# FAO - NUTRITION COUNTRY PROFILES

# PAPUA NEW GUINEA


**FOOD AND AGRICULTURE ORGANIZATION**

**OF THE UNITED NATIONS**

*Note for the reader*

*The objective of the Nutrition Country Profiles (NCP) is to provide concise analytical summaries describing the food and nutrition situation in individual countries with background statistics on food-related factors. The profiles present consistent and comparable statistics in a standard format. This pre-defined format combines a set of graphics, tables and maps each supported by a short explanatory text. Information regarding the agricultural production, demography and socio-economic level of the country are also presented.*

*In general, data presented in the NCP are derived from national sources as well as from international databases (FAO, WHO...).*

*Technical notes giving detailed information on the definition and use of the indicators provided in the profile can be obtained from ESNA upon request. An information note describing the objectives of the NCP is also available.*

*Useful suggestions or observations to improve the quality of this product are welcome.*

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Nutrition Country Profile of Papua New Guinea

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**FAO, 2003**

**MAPS** are presented after the <REFERENCES>

- General map of Papua New Guinea

*Graphs, tables and maps can be visualised by clicking on the words in bold and underline, only in the "Full profile" pdf file.*

## SUMMARY

*According to surveys over the last 15 years, the nutritional status of children under five years in Papua New Guinea has not improved (Smith, 1992; Gibson and Rozelle, 1998). In rural areas there is a high prevalence of underweight, a very high prevalence of stunting and a medium prevalence of wasting in children under five years (**Table 4a-1**) (Monsef, 1998). The prevalence of underweight and wasting was highest among infants at one year, while stunting affected more than half of the children at four years. A sub-national survey carried out among children under five years reported a lower prevalence of underweight, stunting and wasting in urban areas. Children under five years living in the Highlands have a greater risk of stunting than their coastal counterparts. However, children living in the coastal regions are more likely to be wasted (**Table 4a-2**) (Gibson and Rozelle, 1998).*

*The prevalence of chronic energy deficiency in adults (greater than 18 years) in 1996 was 12% for women and 5% for men (**Table 4c**). Although there are no nationally representative data available, adults seem to be affected by overweight and obesity. According to a small scale survey, obesity is most prevalent in the urban coastal areas, and least prevalent in rural Highlands (**Table 4c**). This increase in the prevalence of overweight and obesity is partly attributable to the adoption of a modern life-style (Gibson & Rozelle, 1998).*

*Non-communicable diseases are of concern with increasing age, while communicable diseases still account for a majority of deaths, especially at an early age. Maternal and infant mortality rates are still high. There is insufficient routine immunisation coverage (UNICEF, 2002).*

*Food consumption patterns have changed in the last four decades in Papua New Guinea: from starchy roots to cereals as the main source of energy. There is a steady decrease in the availability of starchy roots (**Figure 3**). During the same period consumption of rice nearly tripled.*

*Iron deficiency anaemia is known to be widespread in Papua New Guinea, although no national representative survey has been carried out. Women of child-bearing age and young children are considered to be especially vulnerable. A survey carried out in 1998 identified a high prevalence of anaemia in children under five years. The highest prevalence was observed in the province of Sepik, indicating almost all children less than 5 years as anaemic (**Table 5**).*

*Though there are no national representative data available, results from small scale surveys suggest that there is a problem of clinical vitamin A deficiency in some provinces. Prevalence of night blindness and xerophthalmia in Madang is a public health problem (**Table 5**) (Friesen et al., 1998a).*

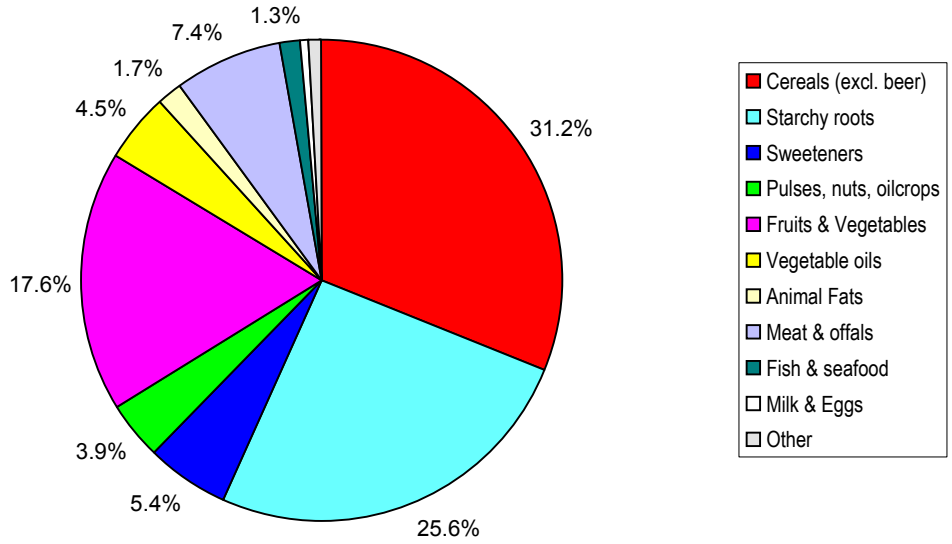
*Data from different provinces of Papua New Guinea suggests that iodine deficiency disorders (IDD) are a national public health problem. In one district in Morobe, mild IDD was reported in children between 8 and 10 years in 1997 (**Table 5**). Earlier studies identified a much higher prevalence in several provinces and a vast gender difference in the prevalence of IDD, suggesting that women, especially pregnant and lactating, were twice as likely to suffer from iodine deficiency as men (Amoa. et al., 1997).*

TABLE 1: GENERAL STATISTICS OF PAPUA NEW GUINEA

| Indicator (§) | Year | Unit of measure | |
|---|---|---|---|
| **A. Land in use for agriculture** | | | |
| 1. Agricultural land | 2000 | ha per person | 0.158 |
| 2. Arable and permanent crop land | 2000 | ha per person | 0.139 |
| **B. Livestock** | | | |
| 1. Cattle | 1998-2000 | thousands | 87 |
| 2. Sheep & goats | 1998-2000 | thousands | 8 |
| 3. Pigs | 1998-2000 | thousands | 1550 |
| 4. Chickens | 1998-2000 | millions | 4 |
| **C. Population** | | | |
| 1. Total population | 2000 | thousands | 4807 |
| 2. 0-4 years | 2000 | % of total pop. | 17.1 |
| 3. 5-14 years | 2000 | % of total pop. | 28.4 |
| 4. 15-24 years | 2000 | % of total pop. | 49.6 |
| 5. >= 60 years | 2000 | % of total pop. | 4.9 |
| 6. Rural population | 2000 | % of total pop. | 82.6 |
| 7. Population growth rate, Total | 2000-2005 | % of total pop. | 2.1 |
| 8. Population growth rate, Rural | 2000-2005 | % of rural pop. | 1.7 |
| 9. Projected total population in 2030 | 2030 | thousands | 7880 |
| 10. Agricultural population | 2000 | % of total pop. | 77.1 |
| 11. Population density | 2000 | pop. per km$^2$ | 10.4 |
| **D. Level of Development** | | | |
| 1. GNP per capita, Atlas method | 1998 | current US$ | 890 |
| 2. Human Development Index rating | 1999 | min[0] - max[1] | 0.534 |
| 3. Incidence of poverty, *Total* | 1996 | % of total pop. | 37.5 |
| 4. Incidence of poverty, *Rural* | 1996 | % of total pop. | 93.5 |
| 5. Life expectancy at birth (for both sexes) | 2000-2005 | years | 59.7 |
| 6. Under-five mortality rate | 2000 | per 1,000 live births | 112 |
| **E. Food Trade** | | | |
| 1. Food Imports (US $) | 1998-2000 | % of total imports | 18.0 |
| 2. Food Exports (US $) | 1998-2000 | % of total exports | 12.7 |
| 3. Cereal Food Aid (t) | 1998-2000 | % of cereals impor | NA |
| **F. Indices of Food Production** | | | |
| 1. Food Production Index | 1998-2000 | 1989-91=100 | 116.0 |
| 2. Food Production Index Per Capita | 1998-2000 | 1989-91=100 | 92.8 |

| Indicator (§) | Year | Unit of measure | |
|---|---|---|---|
| **G. Average Food Supply** | | | |
| 1. **Dietary Energy Supply (DES)** | 1998-2000 | kcal/caput/day | 2180 |

**Percentage of DES by major food groups**




Note: Value not indicated if below 1%

| | | | |
|---|---|---|---|
| 2. **Proteins** | 1998-2000 | g/caput/day | 45 |
| **% from:** | | | |
| 3. Vegetable products | 1998-2000 | % of total proteins | 67.6 |
| 4. Animal products | 1998-2000 | % of total proteins | 32.4 |
| **% Energy from:** | | | |
| 5. Protein | 1998-2000 | % of total energy | 8.5 |
| 6. Fat | 1998-2000 | % of total energy | 16.9 |
| **H. Food Inadequacy** | | | |
| 1. Total population "undernourished" | 1998-2000 | millions | 1.3 |
| 2. % population "undernourished" | 1998-2000 | % of total pop. | 27.0 |

NA Data not available § see References for data sources used

# Papua New Guinea

## I. OVERVIEW

### 1. Geography

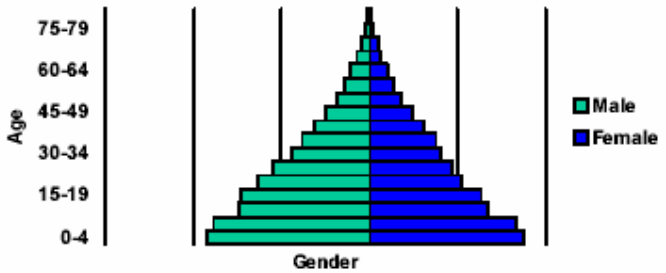
Papua New Guinea is the largest of the Pacific Islands Nations. It is made up of the eastern half of the island of New Guinea in the western Pacific Ocean, has several large volcanic islands and 600 small and scattered islands to the east and north in the Bismarck and Solomon Sea. Total land area is over 462 840 $km^2$. It has a land border with the Indonesian province of Irian Jaya, and sea boundaries with the Solomon Islands and Australia. The topography of Papua New Guinea is among the most rugged in the world, with altitudes of over 4000 m. Large geographical diversity exists with offshore islands, lowland forests and extensive marches, dry savannah and temperate highlands. Only 13% of the country is inhabited (NSO, 1994) (**General Map**).

### 2. Population

In 2000, the total population in Papua New Guinea was estimated at more than 4.8 million inhabitants, spread over 20 provinces. In 2000, the population density was estimated to be 10.4 persons/$km^2$ (**Table 1**) (UN, 2001).

The population of Papua New Guinea is growing at an annual rate of 2.1% and is projected to reach more than 7.8 million inhabitants by the year 2030. The rapid population growth continues despite the high under five mortality rate (95 per 1000 live births in 2000) and the low life expectancy at birth (59.7 years). Papua New Guinea is characterised by a young age structure (around 95% of the population were less than 24 years of age in 2000) and more than 83% of the population currently reside in rural areas (**Table 1**). Papua New Guinea is noted for its cultural and linguistic diversity with over 700 languages spoken.

