figure 7 are national averages. This data can make malnutrition look better than it actually is because food may be distributed unequally. As such, large parts of population may even suffer caloric deprivation. Malnutrition affects women the most; undernourished women eventually give birth to underweight children (UNDP, 2006b). Figure 8 shows the percentages of children under the age of 5 who were underweight in 2002 (far too light for their age). Figure 8 does confirm that malnutrition is widely prevalent in Pacific Island countries with some of the larger economies experiencing higher incidence of malnutrition than their smaller counterparts.



(Source of data: World Health Organisation, 2006).

### The Relationship between Food Prices and Health Outcomes: An Analytical Framework

The effect of food prices on health outcomes in the Pacific Island countries deserves an investigation in light of the prevalence of infant and under five mortality rates and new borns with low birth weights. The analytical framework consists of identifying indicators of health outcomes as

well as influences other than food prices on health outcome indicators. Empirical evidence by past researchers and conceptual models contributes to the discussion on the choice of variables. Infant mortality, under five mortality, crude death rates and life expectancy are considered to be better indicators of the health status of the population (see also Sen, 1998). It has been also noted that the long-term improvements in the health status of populations are best reflected in infant mortality and life expectancy rates (Gupta and Mitra, 2004). This study incorporates variables that address the issue of health outcomes, food prices, nutrient security, incidence of diseases and the level of immunisation. Food prices are hypothesised to affect health. Thus, health outcome indicators are presumed to be functions of food prices, and be primarily affected by other variables such as nutrients, incidence of diseases and the level of immunisation. In the regression analysis, this relationship is simply expressed as follows:

$$HOI = f(\text{food prices, nutrient security, incidence of diseases, immunisation});$$

where: HOI is Health Outcome Indicator

The theoretical justification of the inclusion of the variables is discussed below.

#### Food prices

Two key aspects of food security are the availability of sufficient food and access to food, which is a function of household income, and the prevalence of poverty (Islam and Malik, 1996). Human life is ultimately nourished and sustained by consumption; therefore, food accessibility is defined as utilisation of food by individuals through direct consumption (UNDP, 1998).

One factor that directly affects food consumption is food price. Low food price equates to easier access to food and higher levels of consumption. Available statistics show that the richest fifth of the world's people consume 45 percent of all meat and fish; the poorest fifth consume 5 percent (UNDP, 1998). The benefits of food accessibility are significant: the more the food is accessible, the better fed the population is. Consumption clearly contributes to human development when it enlarges the capabilities and enriches the lives of people without adversely affecting the well being of others (UNDP, 1998). Thus, food prices can be correlated with health outcome indicators, with an expected positive association with mortality rates and a negative association with life expectancy.

*Nutrient Security*

Food availability and accessibility is not enough for significant improvement in human health. It is noted that the quality of food and the availability of protein, calories, and micronutrients in the correct combination are also essential along with other vital ingredients such as safe drinking water, minimum income security, nutritional intervention and education, and population stabilisation (Swaminathan, 1986). Maxwell and Frankenberger (1992) note that much of the debate in defining food security has focussed on caloric consumption while paying little attention to protein consumption. Micronutrient deficiencies such as Vitamin A, iron and iodine deficiencies have serious consequences on health and mental and physical function. Ram (1992) noted that calorie supply together with life expectancy and literacy are three indicators of basic need fulfilment, and that calorie supply is obviously a prime indicator of the extent to which basic needs relating to nutrition are being met. Thus, nutrient security focuses on the body's ability to utilise food for satisfactory physical and cognitive achievement. Therefore, it is hypothesised that adequate nutrition can positively contribute to human health. Thus, nutrient security is expected to be negatively correlated with mortality rates and positively with life expectancy.

*Incidence of Diseases*

Diseases can pose major developmental challenges in countries where their prevalences are high and where economies are performing poorly. Bloom, Canning and Jamison (2004) note that better health, while having profound consequences for population size and structure, has also boosted rates of economic growth worldwide. Other than the growth effects of better health, it has been also noted that deteriorations in economic performance resulting from diseases are also likely to compound social and human effects (Dixon, McDonalds and Roberts, 2001). For example, increased incidences of ill health can reduce worker productivities, thereby adversely affecting growth. Further, others note that high incidence of diseases can compound economic growth or growth in per capita incomes (Over, 1992; Cuddington and Hancock, 1994; and Bonnel, 2000). More specifically, diseases undermine efficiency and lower returns on human capital investments. According to the World Bank (2006c and 2006d), HIV/AIDS has a direct impact on human health, loss of years of healthy life, reduced labour supply, and reduced efficiency of labour, with

consequent impact on economic development. The World Bank (2000) has also noted other impacts becoming more severe: health systems become overburdened, fiscal cost rises, social systems become overburdened, all leading to substantial negative impact on economic growth. In this analysis the incidence of disease is expected to be positively correlated with mortality and negatively with life expectancy.

*Immunisation*

Health care interventions like immunisation and oral rehydration therapy are found to be cheap (Deaton, 2006). They aid in minimising deaths among children. The poor state of human health, usually manifested in under nourishment, high incidence of diseases, and mortality and morbidity rates, can affect productivity as workers would tend to reduce the number of their effective hours. Thus, poor health reduces the ability to work productively and so can have a regressive effect on growth (Bonnel, 2000). Reductions in labour supply as a result of declining life expectancy will adversely affect output, an impact that will be compounded by reductions in productive efficiency associated with increased incidences of ill health and shortages of critical skills (Dixon, et.al. 2001). Thus, immunisation is expected to be negatively correlated with mortality and positively with life expectancy.

