

Obesity in Pacific Island Nations

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INTRODUCTION

Fatness and obesity became an important public health problem among Pacific Islander populations during the second part of the twentieth century, along-side great increases in population size in many of the Pacific Island nations, and migration from the Pacific Islands to urban centres, especially in the United States, France, New Zealand, and Australia. Best documented is the rise of obesity and fatness among adults in Western Samoa (Jackson et al., 1981; Bindon and Baker, 1985) the Cook Islands (Hunter, 1962; Evans and Prior, 1969), the Tokelau Islands (Prior et al., 1974), Tuvalu (Zimmet et al., 1977), the Marquesas Islands (Darlu et al., 1984), and American Samoa (Bindon and Baker, 1985). Of the measures of economic modernisation investigated in relation to obesity and fatness in Pacific Island nations, changes in diet and patterns of physical activity associated with levels of education, occupational status, and urban residence have been put forward as key factors (eg. Hunter, 1962; Evans and Prior, 1969; Prior, 1971; Bindon and Baker, 1985; McGarvey, 1991; Uljaszek, 2001; Uljaszek, 2003).

Another factor which is likely to be important in the emergence of obesity and fatness in Pacific Island nations is the extent to which migrants send resources back to relatives on the Pacific Islands. This is an influence which has increased across the second half of the twentieth century. Migrations of significant numbers of Pacific Islanders have taken place since the 1920's, when Samoans and Tongans began to migrate to Hawaii in large numbers. The greatest influx of Samoans to Hawaii came in the 1950's with the end of United States naval administration in American Samoa, but migration has continued at a steady rate to the present day. In New Zealand, Pacific Islanders have a more recent demographic history. In 1945, there were just over 2,000 people of Pacific origin in this country; by 2001, the number of Pacific Islanders in New Zealand was 232,000, about 6% of the total resident population. Migration of Pacific Islanders to Australia was already in place prior to 1950, but increased greatly in the early 1980's. Between 1971 and 1991, the Pacific Islander population of Australia had more than trebled from a 1971 value of 23,000 people. In France, Pacific

Islander migration from French colonies has taken place since the beginning of the 20th century.

In this article, dietary change and the emergence of obesity and fatness in the context of the expanding world food system is described. Differences in population growth between Pacific Islander nations across the period 1964-2001, when overall population for the Pacific region doubled, are described and estimates of migrant Pacific Islander populations to the United States, France, New Zealand and Australia are made. The potential for migration for individual Pacific Island nations, calculated from known population growth, total fertility rates (TFR) and total mortality rates, is also estimated. From this, the extent to which migrants may be fuelling the process of economic modernisation which is contributing to the high prevalence of obesity in the Pacific Islands is commented on. It is argued that increasing Pacific Islander migrant numbers, now at approximately one quarter of the total global Pacific Islander population, have accelerated the process of dietary change and increased prevalence of obesity in the Pacific Islands, both directly through remittances, and indirectly through the introduction to new foods from industrialised nations.

OBESITY AND FATNESS IN PACIFIC ISLANDS NATIONS

Table 1 shows mean body mass index (BMI) of adult Pacific Islanders living in their Pacific Island nations, and of Pacific Island migrants to industrialised nations. In all cases, mean BMI is high, when compared with values for industrialised nations. In general, mean BMI is higher among more modernised Pacific Islanders living on Pacific Island nations than among those leading traditional lifestyles. For example, A survey carried out in 1966 in the Cook Islands showed adults living on the more modernized island of Rarotonga to be taller, heavier with greater BMI than those observed on the less modernized island of Pukapuka (Evans and Prior, 1969). Furthermore, Katoh et al. (1990) observed the adult population of Rarotonga to have higher prevalence of obesity than the population of the less modernized island of Mangaia. Increased prevalence of obesity and fatness across time

Table 1: Mean BMI of adults in Pacific Island nations.