**Population Pyramid**




Source: UNAIDS/WHO, 2002.

### 3. Level of development: poverty, education and health

A 1996 household survey classified 38% of the population as poor, of which 94% were rural residents and 7% were urban, making poverty a predominantly rural problem (Gibson and Rozelle, 1998) (**Table 1**). Only 44% of the children between the age of 6 and 15, and 18% of

the population aged 16 to 20 years went to school in 1997 (NSO, 1997). The adult literacy rate in 1997–99 was 72%, with 81% for males and only 63% for females (UNICEF, 2002).

The mortality pattern has not changed in the last ten years. Communicable diseases account for the majority of deaths in Papua New Guinea. Immunization coverage is not sufficient. Although routine immunization (EPI ie expanded programme on immunization) was completely funded by the government in 2001, the percentage of children less than one year immunized for TB, DPT, polio, measles and HepB3, were 74%, 56%, 33%, 58% and 42%, respectively (UNICEF, 2003). The rate of immunization of pregnant women against tetanus was only 14% in 1997–99 (UNICEF, 2002). It is estimated that the number of adults and children living with HIV/AIDS, in the end of 2001, was of 16 000 adults (4100 being women) and of 500 less than 15 year-old children (UNAIDS/WHO, 2002).

Infant mortality can be attributed to five causes; pneumonia (33%), neonatal infection (17 %), slow foetal growth/immaturity (11 %), hypoxia/asphyxia (17 %) and meningitis (7 %). Pneumonia and malaria are the prominent causes of death among older children (Cibulskis, 1998). The infant mortality rate has declined from 134 to 69 deaths per 1000 births between 1971 and 1992–1996 (Gibson and Rozelle, 1998; NSO, 1997). Differences in infant mortality rates and maternal mortality rates vary greatly between regions.

Non-communicable diseases (NCDs) such as cancer and coronary heart disease are prevalent later in life especially in urban centres. Obstetric causes, especially in the rural areas, are a prominent cause of death in women of child-bearing age (Cibulskis, 1998). Nearly twice as many women in urban centres (87 %) than in rural areas (43 %) use health facilities to deliver their babies. The total fertility rate is five for rural, and four for urban women (NSO, 1997). In 1995–2000 the national total fertility rate was 4.6 (UN, 2001).

## 4. Agricultural production, land use and food security

Agriculture remains the most important sector of Papua New Guinea's economy, contributing about 30% to the Gross Domestic Product (GDP) and accounting for 85% of the labour force (EIU, 2002). Only 30% of the land is considered suitable for agriculture production (DAL, 1996). About 97% of the land remains under customary tenure[1] (UNICEF, 1996). Ownership rights are vested in the clan and activated through social relationships. Agricultural land represented 0.158 ha per person in 2000 with 0.139 ha per person as arable and permanent cropland (FAOSTAT, 2002) (**Table 1**).

Of the total value of agricultural output, 50% comes from staple food crops, 13% from livestock; and 33% from export cash crops, mainly coffee, cocoa, copra and palm oil (DAL, 1995; 1996; EIU, 2002). Coffee is the most important cash crop, with 43% of rural households involved in the production. Between 1990 and 2000, total production of coffee increased from 60 000 t/year to 66 000 t/year and palm oil increased from 600 000 t/year and 1 million t/year (FAOSTAT, 2002).

Subsistence agriculture is characterised by shifting cultivation using the practice of 'slash and burn', with extensive areas left uncultivated to recover fertility for periods of up to 30 years. Most gardens contain mixed crops, sometimes up to 30 different species. The main staple food crops include sweet potato, taro, banana, cassava, yam, and sago palm. Sweet potato is the most valuable crop because of its shorter maturation period, and its resistance to pests, disease and drought. It is gradually replacing other crops (DAL, 1996; Taufa, 1995). The production of sweet potatoes is mainly for local consumption and feeder stocks.

[1] The right to hold land provided that certain conditions are met. A system of communally held land is practised .

Food shortages, in part, can be attributed to decreased agricultural production due to natural disasters such as the 1998 tsunami, the drought caused by El Niño in 1997, volcanic eruptions, as well as frost damages. At the height of the 1997/98 El Niño event, it was estimated that about 1.2 million Papua New Guineans were suffering from food shortages (EIU, 2002). Towards the end of the dry season food supplies for subsistence farmers decreased. Food security problems are also due to the imbalance between local production and population growth, a wide disparity in income distribution, an increased dependency on cash income to purchase food items and the declining trade balance (DAL, 1996). In 1998–2000, the number of undernourished people was 1.3 million, which represents 27% of the total population (FAO, 2002) (**Table 1**).

## 5. Economy

The total gross national product (GNP) per capita in 1998 in Papua New Guinea was US$890 (**Table 1**) and the gross domestic product (GDP) in 1998 accounted for US$3.7 billion (World Bank, 2001). The significant rise in GDP in the early 90s was offset by the deficit and cash flow problems that the country faced in 1994 (UNICEF, 1996). In 1997 the country experienced a negative growth of -4.6% in GDP. However, the average growth of GDP in 1998 was 2.5% (World Bank, 1999).

Economic growth is heavily constrained by the poor infrastructure, the low level of human resource development and the difficult topography. The economy has also been affected by generally depressed commodity prices, due to the Asian financial crisis and natural disasters (World Bank, 1999).

Papua New Guinea has large gold and copper deposits. The export of gold accounted for US$607 million in 1998, compared to US$323 million for copper (World Bank, 1999). Total imports in 1998 accounted for US$1289 million; US$166 million for food imports and US$142 million for fuel and energy imports (World Bank, 1999).

# II. THE FOOD AND NUTRITION SITUATION

## 1. Trends in energy requirements and energy supplies

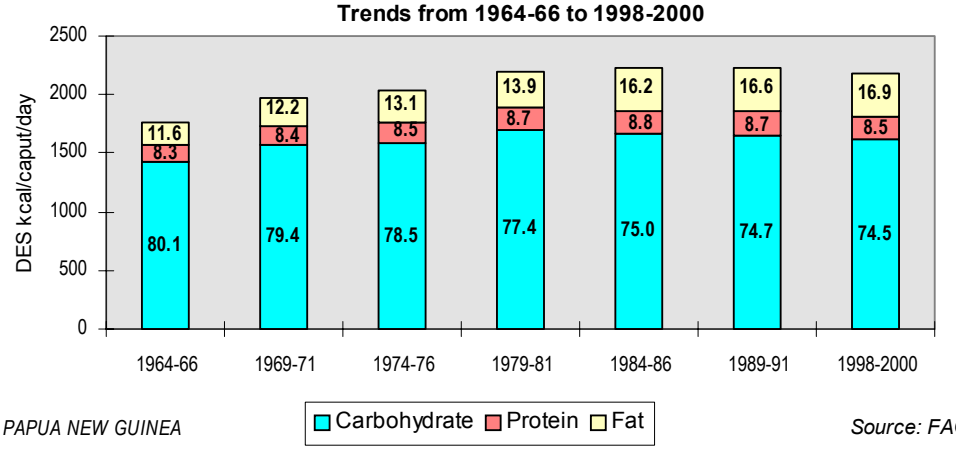
Per caput energy requirements remained stable between 1965 and 2000 at approximately 2140 kcal/day and are not expected to increase until 2030 (**Table 2**). In the year 2000, energy requirement in rural areas was 2155 kcal/caput/day and in urban areas it was 2052 kcal/caput/day. Trends in energy requirements reflect the changes in population structure and in particular the urban-rural distribution. While in 1965 only 5% of the population lived in urban areas, the percentage of the urban population increased to 17% in 2000 and is expected to reach 33% in 2030 (**Table 2**). The total population increased from 2.1 million in 1965 to 4.8 million in 2000 and is expected to reach 7.9 million in 2030. In 1965, the dietary energy supply (DES) did not cover energy requirements, but data for the year 2000 show that DES slightly exceeded energy requirements (FAOSTAT, 2002).

**Table 2: Total population, urbanisation, energy requirements and dietary energy supplies (DES) per person and per day in 1965, 2000 and 2030**

* Three-year average calculated for 1964–66 and 1998–2000 (*Source*: FAOSTAT)

The contribution of fat to the total DES increased from 12% to 17% in the period from 1964–66 to 1998–2000. The share of carbohydrates decreased from 80% to 75% over the same period. However, it is interesting to note that, over this time period the percentage of fat coming from animal products decreased by 10% and the percentage of fat coming from vegetable products increased by 10%. The share of protein in total DES remained the same (**Figure 1**) (FAOSTAT, 2002).

**Figure 1: Share of protein, fat and carbohydrate in Dietary Energy Supply**
**Trends from 1964-66 to 1998-2000**

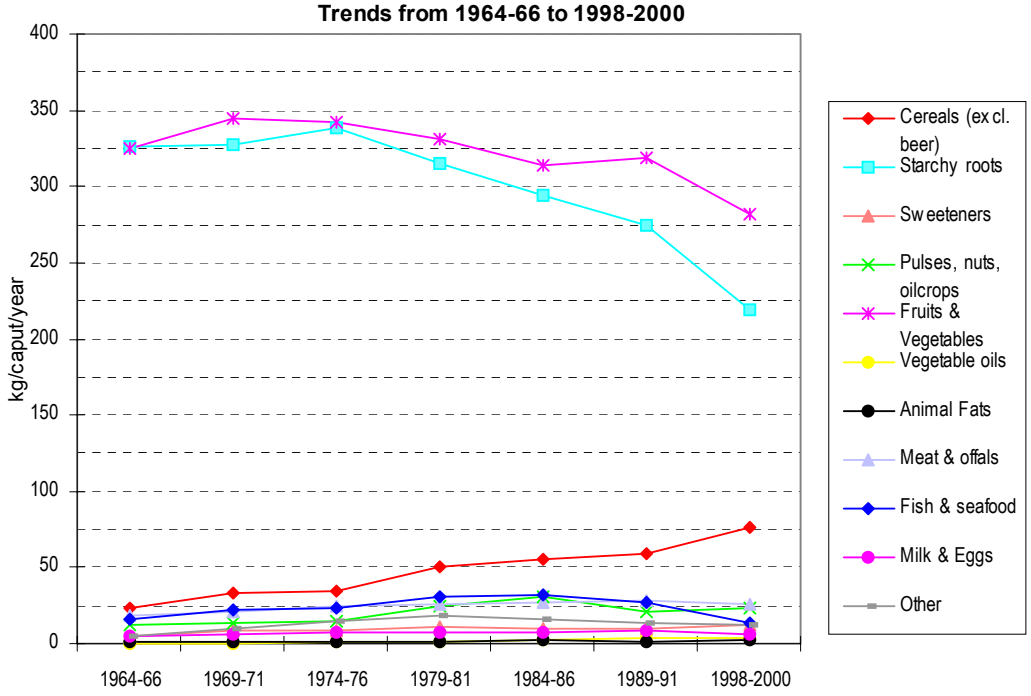



*PAPUA NEW GUINEA* *Source: FAOSTAT*

## 2. Trends in food supplies

*Quantity* – The per capita availability of food is a function of population and food production, with adjustments made for exports, imports, food aid, wastage and livestock feed. From 1964–66 to 1998–2000, annual per caput availability of the two major food groups (fruits and vegetables, and starchy roots) decreased (**Figure 2**). The annual per caput availability of fruits and vegetables decreased from 325 kg/caput/year to 282 kg/caput/year and the availability of starchy roots decreased from 326 kg/caput/year to 219 kg/caput/year over the thirty six years. In the same period the supplies of cereals increased from 24 kg/caput/year to 77 kg/caput/year (FAOSTAT, 2002).