**Data**

While the health status of an individual can be determined clinically by qualified health professionals, this is an expensive way to measure the health status of an entire population. As such, published annual data are used for each of the selected countries. Data from seven countries - Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu - are chosen for the empirical analysis. Country selection was based on availability of published data on variables of interest. Unfortunately, not all countries have a consistent set of data, and where data is available the time-span is limited. Because of the lack of continuous time series measures for a number of explanatory variables, selected years are chosen for the 1990-2002 period where the left hand side variables match the years of data availability with the right hand side variables. Since the sample timeframe for the dependent variable had to be consistent with the explanatory variables, the final choice of sample years was dictated by the data availability on left and right hand side variables. The selected

years are listed in Table 2.

The measures for the dependent variables are: infant mortality rate (per 1,000 live births); the under five mortality rate (per 1,000 live births); the crude death rate (per 1,000 people); and the total years of life expectancy at birth. The source of data for these measures is World Bank (2006b).

With regard to the explanatory variables, *food price* is measured by food price index (1995=100), which was extracted from World Development Indicators CD ROM (World Bank, 2006b). *Nutrient security* is measured by per capita calorie intake (grams per day) extracted from World Health Organisation (2006). *Incidence of disease* is measured by the prevalence of Tuberculosis per 100,000 people (World Health Organisation, 2007). *Immunisation* is measured by immunisation against measles (percent of children aged 12-23 months) data carried by World Bank (2006b).

## Findings

Results of the analysis are presented in Table 2. The variables selected are able to explain a significant percentage effect on health outcome indicators as revealed by the goodness of fit. Given the use of pooled data, the  $R^2$  presented in Table 2 are considered to be highly satisfactory.

The coefficient *food price* has the expected positive sign on its coefficient for the infant mortality rate and the expected negative sign for life expectancy. However, the coefficient is statistically insignificant in case of infant mortality rate, suggesting that increases in food prices had only weak effects on infant mortality rate. The negative and statistically significant coefficient of food prices on life expectancy confirms that rising food prices are strongly associated with falling life expectancy.

The results also provide strong evidence that *diseases* have significant effect on health outcomes. The coefficient of diseases is positive and statistically significant for infant and under five mortality, as well as for crude death rate. The results of this variable provide strong support that rising incidence of diseases are strongly associated with higher incidence of mortality among children and crude death rates. In case of life expectancy, the coefficient of disease is negative and statistically significant at the 1 percent level. This suggests that high incidence of diseases is strongly associated with lower life expectancies.

**Table 2. Regression results of food prices and health outcomes**

	Infant Mortality Rate	Under Five Mortality Rate	Crude Death Rate	Life Expectancy
<i>Constant</i>	8.139 (0.333)	47.525 (1.391)	7.534 (3.005)*	69.230 (15.120)*
<i>Food price</i>	0.013 (0.203)	-0.002 (-0.018)	-0.003 (0.356)	-0.024 (1.724)***
<i>Calorie intake</i>	0.008 (1.262)	0.008 (0.729)	-0.0002 (0.003)	0.0005 (0.319)
<i>Disease</i>	0.055 (7.193)*	0.065 (7.209)*	0.003 (5.064)*	-0.013 (9.551)*
<i>Immunisation</i>	-0.137 (0.871)	-0.489 (2.488)**	0.014 (0.818)	0.040 (1.470)
<i>N</i>	35	28	42	42
<i>Adj. R<sup>2</sup></i>	0.71	0.75	0.57	0.81
<i>DW</i>	1.94	1.57	1.90	1.76
<i>Years chosen</i>	1990, 1995, 1998, 2000, 2002	1990, 1995, 1998, 2000, 2002	1990, 1992, 1995, 1998, 2000, 2002	1990, 1992, 1995, 1997, 2000, 2002

t-statistics are in parentheses.

\*, \*\*, \*\*\* indicate statistically significant at the 1, 5 and 10 percent levels respectively.

With regard to *immunisation*, the coefficient is as expected, negative, for infant and under five mortality. It is statistically significant at the 5 percent level for under five mortality rate. Thus, immunisation matters, and is strongly associated with under five mortality rates; the higher the immunisation rate, the lower the under five mortality. *Calorie intake* has shown the expected effect for crude death rate and life expectancy. However, in both cases, the coefficients are statistically insignificant.

## Conclusion

This study examined the effect of food prices on a number of health outcome indicators in Pacific Island countries. Empirical results provide confirmation that while food prices are shown to have expected effects on infant mortality and crude death rates, they are statistically insignificant in both cases. However, the results do provide strong support that rising food prices are strongly associated with falling life expectancy. The results also provide strong evidence that diseases have significant effect on health outcomes. There is strong evidence that rising incidence of diseases is associated with higher incidence of mortality among children and crude death rates and lower life expectancies. It is also confirmed that the level of immunisation matters and is strongly associated with under five mortality rates.

The results obtained for food prices certainly have policy implications with regard to achieving the MDGs. The MDGs vision for the future – a world with less poverty, hunger and diseases, and greater survival prospects for mothers and infants, among others, has relevance for the Pacific Island countries and can be made feasible by addressing the issue of food security. Results obtained here have shown that food price, although revealing a weak effect, is still a determining factor in health outcomes.

For policy purposes the link between food prices and health outcome indicators will have to be carefully considered. Poverty as it prevails in the Pacific Island countries, has many dimensions. Easier access to food could help improve the overall situation in the short-term and may lead to long-term health improvements. This calls for increased efforts to enhance agricultural production. Governments of Pacific Island countries need to invest in agriculture in terms of capital formation, and at the same time, provide support for agricultural development such as affordable loans, cool storage facilities, processing and distribution facilities and marketing. Increases in food production can reduce food prices and increase consumption. Greater availability and consumption of food will also aid in reduction of malnourishment and underweight new borns. National development policies directed towards improving food security would certainly contribute towards improvements in human health and well being.

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