Country	Males		Females		Reference
	N	BMI	N	BMI	
Tokelau Islands					
traditional	255	26.7	319	29.4	Prior et al., 1974
traditional	135	26.9	145	29.4	Ramirez, 1987
Marquesas Islands					
traditional	27	23.4	53	25.1	Darlu et al., 1984
Westernised	24	26.6	33	28.1	Darlu et al., 1984
Nauru		31.1		32.8	Zimmet and Whitehouse, 1981
Western Samoa					
urban	318	28.1	412	30.9	Jackson et al., 1981
rural	140	26.2	196	28.3	Bindon, 1995
American Samoa	137	28.6	238	32.7	McGarvey, 1991
American Samoa	624	29.8	848	33.0	McGarvey, 1991
American Samoa	95	28.0	164	31.5	Bindon, 1995
Cook Islands:					
Atiu and Mitiaro	208	25.3	66	29.0	Hunter, 1962
Pukapuka	172	25.1	163	26.4	Evans and Prior, 1969
Mangaia	74	28.1	85	29.8	Katoh et al., 1990
Rarotonga	47	27.2	39	27.4	Fry, 1957b
Rarotonga	151	26.9	38	27.8	Hunter, 1962
Rarotonga	222	25.7	194	30.0	Evans and Prior, 1969
Rarotonga	24	28.9	28	29.9	Katoh et al., 1990
Rarotonga	147	30.5	277	32.4	Ulijaszek, 2001

has been documented for adults in Western Samoa (Jackson et al., 1981; Bindon and Baker, 1985) the Cook Islands (Ulijaszek, 2001), the Tokelau Islands (Prior et al., 1974), Tuvalu (Zimmet et al., 1977), the Marquesas Islands (Darlu et al., 1984), and American Samoa (Bindon and Baker, 1985), in association with increased economic modernisation (Prior, 1971; Bindon and Baker, 1985; McGarvey, 1991; Ulijaszek, 2001). Mean BMIs of migrants to industrialised nations are generally greater than those of non-migrants.

Changing diet has been implicated in this pattern of emerging obesity. Historically, traditional diets of the Pacific have been uniformly very low in fat and high in complex carbohydrates, dietary fiber, and foods of plant origin (Shintani and Hughes, 1994), comprising largely of bananas, yams, taro, coconut and animal foods obtained from reefs (Bindon, 1982). However, modernization of the Samoan diet through the increased consumption of imported items is not just a recent phenomenon, but has taken place across most of the 20th century (Hanna, Pelletier and Brown, 1986), perhaps beginning with the earliest large-scale migrations of Samoans to Hawaii in the 1920's. In 1952, the typical rural diet of Cook Islanders on Rarotonga largely comprised of taro, banana, breadfruit, fresh fish and coconut, although significant amounts of bread and tea or

coffee with sugar were also consumed (Fry, 1957a,b). Thus, food imports were clearly important on Rarotonga fifty years ago. Dietary change with modernization and migration in the Pacific region has been documented by other authors, showing modernising populations to have a higher proportion of fat and protein in their total energy intake than among those practicing traditional subsistence (Ringrose and Zimmet, 1979; Prior and Tasman-Jones, 1981; Schendel, 1988; Hezel, 1992). The extent of migration is examined in the next section.

PACIFIC ISLANDER POPULATION: INCREASE AND MIGRATION

The population of Pacific Island nations doubled across the period 1964-2001, this increase being very uneven in distribution (Food and Agriculture Organisation, 2003) (Table 2). Population size has more than doubled in this period for American Samoa, Vanuatu, French Polynesia, Palau, the Marshall Islands, the Federated States of Micronesia, New Caledonia, Nauru and Guam. Natural disasters have resulted in outmigration and greatly reduced population size in Tokelau and Niue respectively, while Tonga, Fiji, Tuvalu, Samoa, the Cook Islands, and the Wallis and Futuna Islands have seen population increases

which are considerably less than two-fold across this period. However dramatic these increases might seem, they mask the true extent of Pacific Islander population increase, as determined from changing fertility and mortality rates across this period.

Table 2: Population of Pacific Island nations, and potential for migration 1961-2000.

	Popula- tion (1000s) 2001	Popula- tion increase 1964-2000	Potential for migra- tion	1964 (1000s)
Tonga	72	99	38	179
French Polynesia	90	237	163	82
Fiji	451	823	82	81
Micronesia	50	126	152	74
Vanuatu	72	202	181	63
New Caledonia	89	220	147	60
Marshall Islands	21	52	148	44
Cook Islands	19	20	5	41
Guam	74	158	114	33
Western Samoa	124	159	28	29
Wallis and Futuna	8	15	87	22
Niue	5	2	-60	18
Kiribati	44	84	1	17
Nauru	6	13	117	10
Tokelau	2	1	-100	7
Tuvulu	6	10	67	1
Palau	8	20	150	-2
American Samoa	23	70	204	-9
Total	1164	2311		750