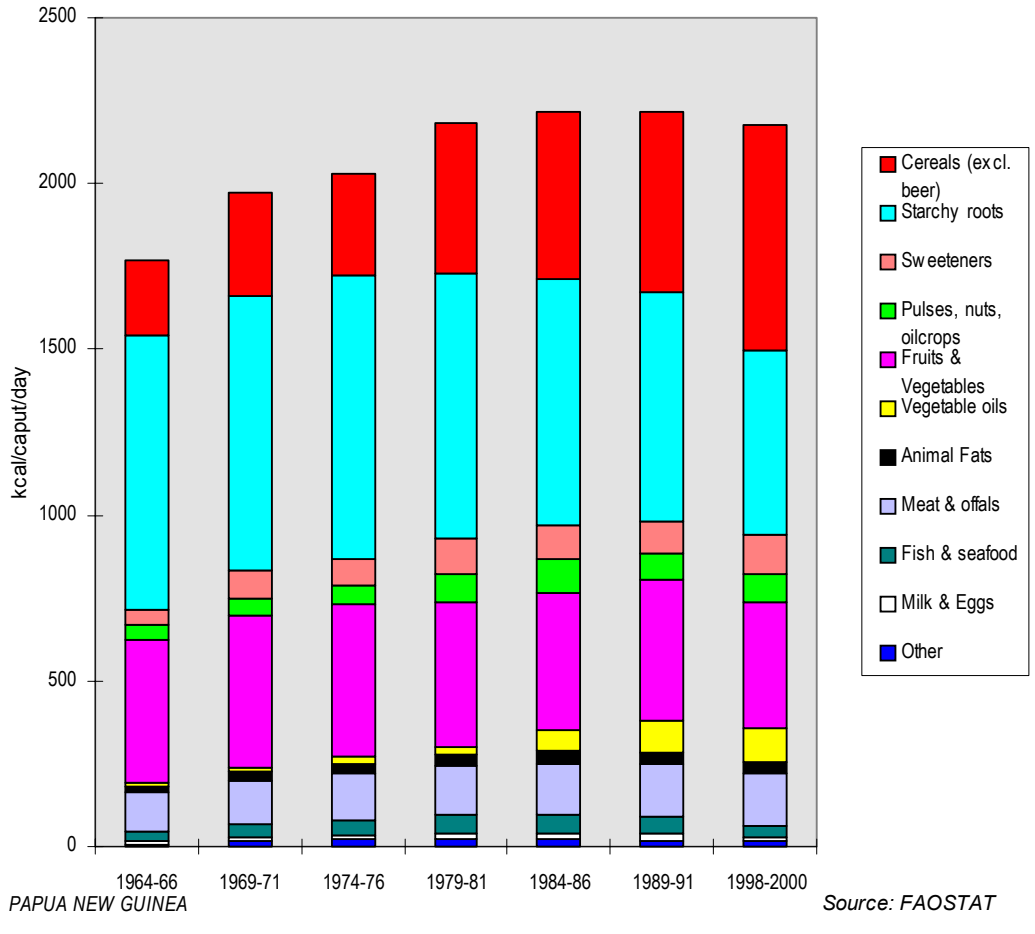
**Figure 2: Supplies of major food groups (in kg/caput/year)**
**Trends from 1964-66 to 1998-2000**




*PAPUA NEW GUINEA* *Source: FAOSTAT*

*Energy* – From 1964–66 until 1989–91, starchy roots represented the main source of energy in the diet. However, from 1998–2000 they were replaced by cereals, which provided 680 kcal/caput/day, equivalent to 31% of the total DES. In 1998–2000, starchy roots provided 557 kcal/caput/day which represents 26% of the total DES. Fruits and vegetables represented the third major food group (384 kcal/caput/day), even though their share in total DES reduced from 24% to 18% (**Figure 3**). In the mean time, the share of total DES for vegetable oils increased continuously from less than 1% to 5% over the thirty six year period (FAOSTAT, 2002).

**Figure 3: Share of major food groups in Dietary Energy Supply Trends from 1964-66 to 1998-2000**

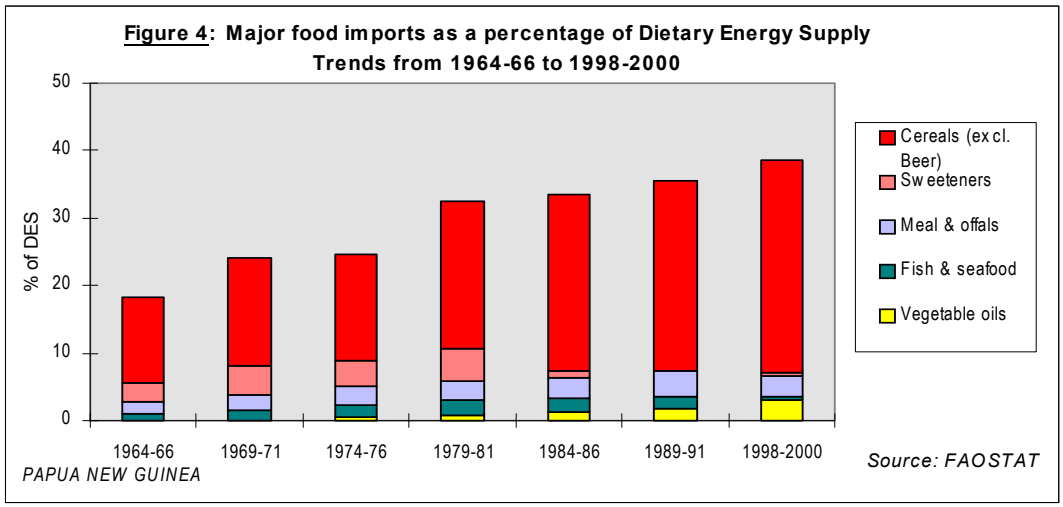


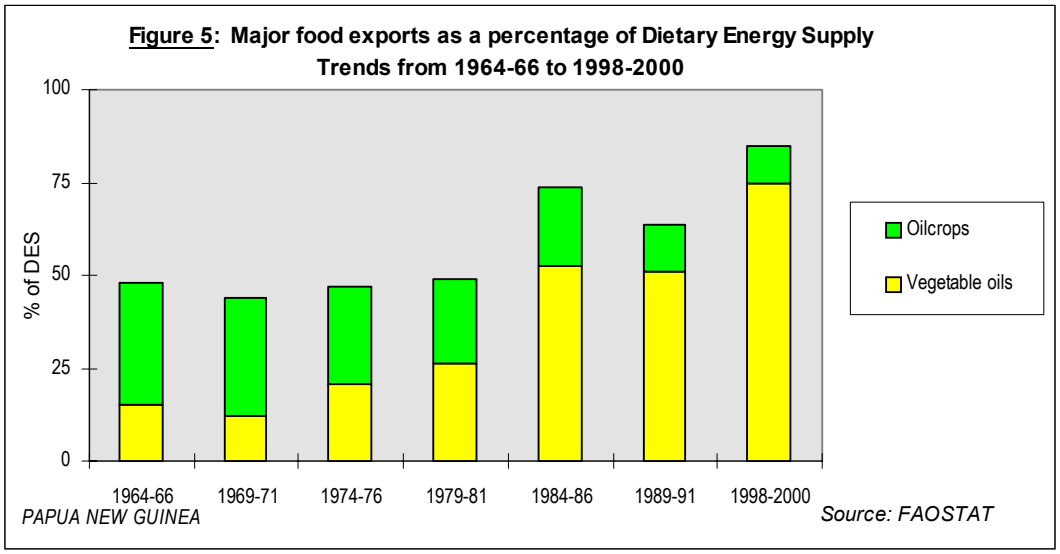

*Major food imports* – From 1964–66 to 1998–2000 imports of cereals (mainly rice) increased from 13% to 32% of total DES **(Figure 4)**. Since 1990 imports of rice have remained at 130 000 t/year with domestic production at less than 1% of demand (Gwaiseuk, 1998). Total import of cereals, accounted for 360 459 t/year in 1998–2000. The 1997/98 drought in Papua New Guinea resulted in a situation of food insecurity, with rice imports showing a marked increase (Gwaiseuk, 1998).

The import of meat and offals increased from 1964–66 to 1998–2000, while the import of sweeteners increased from 1964–66 to 1979–81 and decreased in 1998–2000. Fish

and seafood imports peaked from 1979–81 but have returned to values of less than 1%. Vegetable oil imports have increased slightly over the last thirty six years **(Figure 4)**.

*Major food exports* – The share of the export of vegetable oils reached 75% of the total DES in 1998–2000, which is up from 15% in 1964–66 due to higher production **(Figure 5)**. The share of oil crops, however, decreased from 33% to 10% of the total DES, in the last thirty six year period.




## 3. Food consumption

Food intake in Papua New Guinea was estimated in males (20 to 40 years) using a 24-hour weighed-intake for 3 consecutive days in 1978, 1980 and 1982. These studies took place in Bena Bena, located in the Highlands (Koishi, 1990). According to these studies roots and tubers were mainly consumed, however with a decreasing trend (409 g/caput/day in 1978 and 380 g/caput/day in 1982). The consumption of fruits and vegetables (39 g/caput/day in 1978 to 79 g/caput/day in 1982) and cereals (from 18 g/caput/day in 1978 to 91 g/caput/day in 1982) increased. It is interesting to note that the consumption of roots and tubers and fruits and vegetables peaked in 1980. However, it is important to recognise the limitations of the

small sample sizes used (males between 20 and 40 years in less than 18 households) for the studies (**Table 3**). The consumption of oils and fats decreased for 16 g/caput/day in 1978 to zero in 1980 and 1982. The consumption of meat decreased steadily and the consumption of fish increased from 5 g to 15 g/caput/day for the same time period. In 1982, the average daily per caput energy intake for men was 2837 kcal (compared to 2390 kcal in 1978). Eight percent of total DES was provided by protein and 7% by fat (**Table 3**) (Koishi, 1990).

A 1996 survey looked at the diet of the urban Wanigela community in Koki, located in the National Capital District, and estimated the average daily energy intake to be 2738 kcal/day for men and 2500 kcal/day for women. The age of the subjects was not indicated. Twenty three percent of total DES was derived from fat for both males and females. Fourteen percent and 15% of total DES was derived from protein for men and women, respectively (Hodge et al., 1996b) (**Table 3**). Both the prevalence of obesity and of glucose intolerance was high in urban Wanigelas (Hodge et al., 1996b).

The 1996 household survey estimates, that the average daily energy intake was 3663 kcal in the richest quartile of the population, while it was only 1783 kcal/day in the poorest quartile. The daily energy intake also ranged from 2346 kcal/day in the National Capital District to 2963 kcal/day in the Papuan South Coast (Gibson and Rozelle, 1998) (**Table 3**).

The consumption of protein differs throughout the regions of the country. It is highest in the National Capital District (12% of energy) and lowest in the Highlands and Momase of the North Coast (7% of energy). Large differences are also seen by socio-economic level. Households belonging to the first and second quartile, consume 23 g and 37 g of protein per day, respectively, versus 87g in the fourth quartile (Gibson and Rozelle, 1998).

The dietary patterns of people in urban and rural Papua New Guinea seem to differ mainly in their rice consumption. A 24-hour food recall revealed that almost 90% of the urban population compared to only 25% of the rural population eat rice daily. Furthermore, people living in urban areas tend to consume biscuits, bread, meat and fish more often than rural people. The rural population consumes more sweet potatoes, taro and yams (Gibson and Rozelle, 1998). The main cause of low consumption of traditional food staples in urban households is high prices (Gibson, 1995). An increased consumption of rice and bread was also observed among students in urban centres and in smaller provincial towns (Saweri, 1998).

Adoption to a modern lifestyle in Papua New Guinea affects food habits and food choices of the people living in rural areas. Although this transition is not uniform across the country, the change is greatest in areas where people have access to cash. In rural areas, large scale projects provide residents with cash. The dependency on purchased food items has resulted in a problem of malnutrition in urban areas, especially in unplanned settlements among poor families. Single mothers and their families are the most affected. Over 90% of the food supply is purchased at stores or markets, and often only one meal per day is consumed (Jenkins, 1996).

## Table 3: Food consumption surveys

| Source/ Year of survey | Location | Sample Number | Sex | Age Years | Average food intake | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Major Food Groups (g/caput/day) | | | | | | | | | |
| | | | | | Cereals | Roots/ Tubers | Pulses | Fruits/ Vegetables | Oils/ Fats | Meat | Fish | Milk products | Sugar-cane | Other |
| **Koishi, 1990** | | households | | | | | | | | | | | | |
| 1978 | Bena, Eastern Highlands Province | 18 | M | 20-40 | 18 | 409 | 0 | 39 | 16 | 10 | 5 | 0 | 31 | NA |
| 1980 | | 7 | M | 20-40 | 26 | 540 | 6 | 94 | 0 | 8 | 8 | 0 | 33 | NA |
| 1982 | | 10 | M | 20-40 | 91 | 380 | 2 | 79 | 0 | 3 | 15 | 0 | 0 | NA |
| | | | | | Nutrient Intake (person/day) | | | | | | | | | |
| | | | | | | Energy (kcal) | % Protein | % Fat | | Protein (g) | % from Animal products | | Fat (g) | % from Animal products |
| **Koishi, 1990** | | | | | | | | | | | | | | |
| 1978 | Bena, Eastern Highlands Province | 18 | M | 20-40 | | 2390 | 5 | 17 | | 35.0 | 33 | | 45.0 | NA |
| 1980 | | 7 | M | 20-40 | | 2814 | 6 | 3 | | 45.0 | 17 | | 17.0 | NA |
| 1982 | | 10 | M | 20-40 | | 2837 | 8 | 7 | | 54.0 | 19 | | 23.0 | NA |
| | | Individuals | | | | | | | | | | | | |
| **Hodge et al., 1996b** | Koki, NCD | 148 | M | NA | | 2738 | 14.0 | 23.0 | | 96.0 | NA | | 71.0 | 46.5 |
| 1996 | | 137 | F | NA | | 2500 | 15.0 | 23.0 | | 93.0 | NA | | 65.0 | 47.7 |
| | | | | | | | | | | | | | | |
| **Gibson&Rozelle, 1998** | Quartile: | households | | | | | | | | | | | | |
| 1996 | I (poorest) | NA | M/F | NA | | 1783 | 5 | NA | | 23.0 | NA | | NA | NA |
| | II | NA | M/F | NA | | 2303 | 6 | NA | | 37.0 | NA | | NA | NA |
| | III | NA | M/F | NA | | 2765 | 8 | NA | | 52.0 | NA | | NA | NA |
| | IV (richest) | NA | M/F | NA | | 3663 | 10 | NA | | 87.0 | NA | | NA | NA |
| | Regions: | | | | | | | | | | | | | |
| | National Capital District | 247 | M/F | NA | | 2346 | 12.1 | NA | | 71.0 | NA | | NA | NA |
| | Papuan / South Coast | 166 | M/F | NA | | 2963 | 8.5 | NA | | 63.0 | NA | | NA | NA |
| | Highlands | 452 | M/F | NA | | 2544 | 6.9 | NA | | 44.0 | NA | | NA | NA |
| | Momase / North Coast | 336 | M/F | NA | | 2715 | 6.9 | NA | | 47.0 | NA | | NA | NA |
| | New Guinea Islands | 124 | M/F | NA | | 2348 | 8.0 | NA | | 47.0 | NA | | NA | NA |
| | Total | 1325 | M/F | NA | | 2629 | 7.6 | NA | | 50.0 | NA | | NA | NA |

Note: NA Data not available

## 4. Infant feeding practices

Some beliefs about colostrum still exist. It is taboo for some tribes and clans to give colostrum, which is considered to be 'dirty' milk. A survey on 1822 mothers, in 1998, showed that 29% of the mothers did not give colostrum and about half of the mothers introduced solids before the baby was four months old (Friesen et al., 1998b). According to the Baby Feed Supply Act of 1977, bottles and cups to feed infants are only available by prescription. This act achieved universal acceptance of breast-feeding as a norm. However, a survey conducted in 1994 on current feeding practices concluded that 20% of infants less than four months were bottle-fed, identifying paid employment and adoption as the predominant reasons for switching to bottle-feeding (Friesen et al., 1995; 1998a). The length of maternity leave for new mothers is six weeks (UNICEF, 1999). Forty two percent of women in Papua New Guinea are part of the adult labour force (UNDP, 1999).

In Papua New Guinea the International Code of Marketing of Breast Milk Substitutes was implemented in December 1998. Nevertheless, the number of hospitals/maternities officially designated by UNICEF as 'Baby Friendly', having fulfilled 10 criteria supportive of breast-feeding are only 4 of 500.

## 5. Anthropometric data

***Anthropometry of children***

The nutritional status of children under five years is commonly assessed using three indices: weight-for-height which reflects acute growth disturbances, height-for-age which reflects long-term growth faltering and weight-for-age which is a composite indicator of both long and short term effects. Weights and heights of children are compared with the reference standards (NCHS/CDC/WHO) and the prevalence of anthropometric deficits is usually expressed as the percentage of children below a specific cut-off point such as minus 2 standard deviations (SD) from the median value of the international reference data (WHO, 1983).

Results of the 1982/83 National Nutrition Survey indicated that 30% of rural children under five years were underweight, 43% were stunted and 6% were wasted (Smith, 1992). Underweight (42 %) and wasting (14 %) are most prevalent in infants at the age of one year. The prevalence of stunting was highest in the age group from two to four years (50% at two years, 52% at three years and 57% at four years). Malnutrition affects male underfives more than females **(Table 4a-1).**

A survey carried out in 1986/87 on 568 children less than five years in urban centres (Port Moresby, Goroka, Arawa, Wewak and the settlement of Bougainville) reported a much lower prevalence of underweight, stunting and wasting (14%, 19% and 4%, respectively) (Jenkins and Zemel, 1990).

In 1995, a study was carried out in the National Capital District, the Highlands and Coastal region among children less than five years. The study found that the highest prevalence of underweight (36%) was in the Coastal region, the highest prevalence of stunting (47%) was in the Highlands region and the highest prevalence of wasting (18%) was in the National Capital District (Gibson, 1995).

A 1996/97 survey carried out in 3 different provinces in Papua New Guinea on children aged 6 months to less than five years found the highest prevalence of underweight and wasting in Madang (Coastal) (47% and 28%, respectively), while the children in Sepik (Highlands) were most likely to be stunted (45%) (Friesen et al., 1998b)(**Table 4a-1**).

In 1998, a cross-sectional nutrition survey was carried out among children less than five years in the eight districts that were most affected by the drought caused by El Niño. The highest prevalences of underweight, stunting and wasting were found in Rabaraba (Coastal region) at 77%, 74% and 24%, respectively. The lowest prevalences for underweight and wasting were found in Tambul at 21% and 5%, respectively and the lowest prevalence of stunting was found in Nomad (31%), both in the Western Highlands (Monsef, 1998).

Anthropometric data derived from the Papua New Guinea Household Food Survey in 1997 found much higher prevalence of stunting and a lower prevalence of wasting in male and female children less than five years living in the Highlands compared to their Coastal counterparts (Gibson and Rozelle, 1998) **(Table 4a-2)**. The result for the Highlands region is especially interesting as the 1982/83 National Nutrition Survey found that Highland (>1200m) children were significantly shorter but also significantly heavier than Lowland (0–600m) children (Heywood et al., 1988). However, potential genetic differences in the growth pattern of children in the two areas make the interpretation of anthropometric indices difficult.

In the second year of life the prevalence of stunting, at the National level, was 48%. The risk of being stunted was higher for children, less than five years, living in the Momase (35%) and Papuan (35%) regions and especially for those in the Highlands (77%) (Gibson and Rozelle, 1998). Across all ages from zero to five years, 8% of the children in Papua New

Guinea were wasted. The highest rate of wasting occurred in the second year of life (13 %),which was also the time of greatest risk found by the National Nutrition Survey.The cause appears to be the late introduction, infrequent feeding and low nutrient density of complementary foods (Heywood et al., 1988). The highest rate of wasting, concerning less than 5 year-old children, was found in the National Capital District (18%) and the Momase region (12%) (Gibson and Rozelle, 1998). Sample sizes are not provided (**Table 4a-2**). According to the WHO , underweight, stunting and wasting can be classified as having a high, very high and medium prevalence, respectively. Thus, malnutrition among children less than five years can be considered a serious health problem in Papua New Guinea (WHO, 1995).

***Low birth weight***

The prevalence of low birth weight (LBW), defined as a birth weight below 2500 g, was found to be lower in the Highlands than in other parts of Papua New Guinea. Results of a retrospective survey of normal term births in the main hospital of the nation's capital estimated a mean of 3251 g with a SD of 404 g. Babies of mothers of Highland descent (mean of 3379 g and SD of 354 g) were significantly heavier than babies from Papuan mothers (mean of 3207 g and SD of 416 g) (Klufio et al., 1992).

Further studies indicate the same regional difference in the prevalence of LBW. A recent study conducted in rural Papua New Guinea, in 2002, looked at regional differences in mean birth weight. The study looked at birth weight patterns collected by the 1982/83 Papua New Guinea National Nutrition Survey, using a sample size of 6137 newborns from 85 districts. The highest birth weights were found in central Papua New Guinea highlands and affluent lowland areas, while the lowest birth weights were found in Sepik, Western, Madang and Milne Bay Provinces (Lowlands), plus remote Highland areas (Muller et al., 2002).

Nutrition and socio-economic status are important factors in explaining differences between birth weights. Therefore, there is not only a need to improve maternal health but also to strengthen the rural economy and to cultivate and consume nutritious foods (Muller et al., 2002).