Figure 1 shows the relationship between total fertility rates prior to 1980 (South Pacific Commission, 1998), and the rate of population increase per decade for the various Pacific Island nations, 1961-2000 (Food and Agriculture Organisation, 2002). The hatched line represents the expected population growth rate at different total fertility rates, acknowledging a steady decline in total

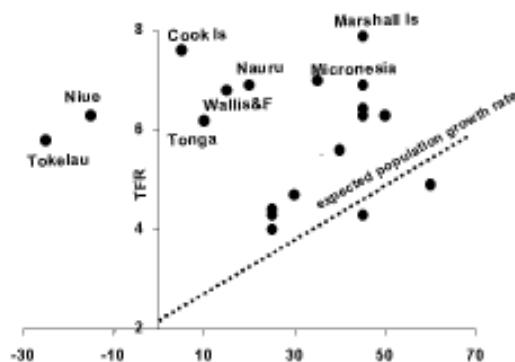


Fig. 1. Population growth (% per decade)

mortality rates across this time. While most nations lie reasonably close to this line, eight of them have much lower population growth rates than might be expected on the basis of total fertility rate (TFR) and declining total mortality rate. While Tokelau and Niue became depopulated because of natural disasters, Tonga, Fiji, the Cook Islands, Wallis and Fortuna, Nauru, the Marshall Islands, and the Federated States of Micronesia are likely to have experienced lower than expected population growth because of high levels of out-migration.

By comparing the expected population growth at the average TFR and average total mortality rates with known population growth of different Pacific Island states across the period 1961-2000, the potential migrant population was calculated. Potential migrant population values are given in the final column of Table 2. While there were 2,318,000 Pacific Islanders living in their nation-states in the year 2000, there may be a further 815,000 living elsewhere, predominantly in the United States, France, New Zealand, and Australia. The most numerous of these are likely to be Tongans, Fijians, and French Polynesians. The potential migrant Pacific Islander population values estimated in this way are very similar to values obtained from census data for Pacific Islander populations in the United States, New Zealand and Australia (Table 2). The estimates of potential migrant Pacific Islander populations of the United States, New Zealand and Australia across the period 1964-2001 obtained by this method is 545,000, while the value obtained from census enumeration was 577,000. Of Pacific Islanders living abroad, most are in the United States; the year 2000 Census enumerated about 249,000 Pacific Islanders (United States Census, 2000). The nations next most populated by Pacific Islanders is New Zealand, followed by France, although the latter value can only be estimated from the calculation carried out using data presented in Table 2 and Figure 1, since there is no enumeration on the basis of ethnicity in France. This estimate suggests that there are 205,000 Pacific Islanders in France. New Zealand has a Pacific Islander population of 232,000 (Statistics New Zealand, 2002). In 1945, there were only 2,000 people of Pacific origin in New Zealand. While there was a period of high immigration in the early 1970s, this inflow slowed in the late 1970s, as social, economic and labour market conditions in New Zealand became less favourable. In Australia, migration of Pacific Islanders was already in place prior to 1950, but increased greatly in the early 1980's. In 1996, Australia was estimated to

have a Pacific Islander population of 96,000 (Australian Bureau of Statistics, 2002). Links between migrants and relatives on their island nations of origin strongly operate to generate tastes for imported foods, and in providing remittances which can be used to buy foods among those living on the home islands. Pacific Island nations where migrants are likely to outnumber island residents, and where remittances are likely to support the use of imported foods include the Cook Islands, Tonga, Wallis and Fortuna, Tokelau, and Niue.

The proportion of global food production being traded internationally increased enormously during the last three decades of the 20th century (Dyson, 1996). Food imports to the least developed nations of the Pacific Region, including Tuvalu, the Solomon Islands, Kiribati, increased more than six-fold in the period 1964 to 2001; the increase across the same time-frame being more than four-fold for Western Samoa, and more than two-fold for the Cook Islands (Food and Agriculture Organisation, 2003). Hanna et al. (1986) observed that the proportion of dietary energy from imported foods varied according to the degree of modernization, being highest among Samoans on Hawaii, lowest among those in Western Samoa, and at an intermediate level in American Samoa. Galanis et al. (1999) found substantial differences between the diets of residents of American Samoa and of those of the less modernized nation of Western Samoa. American Samoans consumed significantly more energy as carbohydrate and protein and less as total fat and saturated fat than Western Samoans. Hanna, Pelletier and Brown (1986) reported greater

dietary diversity with greater extent of modernization and with migration among Samoans, speculating that this greater diversity may be associated with increased food consumption. Ulijaszek (2002) drew similar conclusions for adults on Rarotonga, the Cook Islands. In a comparison of urban and rural populations in Fiji, Kiribati and Vanuatu, Taylor et al. (1992) found that urban diet contained more protein and fat than rural diet, with the exception of Kiribati, where rural communities consumed large amounts of coconut. However, in Kiribati imported food constituted a lower proportion of the daily energy intake of the rural population compared to the urban population (King et al., 1984).