## Table 4a-1: Anthropometric data on children

| Source/ Year of survey | Location | Sample Size Individuals | Sex | Age Years | Prevalence of malnutrition | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Underweight % Weight/Age | | Stunting % Height/Age | | Wasting % Weight/Height | | Overweight % Weight/Height |
| | | | | | < -3SD | < -2SD* | < -3SD | < -2SD* | < -3SD | < -2SD* | > +2SD |
| **Smith, 1992** | Rural | 27464 | M/F | <5 | 6.4 | 29.9 | 16.6 | 43.2 | 0.8 | 5.5 | 1.6 |
| NNS | Rural | 3277 | M/F | <0.5 | 1.4 | 6.2 | 3.6 | 12.3 | 0.3 | 2.2 | 6.6 |
| 1982/83 | Rural | 3338 | M/F | 0.5-0.99 | 7.4 | 28.3 | 8.2 | 27.4 | 1.0 | 6.3 | 2.1 |
| | Rural | 5981 | M/F | 1 | 10.8 | 41.7 | 17.1 | 45.0 | 2.0 | 14.2 | 0.9 |
| | Rural | 5437 | M/F | 2 | 7.7 | 35.3 | 19.7 | 50.3 | 0.4 | 3.5 | 0.6 |
| | Rural | 5116 | M/F | 3 | 4.2 | 27.4 | 20.5 | 52.3 | 0.2 | 2.2 | 0.7 |
| | Rural | 4316 | M/F | 4 | 4.4 | 28.7 | 23.8 | 56.7 | 0.4 | 1.7 | 0.6 |
| | Rural | 14237 | M | <5 | 6.6 | 30.3 | 17.6 | 45.7 | 1.0 | 5.6 | 1.5 |
| | Rural | 1705 | M | <0.5 | 1.2 | 5.7 | 4.0 | 12.8 | 0.3 | 2.1 | 6.5 |
| | Rural | 1744 | M | 0.5-0.99 | 8.8 | 31.4 | 10.2 | 30.7 | 1.3 | 6.8 | 1.4 |
| | Rural | 3149 | M | 1 | 11.8 | 43.8 | 18.6 | 48.1 | 2.5 | 15.0 | 0.9 |
| | Rural | 2818 | M | 2 | 7.5 | 34.1 | 20.8 | 52.3 | 0.5 | 3.0 | 0.7 |
| | Rural | 2621 | M | 3 | 3.7 | 25.9 | 20.4 | 54.5 | 0.3 | 2.1 | 0.7 |
| | Rural | 2200 | M | 4 | 4.0 | 29.9 | 25.1 | 60.4 | 0.5 | 1.5 | 0.5 |
| | Rural | 13227 | F | <5 | 6.2 | 29.3 | 15.5 | 40.6 | 0.6 | 5.4 | 1.7 |
| | Rural | 1571 | F | <0.5 | 1.5 | 6.7 | 3.1 | 11.6 | 0.3 | 2.4 | 6.6 |
| | Rural | 1594 | F | 0.5-0.99 | 5.8 | 24.9 | 6.0 | 23.7 | 0.8 | 5.7 | 2.9 |
| | Rural | 2832 | F | 1 | 9.6 | 39.3 | 15.3 | 41.5 | 1.6 | 13.3 | 1.0 |
| | Rural | 2619 | F | 2 | 8.0 | 36.5 | 18.5 | 48.2 | 0.4 | 4.1 | 0.6 |
| | Rural | 2495 | F | 3 | 4.7 | 29.2 | 20.6 | 49.9 | 0.1 | 2.4 | 0.8 |
| | Rural | 2116 | F | 4 | 4.7 | 27.5 | 22.4 | 53.0 | 0.2 | 1.9 | 0.8 |
| **Jenkins & Zemel, 1990** | Urban | 568 | M/F | <5 | NA | 13.6 | NA | 18.9 | NA | 4.1 | NA |
| 1986/87 | Urban | 59 | M/F | <0.5 | NA | 3 | NA | 5 | NA | 1.7 | NA |
| | Urban | 68 | M/F | 0.5-0.99 | NA | 4 | NA | 7 | NA | 5.9 | NA |
| | Urban | 109 | M/F | 1 | NA | 22.9 | NA | 19.3 | NA | 11.9 | NA |
| | Urban | 109 | M/F | 2 | NA | 20.2 | NA | 25.7 | NA | 0.9 | NA |
| | Urban | 110 | M/F | 3 | NA | 12.7 | NA | 22.7 | NA | 0.9 | NA |
| | Urban | 75 | M/F | 4 | NA | 8 | NA | 24 | NA | 2.7 | NA |
| **Gibson, 1995** | National Capital District | 266 | M/F | <5 | 12.1 | 31.6 | 11.0 | 25.4 | 3.4 | 18.4 | 3.4 |
| 1995 | Highlands | 261 | M/F | <5 | 6.0 | 19.5 | 20.5 | 46.5 | 1.2 | 2.8 | 8.8 |
| | Coastal | 488 | M/F | <5 | 11.3 | 36.4 | 15.6 | 39.6 | 1.8 | 10.2 | 3.4 |
| | Total | 1018 | M/F | <5 | 9.6 | 29.1 | 16.1 | 39.8 | 2.1 | 10.4 | 4.9 |
| **Friesen, 1998b** | Madang | 502 | M/F | 0.5-4.99 | 12.5 | 47.4 | 8.0 | 31.5 | 6.8 | 27.5 | 2.2 |
| 1996/97 | Sepik | 246 | M/F | 0.5-4.99 | 9.3 | 40.2 | 15.9 | 44.7 | 2.0 | 11.4 | 2.0 |
| | Western Highlands | 134 | M/F | 0.5-4.99 | 0.7 | 5.3 | 9.7 | 40.3 | 0.0 | 1.5 | 11.9 |
| **Monsef, 1998** | Gumine | 147 | M/F | <5 | 6.5 | 28.8 | 17.4 | 44.3 | 2.7 | 12.2 | 3.4 |
| 1998 | Goilala | 64 | M/F | <5 | 19 | 61 | 25 | 58 | 6 | 14 | 0 |
| | Rabaraba | 376 | M/F | <5 | 31.7 | 76.7 | 30.2 | 74.3 | 2.1 | 23.7 | 0.0 |
| | Kaintiba | 262 | M/F | <5 | 27.6 | 65.6 | 43.1 | 71.4 | 1.9 | 10.3 | 0.0 |
| | Raicoast | 159 | M/F | <5 | 7.9 | 42.6 | 12.3 | 42.2 | 0.6 | 11.9 | 0.0 |
| | Tambul | 215 | M/F | <5 | 6.1 | 21.0 | 9.1 | 42.6 | 1.9 | 4.7 | 2.1 |
| | Kandep | 117 | M/F | <5 | 10.9 | 28.3 | 23.5 | 67.8 | 1.7 | 6.0 | 0.0 |
| | Nomad | 137 | M/F | <5 | 19.7 | 43.9 | 12.1 | 30.7 | 8.0 | 24.1 | 0.0 |

Notes: NA Data not available

Each index is expressed in terms of the number of standard deviations (SD) units from the median of the NCHS/CDC/WHO international reference population. * Includes children who are below -3 SD.

## Table 4a-2: Anthropometric data on children

| Source/ Year of survey | Location | Sample Size Individuals | Sex | Age Years | Prevalence of malnutrition | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Underweight % Weight/Age | | Stunting % Height/Age | | Wasting % Weight/Height | | Overweight % Weight/Height |
| | | | | | < -3SD | < -2SD* | < -3SD | < -2SD* | < -3SD | < -2SD* | > +2SD |
| **Gibson & Rozelle, 1998** | National | NA | M/F | <1 | NA | NA | NA | 25 | NA | 12 | NA |
| 1997 | | NA | M/F | 1-1.99 | NA | NA | NA | 48 | NA | 13 | NA |
| | | NA | M/F | 2-2.99 | NA | NA | NA | 47 | NA | 3 | NA |
| | | NA | M/F | 3-3.99 | NA | NA | NA | 48 | NA | 7 | NA |
| | | NA | M/F | 4-4.99 | NA | NA | NA | 46 | NA | 6 | NA |
| | | NA | M/F | <5 | NA | NA | NA | 43 | NA | 8 | NA |
| | Papuan/South Coast | | M/F | <1 | NA | NA | NA | 21 | NA | 16 | NA |
| | | NA | M/F | 1-1.99 | NA | NA | NA | 35 | NA | 7 | NA |
| | | NA | M/F | 2-2.99 | NA | NA | NA | 59 | NA | 0 | NA |
| | | NA | M/F | 3-3.99 | NA | NA | NA | 40 | NA | 15 | NA |
| | | NA | M/F | 4-4.99 | NA | NA | NA | 40 | NA | 0 | NA |
| | | NA | M/F | <5 | NA | NA | NA | 41 | NA | 8 | NA |
| | Highlands | NA | M/F | <1 | NA | NA | NA | 40 | NA | 4 | NA |
| | | NA | M/F | 1-1.99 | NA | NA | NA | 77 | NA | 5 | NA |
| | | NA | M/F | 2-2.99 | NA | NA | NA | 46 | NA | 3 | NA |
| | | NA | M/F | 3-3.99 | NA | NA | NA | 57 | NA | 2 | NA |
| | | NA | M/F | 4-4.99 | NA | NA | NA | 67 | NA | 5 | NA |
| | | NA | M/F | <5 | NA | NA | NA | 56 | NA | 4 | NA |
| | Momase/North Coast | | M/F | <1 | NA | NA | NA | 18 | NA | 21 | NA |
| | | NA | M/F | 1-1.99 | NA | NA | NA | 35 | NA | 24 | NA |
| | | NA | M/F | 2-2.99 | NA | NA | NA | 46 | NA | 3 | NA |
| | | NA | M/F | 3-3.99 | NA | NA | NA | 51 | NA | 4 | NA |
| | | NA | M/F | 4-4.99 | NA | NA | NA | 47 | NA | 13 | NA |
| | | NA | M/F | <5 | NA | NA | NA | 39 | NA | 12 | NA |
| | N G Islands | NA | M/F | <1 | NA | NA | NA | 5 | NA | 6 | NA |
| | | NA | M/F | 1-1.99 | NA | NA | NA | 28 | NA | 10 | NA |
| | | NA | M/F | 2-2.99 | NA | NA | NA | 29 | NA | 0 | NA |
| | | NA | M/F | 3-3.99 | NA | NA | NA | 46 | NA | 10 | NA |
| | | NA | M/F | 4-4.99 | NA | NA | NA | | NA | 0 | NA |
| | | NA | M/F | <5 | NA | NA | NA | 26 | NA | 7 | NA |
| | National Capital District | | M/F | <1 | NA | NA | NA | 9 | NA | 13 | NA |
| | | NA | M/F | 1-1.99 | NA | NA | NA | 29 | NA | 29 | NA |
| | | NA | M/F | 2-2.99 | NA | NA | NA | 24 | NA | 20 | NA |
| | | NA | M/F | 3-3.99 | NA | NA | NA | 22 | NA | 9 | NA |
| | | NA | M/F | 4-4.99 | NA | NA | NA | 16 | NA | 9 | NA |
| | | NA | M/F | <5 | NA | NA | NA | 20 | NA | 18 | NA |

Notes: NA Data not available.
Each index is expressed in terms of the number of standard deviations (SD) units from the median of the NCHS/CDC/WHO international reference population. * Includes children who are below -3 SD.

### *Anthropometry of adolescents*

Several surveys have been conducted in Papua New Guinea in order to determine the height and BMI of male and female adolescents from 10 to 19 years. According to studies carried out in Kaul (on Karkar Island) and Lufa (Eastern Highlands) in 1969 and 1984, students in Kaul have a slightly lower BMI and are taller (around 2–3 cm) than their counterparts in Lufa (Norgan, 1995). The greatest difference in height was found among males between 15 and 17.4 years old. Kaul males had a mean height of 155.1 cm with a SD of 1.4 cm and Lufa males had a mean height of 148.5 cm with a SD of 3.2 cm. According to the 1984 survey, after the age of 12.5 years both male and female adolescents from Kaul are taller those from Lufa (Norgan, 1995) **(Table 4b-2).**

In 1996 and 1997 a nutrition and food habits survey was conducted among male and female students in Central (10 to 15 years), the Western Highlands province (10 to 17 years) and Madang (11 to 18 years) who were taking part in the Health Promoting Schools Programme. Highland students are shorter and stockier than coastal students, resulting in a higher BMI, and females had a higher BMI than males. Students from Central had the lowest mean height and BMI for both males and females. However, in 1998, the lowest mean BMI values were found among male and female adolescents in West New Britain (Saweri, 1998). However, it is important to note the limitations of the data since the age groups vary between school groups.

A 1997 study in Lae, one of the largest towns in the country, found that male and female students (11 to 19 years) were taller than students in the other provinces but their BMI was comparable to those in other provinces (Sema, 1998). School-children living in towns with both parents of Highland origin were shorter and stockier than students, whose parents were from the Coast (Sema, 1998) (**Table 4b-1**).

In 1997, a cross-sectional survey on health and nutritional status of male and female students (10 to 16 years) was carried out in the East New Britain Province (Aichler and Schulte, 1998). This survey identified the mean height of urban children to be higher (around 4 cm) than the mean height of rural children. Median percentage of fat mass, calculated using skinfold measurements, of all investigated students, was 1% higher in urban than rural areas. Urban students were about 1 kg heavier and had a higher BMI than rural students (**Table 4b-2**).

## Table 4b-1: Anthropometric data on adolescents

| Source/ Year of survey | Location | Sample Size Individuals | Sex | Age Years | Nutritional status | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Height (in cm) | | | Body Mass Index (in kg/m$^2$) | | |
| | | | | | mean | SD | median | mean | SD | median |
| **Norgan, 1995** | | | | | | | | | | |
| 1969 | Kaul | 78 | M | 10 - 19 | NA | NA | NA | 17.7 | 1.2 | NA |
| | Kaul | 124 | F | 10 - 19 | NA | NA | NA | 18.1 | 1.9 | NA |
| | Lufa | 110 | M | 10 - 19 | NA | NA | NA | 18.3 | 2.2 | NA |
| | Lufa | 118 | F | 10 - 19 | NA | NA | NA | 19.4 | 1.6 | NA |
| 1984 | Kaul | 167 | M | 10 - 19 | NA | NA | NA | 17.4 | 1.4 | NA |
| | Kaul | 168 | F | 10 - 19 | NA | NA | NA | 18.9 | 1.9 | NA |
| | Lufa | 243 | M | 10 - 19 | NA | NA | NA | 18.4 | 2.5 | NA |
| | Lufa | 180 | F | 10 - 19 | NA | NA | NA | 19.6 | 2.0 | NA |
| 1984 | Kaul | 54 | M | 10 - 12.4 | 129.2 | 2.1 | NA | NA | NA | NA |
| | Kaul | 43 | M | 12.5 - 14.9 | 141.5 | 3.1 | NA | NA | NA | NA |
| | Kaul | 34 | M | 15 - 17.4 | 155.1 | 1.4 | NA | NA | NA | NA |
| | Kaul | 36 | M | 17.5 - 19.9 | 163.9 | 1.5 | NA | NA | NA | NA |
| | Kaul | 39 | F | 10 - 12.4 | 127.3 | 0.6 | NA | NA | NA | NA |
| | Kaul | 50 | F | 12.5 - 14.9 | 143.7 | 2.1 | NA | NA | NA | NA |
| | Kaul | 43 | F | 15 - 17.4 | 153.1 | 1.0 | NA | NA | NA | NA |
| | Kaul | 36 | F | 17.5 - 19.9 | 155.4 | 1.5 | NA | NA | NA | NA |
| | Lufa | 74 | M | 10 - 12.4 | 129.6 | 1.6 | NA | NA | NA | NA |
| | Lufa | 76 | M | 12.5 - 14.9 | 139.3 | 0.9 | NA | NA | NA | NA |
| | Lufa | 38 | M | 15 - 17.4 | 148.5 | 3.2 | NA | NA | NA | NA |
| | Lufa | 55 | M | 17.5 - 19.9 | 160.1 | 2.3 | NA | NA | NA | NA |
| | Lufa | 37 | F | 10 - 12.4 | 130.5 | 3.8 | NA | NA | NA | NA |
| | Lufa | 55 | F | 12.5 - 14.9 | 141.8 | 3.5 | NA | NA | NA | NA |
| | Lufa | 46 | F | 15 - 17.4 | 150.4 | 1.1 | NA | NA | NA | NA |
| | Lufa | 42 | F | 17.5 - 19.9 | 152.2 | 2.6 | NA | NA | NA | NA |
| **Saweri, 1998** | | | | | | | | | | |
| 1996 | Central | 107 | M | 10 - 15 | 146.4 | 9.0 | 144.0 | 16.8 | 1.7 | 16.5 |
| | Central | 84 | F | 10 - 15 | 148.3 | 7.8 | 148.5 | 18.0 | 7.1 | 17.5 |
| 1996 | Western Highlands | 322 | M | 10 - 17 | 149.0 | 9.7 | 148.3 | 19.1 | 1.9 | 18.8 |
| | Western Highlands | 266 | F | 10 - 17 | 149.6 | 7.5 | 150.3 | 20.4 | 2.8 | 19.9 |
| 1997 | Madang | 235 | M | 10 - 18 | 158.9 | 10.4 | 160.4 | 19.0 | 2.0 | 18.9 |
| | Madang | 264 | F | 11- 18 | 155.0 | 6.9 | 155.5 | 20.1 | 2.4 | 20.0 |
| 1998 | West New Britain | 162 | M | 11 - 19 | 156.3 | 9.3 | 157.4 | 17.4 | 2.0 | 17.4 |
| | West New Britain | 142 | F | 11 - 17 | 154.8 | 5.7 | 155.0 | 19.3 | 2.5 | 19.2 |
| 1998 | National Capital | 772 | M | 10 - 18 | 157.3 | 10.2 | 158.1 | 18.6 | 2.7 | 18.4 |
| | National Capital | 881 | F | 10 - 18 | 155.0 | 6.5 | 155.5 | 20.2 | 3.2 | 19.8 |
| 1998 | Total | 1599 | M | 10 - 18 | 155.0 | 10.8 | 155.8 | 18.5 | 2.4 | 18.3 |
| | Total | 1636 | F | 10 - 18 | 153.8 | 7.1 | 154.6 | 20.0 | 3.0 | 19.6 |
| **Sema, 1998** | Lae, Morobe Province | 1224 | M | 11 - 19 | 161.3 | 13.2 | 162.8 | 18.7 | 2.6 | 18.0 |
| 1997 | Lae, Morobe Province | 1078 | F | 11 - 19 | 158.7 | 9.9 | 159.7 | 19.3 | 3.0 | 19.0 |

Data: NA Data not available

## Table 4b-2: Anthropometric data on adolescents

| Source/ Year of survey | Location | Sample Size Number | Sex | Age Years | Nutritional status | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Height (in cm) | | | Body Mass Index (in kg/m$^2$) | | |
| | | | | | mean | SD | median | mean | SD | median |
| **Aichler and Schulte, 1998** | East New Britain Province | | | | | | | | | |
| 1997 | Urban | 99 | M | 10 | 133.3 | 5.7 | 133.5 | 16.3 | 1.8 | 15.8 |
| | Urban | 119 | M | 11 | 136.2 | 6.1 | 136.0 | 16.8 | 1.7 | 16.6 |
| | Urban | 121 | M | 12 | 140.6 | 6.9 | 140.5 | 17.0 | 1.6 | 16.8 |
| | Urban | 139 | M | 13 | 144.8 | 7.6 | 144.5 | 17.4 | 2.1 | 17.1 |
| | Urban | 101 | M | 14 | 149.9 | 7.8 | 149.5 | 18.2 | 2.6 | 17.9 |
| | Urban | 68 | M | 15 | 156.8 | 7.3 | 157.8 | 19.0 | 2.3 | 18.6 |
| | Urban | 28 | M | 16 | 160.3 | 7.4 | 161.0 | 18.9 | 1.5 | 18.8 |
| | Urban | 102 | F | 10 | 134.8 | 6.8 | 134.5 | 16.2 | 1.7 | 16.1 |
| | Urban | 113 | F | 11 | 139.9 | 6.2 | 140.0 | 16.2 | 1.9 | 16.0 |
| | Urban | 117 | F | 12 | 144.9 | 6.9 | 145.5 | 17.3 | 1.9 | 17.0 |
| | Urban | 127 | F | 13 | 148.3 | 7.1 | 148.0 | 18.3 | 3.0 | 17.7 |
| | Urban | 97 | F | 14 | 152.4 | 6.0 | 153.0 | 19.3 | 2.3 | 19.2 |
| | Urban | 76 | F | 15 | 154.9 | 4.7 | 155.3 | 20.0 | 2.7 | 20.0 |
| | Urban | 17 | F | 16 | 155.3 | 6.9 | 156.0 | 21.0 | 1.9 | 21.1 |
| | Metropolitan area | 30 | M | 10 | 132.3 | 5.3 | 131.8 | 16.0 | 1.1 | 16.2 |
| | Metropolitan area | 32 | M | 11 | 136.0 | 5.8 | 136.0 | 16.7 | 2.1 | 16.2 |
| | Metropolitan area | 33 | M | 12 | 140.3 | 5.7 | 141.0 | 17.2 | 2.5 | 16.6 |
| | Metropolitan area | 43 | M | 13 | 143.0 | 6.1 | 143.0 | 17.1 | 1.3 | 17.1 |
| | Metropolitan area | 21 | M | 14 | 145.2 | 4.9 | 145.5 | 17.2 | 2.2 | 17.0 |
| | Metropolitan area | 24 | M | 15 | 155.2 | 5.6 | 156.0 | 18.6 | 2.1 | 18.3 |
| | Metropolitan area | 30 | F | 10 | 131.4 | 5.4 | 132.0 | 15.6 | 1.4 | 15.7 |
| | Metropolitan area | 43 | F | 11 | 135.5 | 5.6 | 135.5 | 16.1 | 2.3 | 15.8 |
| | Metropolitan area | 46 | F | 12 | 140.8 | 6.3 | 140.8 | 17.0 | 2.2 | 16.5 |
| | Metropolitan area | 38 | F | 13 | 146.1 | 6.3 | 146.8 | 17.6 | 2.0 | 17.1 |
| | Metropolitan area | 25 | F | 14 | 151.0 | 6.6 | 153.0 | 19.2 | 2.5 | 19.0 |
| | Metropolitan area | 27 | F | 15 | 154.6 | 4.6 | 155.0 | 21.1 | 2.7 | 20.8 |
| | Rural | 101 | M | 10 | 129.0 | 5.9 | 129.0 | 16.0 | 1.3 | 15.9 |
| | Rural | 126 | M | 11 | 132.4 | 6.0 | 132.8 | 16.3 | 1.4 | 16.1 |
| | Rural | 154 | M | 12 | 136.6 | 6.5 | 136.5 | 16.7 | 1.4 | 16.6 |
| | Rural | 140 | M | 13 | 141.5 | 6.5 | 141.5 | 16.9 | 1.6 | 16.8 |
| | Rural | 138 | M | 14 | 145.9 | 8.5 | 146.5 | 17.7 | 1.7 | 17.5 |
| | Rural | 82 | M | 15 | 149.7 | 8.9 | 149.8 | 18.6 | 1.9 | 18.6 |
| | Rural | 39 | M | 16 | 152.5 | 8.8 | 152.5 | 19.1 | 2.2 | 19.3 |
| | Rural | 104 | F | 10 | 130.7 | 6.4 | 130.5 | 16.0 | 1.4 | 15.9 |
| | Rural | 97 | F | 11 | 134.1 | 6.0 | 134.0 | 16.3 | 1.7 | 16.1 |
| | Rural | 137 | F | 12 | 138.6 | 7.0 | 139.0 | 16.7 | 1.4 | 16.6 |
| | Rural | 155 | F | 13 | 144.6 | 7.3 | 144.5 | 18.1 | 2.0 | 17.9 |
| | Rural | 128 | F | 14 | 147.8 | 6.7 | 148.0 | 18.9 | 2.0 | 18.8 |
| | Rural | 70 | F | 15 | 151.0 | 5.3 | 151.8 | 19.6 | 2.5 | 20.0 |
| | Rural | 32 | F | 16 | 151.1 | 7.2 | 152.8 | 19.9 | 2.7 | 19.9 |