The suggestion that obesity has emerged with increased food availability is borne out in large part by the increased per capita daily energy availability between 1964 and 2001, of four of the five nations for which such data is available on the Food and Agriculture Organisation (2002) FAOSTAT food balance database (Table 3). The exception is New Caledonia, where there has been a slight decrease in per capita energy availability. The proportion of dietary energy from fat has increased in three of the five countries, and decreased in two of them, suggesting that an explanation for increased levels of obesity based on the increased energy density of Pacific Islander diets does not have universal validity. The proportion of dietary energy from protein has increased in three of the five Pacific Islands nations, between 1964 and 2001. The increased energy density of Pacific Islander diets is not generally reflected in the increase in per capita consumption of imported fats and oils.

Table 3: Daily per capita availability of dietary energy, fat, and protein in the years 1964 and 2001, pacific Island nations (from FAO, 2003)

1964	Energy kcal	Fat (g)			Energy from fat (%)	Protein (g)			Energy from protein (%)
		Vegetable	Animal	Total		Vegetable	Animal	Total	
Fiji	2648	34.8	27.3	62.1	21.1	39.9	18.9	58.8	8.9
French Polynesia	2592	34.2	36.4	70.6	24.5	35.9	31.0	66.9	10.3
Kiribati	2159	78.8	20.1	98.9	41.2	28.6	24.5	53.1	9.8
New Caledonia	2894	42.5	51.3	93.8	29.2	33.7	40.8	74.5	10.3
Vanuatu	2504	50.0	43.2	93.2	33.5	30.0	31.3	61.3	9.8
2001	Energy kcal	Fat (g)			Energy from fat (%)	Protein (g)			Energy from protein (%)
		Vegetable	Animal	Total		Vegetable	Animal	Total	
Fiji	2789	62.6	38.2	100.8	32.5	44.8	27.3	72.1	10.3
French Polynesia	2889	60.0	55.4	115.4	36.0	34.6	51.8	96.2	13.3
Kiribati	2922	82.8	22.3	105.1	32.4	36.9	35.4	72.3	9.9
New Caledonia	2770	59.4	46.0	105.4	34.2	38.2	43.1	81.3	11.7
Vanuatu	2565	59.8	30.6	90.3	31.7	36.1	24.4	60.5	9.4

DISCUSSION

The increase in mean BMI observed in Pacific Islanders in the second half of the twentieth century can in general be attributed to dietary change associated with greater food and energy intake, associated with increased consumption of fatty foods and meat, most of which are imports. Economic modernization on the Pacific Islands has been identified as consisting of common nexus of factors fuelling dietary change and the emergence of obesity. However, the modernizing influence of migrants on their home populations and communities is largely left out of this nexus. The existence of significant and increasing Pacific Islander migrant populations in the United States, New Zealand, France and Australia must provide considerable impetus for economic modernization on the Pacific Islands. As migrant populations continue to increase in size, this impetus may increase, accelerating the pace of dietary change on the Islands.

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ABSTRACT The emergence of obesity and fatness across the second part of the twentieth century has been documented for a number of Pacific Islands populations. While dietary change and reduced physical activity levels associated with economic modernisation have been identified as the key factors fuelling the emergence of obesity, it is argued here that increasing numbers of Pacific Island migrants in the United States, New Zealand, France and Australia have provided the basis for the acceleration of the modernisation process by way of remittances, and the transmission of ideas of economic opportunity and change. Population growth and potential for migration for the Pacific Island nations is estimated from available data on population growth, total fertility rates and total mortality rates, and described. Pacific Islander migrants form approximately one quarter of the total global Pacific Islander population, the majority of which are from Tonga, Fiji, French Polynesia, and the Federated States of Micronesia. Per capita energy and fats and meat intake for the period 1961 to 2000 is described for five Pacific Island nations, showing that in general, energy intakes have increased, as have the energy densities of the diets consumed. Thus the increase in mean body mass index observed in Pacific Islanders in the second half of the twentieth century can in general be attributed to dietary change associated with greater food and energy intake, associated with increased consumption of fatty foods and meat, most of which are imports.

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