### *Anthropometry of adults*

The nutritional status of adults is usually assessed using the BMI calculated as weight (kg) over height squared ($m^2$). For classifying individuals according to their nutritional status, cut-off levels of BMI have been proposed. Adults with a BMI less than 18.5 kg/$m^2$ are considered to suffer from chronic energy deficiency (CED). A BMI of over 25 kg/$m^2$ indicates overweight and over 30 kg/$m^2$ indicates obesity.

A 1991 study carried out in Lihir, conducted on male and female adults, older than 15 years, found a reduction of weight with age, (associated initially with a decline in fat reserves and eventually with a decline in lean body mass), in rural female adults in Papua New Guinea (data not shown). The survey found a decline in mean BMI in women after the age of 20. From 20 to less than 25 years the mean BMI was 21.9 kg/$m^2$ and by the age of 60 or more, mean BMI dropped to 18.5 kg/$m^2$. Mean BMI in men peaked from 40 to 45 years (23.0 kg/$m^2$) and then decreased slightly (Taufa et al., 1991) (**Table 4c**). Limitations due to the small sample size need to be considered. However, the following studies support these findings.

The decline, in mean BMI in women, may be related to the number of children they have had, their eating habits during pregnancy and long periods of breast-feeding. According to the National Nutrition Survey 1982/83, between 65% and 85% of the mothers with children less than five years were lactating or pregnant (Heywood et al., 1988). The trend for weight loss in women can be related to the number of children that they have had (Garner et al., 1994). Also, women's heavy workload in subsistence agriculture, increases energy requirements. Furthermore, infectious diseases such as malaria, pneumonia and tuberculosis, which are prevalent in Papua New Guinea, tend to reduce appetite and food intake (Gillett, 1990; Groos and Garner, 1988).

Limited data on the prevalence of CED and overweight is available. A 1991 study conducted on adult males and females older than 18 years showed that communities in rural Papua New Guinea have a relatively low prevalence of obesity, especially in the Highlands. Obesity seems to be most prevalent in the urban coastal areas (27% and 38% for men and women, respectively) compared to the rural Highlands (3% and 2% for men and women, respectively) (Hodge et al., 1996a). Sample sizes are not available (**Table 4c**).

A 1996 study found obesity to be most prevalent in the National Capital District for both men and women older than 18 years (21% and 17%, respectively). The coastal areas (urban and rural combined) show the lowest prevalence of obesity for both gender groups (Gibson and Rozelle, 1998) **(Table 4c)**. The data available from the Papua New Guinea Household Food Survey in 1996, suggests a gender difference in the prevalence of CED among adults older than 18 years with 12% of women and only 3% of men with a BMI below 18.5 kg/$m^2$ (Gibson and Rozelle, 1998).

A 1997/98 study was conducted on females (21 to 50 years) in the eight districts most affected by the severe drought caused by El Niño. While 11% of the women between 21 and 35 years had CED, 14% were classified as overweight. Those between 36–50 years had a 14% prevalence of CED and the prevalence of overweight was much lower than that of the younger group of women (6%) (Monsef,1998) (**Table 4c**).

## Table 4c: Anthropometric data on adults

| Source/ Year of survey | Location | Sample Size Individuals | Sex | Age Years | Prevalence of malnutrition | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Body Mass Index (kg/m$^2$) | | | Chronic Energy Deficiency %BMI | | | Overweight %BMI | Obesity %BMI |
| | | | | | mean | SD | median | <16.0 | 16.0-16.9 | 17.0-<18.5 | 25.0-29.9 | >30.0 |
| **Norgan, 1995** | | | | Mean | | | | | | | | |
| 1969 | Kaul | 193 | M | 39 | 21.4 | 1.8 | NA | NA | NA | NA | NA | NA |
| | Kaul | 237 | F | 37 | 19.8 | 2.2 | NA | NA | NA | NA | NA | NA |
| | Lufa | 268 | M | 39 | 21.8 | 1.8 | NA | NA | NA | NA | NA | NA |
| | Lufa | 323 | F | 36 | 20.7 | 2.0 | NA | NA | NA | NA | NA | NA |
| 1984 | Kaul | 255 | M | 41 | 21.7 | 2.0 | NA | NA | NA | NA | NA | NA |
| | Kaul | 303 | F | 38 | 20.8 | 2.4 | NA | NA | NA | NA | NA | NA |
| | Lufa | 280 | M | 40 | 22.1 | 1.9 | NA | NA | NA | NA | NA | NA |
| | Lufa | 254 | F | 40 | 21.1 | 2.1 | NA | NA | NA | NA | NA | NA |
| **Taufa et al., 1991** | Lihir | 93 | M | 15.0-19.9 | 18.8 | NA | NA | NA | NA | NA | NA | NA |
| 1991 | Lihir | 67 | M | 20.0-24.9 | 21.3 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 55 | M | 25.0-29.9 | 22.0 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 42 | M | 30.0-34.9 | 22.2 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 35 | M | 35.0-39.9 | 22.5 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 33 | M | 40.0-44.9 | 23.0 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 19 | M | 45.0-49.9 | 22.8 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 33 | M | 50.0-54.9 | 21.4 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 12 | M | 55.0-59.9 | 21.4 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 13 | M | >60 | 21.2 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 79 | F | 15.0-19.9 | 20.2 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 78 | F | 20.0-24.9 | 21.9 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 83 | F | 25.0-29.9 | 21.2 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 53 | F | 30.0-34.9 | 21.1 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 50 | F | 35.0-39.9 | 20.5 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 22 | F | 40.0-44.9 | 20.9 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 32 | F | 45.0-49.9 | 20.0 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 18 | F | 50.0-54.9 | 18.5 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 21 | F | 55.0-59.9 | 18.7 | NA | NA | NA | NA | NA | NA | NA |
| | Lihir | 14 | F | >60 | 18.5 | NA | NA | NA | NA | NA | NA | NA |
| **Hodge et al., 1996a** | Urban Coastal | NA | M | >18 | NA | NA | NA | NA | NA | NA | NA | 27 |
| 1991 | Rural Coastal | NA | M | >18 | NA | NA | NA | NA | NA | NA | NA | 16 |
| | Rural Highland | NA | M | >18 | NA | NA | NA | NA | NA | NA | NA | 3 |
| | Urban Coastal | NA | F | >18 | NA | NA | NA | NA | NA | NA | NA | 38 |
| | Rural Coastal | NA | F | >18 | NA | NA | NA | NA | NA | NA | NA | 14 |
| | Rural Highland | NA | F | >18 | NA | NA | NA | NA | NA | NA | NA | 2 |
| **Gibson and Rozelle, 1998** | National Capital District | 146 | M | >18 | 25.5 | 5.0 | 24.8 | 0.7 | 0.0 | 4.2 | 26.8 | 21.1 |
| 1996 | Coastal | 194 | M | >18 | 22.4 | 2.5 | 22.3 | 0.0 | 1.0 | 1.0 | 14.0 | 0.5 |
| | Highlands | 137 | M | >18 | 23.2 | 3.0 | 23.1 | 0.7 | 0.7 | 0.0 | 20.6 | 2.2 |
| | National Capital District | 161 | F | >18 | 24.9 | 5.7 | 23.6 | 0.6 | 1.9 | 7.7 | 22.4 | 17.3 |
| | Coastal | 211 | F | >18 | 21.3 | 3.2 | 20.8 | 1.9 | 1.9 | 12.4 | 8.6 | 1.4 |
| | Highlands | 144 | F | >18 | 22.7 | 3.8 | 22.4 | 0.0 | 2.1 | 3.5 | 14.7 | 4.2 |
| | Total | 516 | F | >18 | 22.8 | 4.5 | 21.8 | 1.0 | 2.0 | 8.5 | 14.6 | 7.1 |
| | Total | 477 | M | >18 | 23.6 | 3.8 | 23.0 | 0.4 | 0.6 | 1.9 | 19.7 | 7.2 |
| **Monsef, 1998** | 8 districts | 792 | F | 21-35 | 21.8 | 2.9 | 21.7 | 2.1 | 1.8 | 7.2 | 13.5 | 0.5 |
| 1997-98 | 8 districts | 249 | F | 36-50 | 21.2 | 2.5 | 21.1 | 2.8 | 1.6 | 9.2 | 6.4 | 0.0 |

Note: NA Data not available.

## 6. Micronutrient deficiencies

### *Iodine deficiency disorders (IDD)*

Iodine deficiency disorders (IDD) include the clinical and sub-clinical manifestations of iodine deficiency. Iodine deficiency in pregnant women may cause irreversible brain damage in the developing foetus, whereas in infants and young children it may cause psychomotor retardation and intellectual impairment. Total goitre rate (TGR) is the proportion of the population with a prevalence of goitre for all grades combining both palpable and visible goitre.

There is little systematic documentation and no national survey on the extent and distribution of these disorders. However, iodine deficient soils seem to be the main cause for the observed IDD in Papua New Guinea. A survey conducted in the Western Highlands in 1982, highlights gender differences in IDD. It found the prevalence of TGR to be twice as high in females (41 %) from 10 to 19 years, compared to males (Pharoa et al., 1987). Results from the 1987 study carried out in New Guinea found a prevalence of 12% among males and 25% among females in the same age group. Sample size is not available (Simon, 1990). A large difference in goitre rates was observed between two districts in the Morobe province : in one district there were no cases while in the other the prevalence was 14 % (Amoa et al., 1997) **(Table 5)**.

There is a need to standardize the iodization of salt and guarantee an adequate level of iodine in salt. Testing of salt samples revealed that not all samples were adequately iodised (Amoa et al., 1998). Furthermore, salt consumption seems to be too low to provide the recommended daily intake (RDI) of iodine.

### *Vitamin A deficiency (VAD)*

Vitamin A is an essential micronutrient required for normal health and survival. It is involved in several critical functions in the body including vision, immune system, reproduction, growth and development. Children under five years are most susceptible to VAD. The consequences of VAD are tragic: they include night blindness, irreversible blindness, growth retardation and increased susceptibility to infections. Pregnant women are also prone to VAD and their children are likely to become deficient.

Data from East Sepik show the existence of VAD, as 91% of children under 15 years had serum retinol levels below 0.70 μmol/L (Genton et al. 1990). In 1994, a survey was conducted in hospitals, in several provinces in Papua New Guinea. It indicated that six children among 1027 (6 –72 months) had clinical xerophtalmia[2] (Vital, 1994). The preliminary results of a Vitamin A survey in different provinces indicate night blindness in 1% and less than 1% of children under six years in Madang and Sepik respectively, while in the Western Highlands there were no cases. Xerophthalmia was diagnosed in less than 1% of the children in Madang (Friesen et al., 1998a) **(Table 5)**. The prevalence of night blindness in Madang is considered to be a public health problem.

### *Anaemia/Iron deficiency (IDA)*

The consequences of iron deficiency anaemia (IDA) include reduced physical work capacity and productivity, impaired cognitive functions and brain metabolism and reduced

[2] Xerophthalmia: clinically evident ocular manifestation of VAD. These include night blindness through corneal ulcers and keratomalacia.

immunocompetence. The causes of IDA include low dietary intake in relation to the recommended dietary allowances (RDA), poor bio-availability of iron in the diet, malaria and a high prevalence of parasitic infestations.

Several studies among antenatal mothers were reported. In a study of 600 pregnant women at Port Moresby General Hospital, in the nation's capital, a mean haemoglobin of 10.6 g/dL with a SD of 1.6 g/dL was reported in early pregnancy. This is not representative of the status of pregnant women in Papua New Guinea, because those who attend antenatal clinics in the first half of pregnancy tend to have a higher standard of living than those who attend clinics late in pregnancy. Eighty-one percent of the participating women had a haemoglobin level below 11 g/dL, indicating anaemia, and 59% had a haemoglobin level below 10 g/dL indicating moderate and severe anaemia (Sill et al., 1986). In 1987 among 100 pregnant women studied at Port Moresby General Hospital 44% had a haemoglobin level below 10 g/dL and mean haemoglobin of 9.9 g/dL with a SD of 1.6 g/dL. Ninety percent of the subjects had antibodies to malaria. (Sill et al., 1987).

At the Port Moresby General Hospital 27 127 births took place between 1987 and 1992. Haemoglobin was measured in 835 of the women, indicating a mean of 10 g/dL with a SD of 1.7 g/dL. Sixty nine percent of the pregnant women had a haemoglobin level below 11 g/dL. Although iron and folate tablets are prescribed, anaemia is still widespread among pregnant women in Port Moresby (Mola and Amoa, 1998).

A survey carried out in 1998 identified a high prevalence of anaemia in children under five years (Hb<11 g/dL) (**Table 5)**. The highest prevalence of anaemia was observed in the province of Sepik, indicating 91% of children less than five years. The prevalence was lowest among children from the Western Highlands, 35%. In addition, a lower percentage of children in the Western Highlands had positive malaria slides (Friesen et al., 1998a).

## Table 5: Surveys on micronutrient deficiencies

| Source/ Year of survey | Deficiency | Location | Sample | | | Percentage |
|---|---|---|---|---|---|---|
| | | | Size Individuals | Sex | Age Years | |
| | **Iodine** | | | | | |
| **Pharoah et al., 1987** | TGR | Western Highlands | 162 | M | 10-19 | 19.8 |
| 1982 | | Western Highlands | 167 | F | 10-19 | 40.8 |
| | | Western Highlands | 591 | M | All | 9.4 |
| | | Western Highlands | 553 | F | All | 27.4 |
| **Simon, 1990** | | New Guinea | NA | M | 10-19 | 12 |
| 1987 | | | NA | F | 10-19 | 25 |
| **Amoa et al. 1997** | | Morobe (Memyamya) | 211 | M/F | 8-10 | 13.7 |
| 1997 | | Morobe (Huon) | 416 | M/F | 8-10 | 0.0 |
| | **Vitamin A** | | | | | |
| **Friesen et al. 1998a** | Night Blindness | Madang | 609 | M/F | <6 | 1.10 |
| 1998 | | Sepik | 270 | M/F | <6 | 0.50 |
| | | Western Highlands | 141 | M/F | <6 | 0.00 |
| | Xerophthalmia | Madang | NA | M/F | <6 | 0.2 |
| | **Iron** | | | | | |
| **Sill et al., 1986** | Hb<10g/dL | Port Moresby General Hospital | 600 | F* | NA | 59.0 |
| | Hb<11g/dL | Port Moresby General Hospital | NA | F* | NA | 81 |
| **Sill et al., 1987** | Hb<10g/dL | Port Moresby General Hospital | 100 | F* | NA | 44.0 |
| **Mola and Amoa, 1998** | Hb<11g/dL | Port Moresby General Hospital | 835 | F* | NA | 69.0 |
| 1987-1992 | | | | | | |
| **Friesen et al. 1998a** | Hb<11g/dL | Madang | 476 | M/F | <5 | 82.6 |
| 1998 | | Sepik | 238 | M/F | <5 | 90.8 |
| | | Western Highlands | 127 | M/F | <5 | 34.6 |

Note: NA Data not available
F* - Pregnant women.

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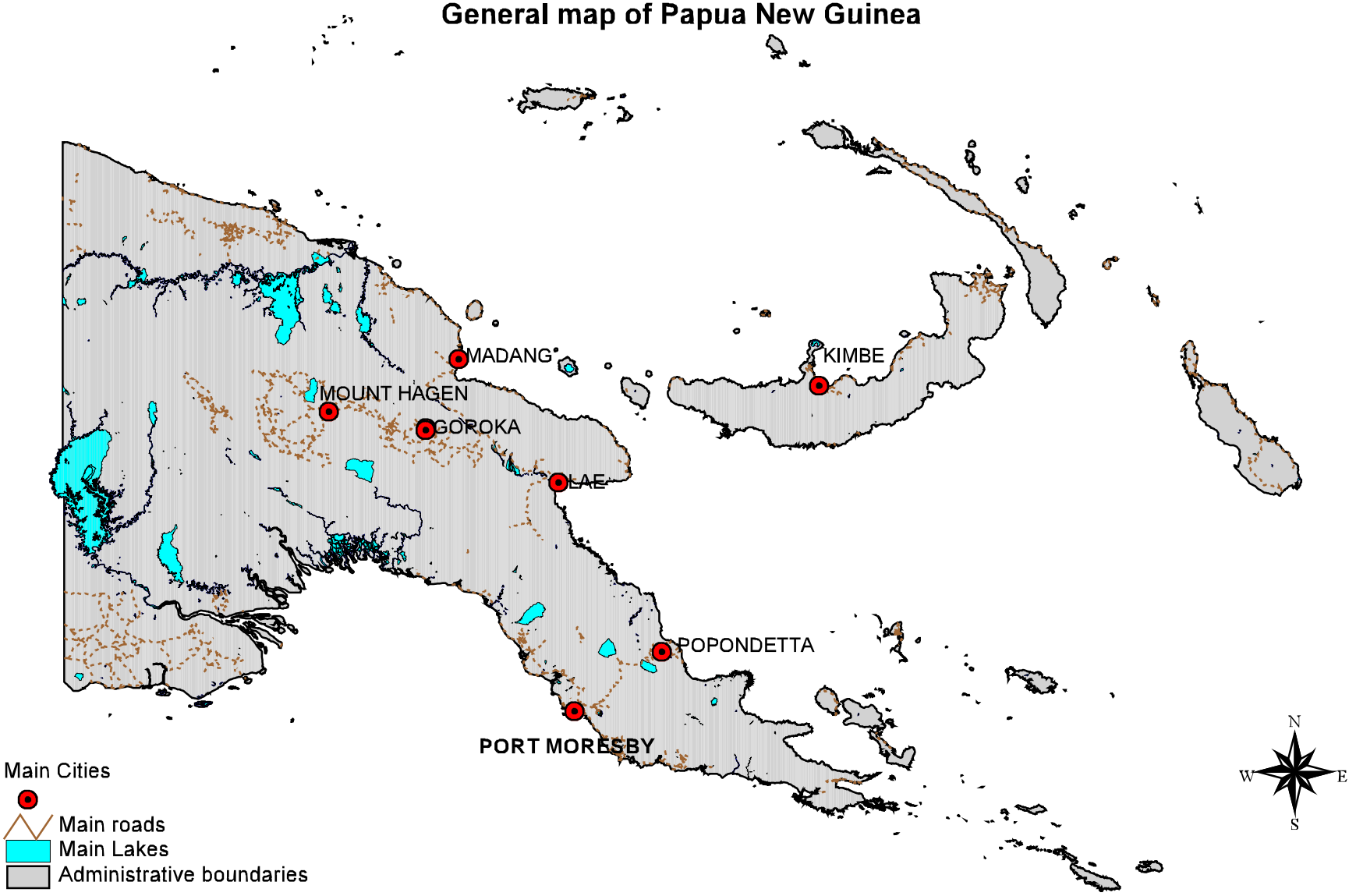
*References of data presented in Table 1, unless otherwise stated:*

| *Source:* | *Indicator:* |
|---|---|
| **FAOSTAT**. 2002 | *A.1 and 2, B, C.10 and11, E.1 to3, F, G* |
| **UN**. 1999/2000 rev. | *C. 1 to 9, D.5* |
| **World Bank**. 2001. | *D.1* |
| **UNDP**. 1999. | *D.2* |
| **Gibson & Rozelle**. 1998. | *D.3 and 4* |
| **UNICEF**. 2002. | *D.6* |
| **FAO/WFS**. 2002. | *H* |

## NCP of PAPUA NEW GUINEA
## MAPS

- General map of Papua New Guinea

# General map of Papua New Guinea




Main Cities

Main roads

Main Lakes

Administrative boundaries

Scale 1: 7.000.000
Geographic Projection (Lat/Long)



*FAO-GIS/ESNA, April 2002*

**Papua New Guinea**