
Health and Survival in Modernizing Papua New Guinea Societies

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Abstract In developed countries, deaths from infectious diseases have decreased and those from chronic diseases have increased with modernization. In many developing countries which are undergoing rapid modernization, these changes have been accelerated, with marked variation from population to population. A typical pattern is observed in the risks of chronic diseases, like cardiovascular disorders and diabetic mellitus, which are closely associated with activity pattern and food intake. This paper reviews the relationship between modernization and health conditions in South Pacific countries, Papua New Guinea in particular, and discusses the significance of health and diseases in achieving ongoing sustainable development.

Key Words: sustainable development, Papua New Guinea, modernization, diseases pattern, health condition

HEALTH PROBLEMS AND SUSTAINABLE DEVELOPMENT

In developed countries, morbidity and mortality from infectious diseases have declined while those from chronic diseases have increased in accordance with modernization. In most developing countries which have been undergoing rapid modernization, this change in the disease pattern progresses at a higher speed and necessarily influences their strategies of adapting to the changing environment.

Most discussion concerning sustainable development in developing countries focuses on the holistic ecological and economic aspects but seldom deals with the living and health status of the local populations in developing countries (e.g., Croll and Parkin, 1992; Pearce and Warford, 1993). In the author’s view, sustainable development is impossible without improvement of the health status of the people. In other words, in order to attain fully sustainable development, it is impossible to avoid modernization-derived aggravation of health conditions, as represented in disease patterns.

This paper aims to fill in gaps in knowledge of the relationship between sustainable development and health and disease in the developing countries, particularly Papua New Guinea (PNG) and other South Pacific countries.

MODERNIZATION AND HEALTH IN THE PACIFIC

History of Development and Health in the Pacific

The peoples in the South Pacific had first contact with Europeans in the 15th
century, when missionaries arrived and small-scale trade with Europeans began. However, the disease pattern did not change dramatically until World War II and afterwards, when large-scale mining and forestry were introduced (Maddocks, 1974). The change in disease pattern has been manifested by the introduction of alien diseases and modern medicine to the area on the one hand and, on the other, changes in the people’s subsistence pattern, food consumption, and eventually nutritional condition.

It can be assumed that there are two distinct stages in the disease pattern (Inaoka, 1993). In the first stage, infectious diseases, such as measles, smallpox, chicken pox, dysentery, tuberculosis, sexually transmitted diseases, and influenza, prevail. They become epidemic in traditional communities within a few years after introduction, depending on the European contact, and consequently mortality rates drastically increase. The second stage is an improvement stage, where infant morbidity and mortality from infectious diseases decline and life expectancy is extended. The diseases that most often infect and kill change to the so-called “adult diseases” such as malignant tumors, arteriosclerosis, hypertension, and diabetes mellitus; these appear to increase with modernization.

Modernization and Health

At present, the South Pacific countries have already entered the second stage, though health levels markedly differ from country to country. Using data from Carew-Reid (1989) and South Pacific Commission (1989), GNP per capita and life expectancy at birth in the South Pacific countries/regions are plotted in Fig. 1, which demonstrates three observations. First, life expectancy tends to increase proportionately with per-capita GNP except in Nauru, French Polynesia, and New Caledonia. Second, in these three high-GNP countries, particularly Nauru where sulfate is abundant, life expectancy is not so high. Third, PNG, on which this report focuses, has low GNP per capita and low life expectancy; its low life expectancy is in contrast to the markedly high levels in Cook Islands and Palau, whose GNPs are similar to that of PNG.

Similarly, infant mortality rates (IMR) of these countries/regions are plotted against GNP per capita (Fig. 2). The scattergram illustrates a pattern similar to that in Fig. 1, though the life expectancy and the IMR are related in opposite ways to the GNP. The higher the GNP per capita, the lower the IMR in many countries/regions; three high-GNP countries, Nauru, French Polynesia, and New Caledonia, show IMRs of intermediate level. The relatively lower life expectancies and higher IMRs of the three high-GNP countries suggest that economic development represented by GNP does not always improve health status.

The life expectancy is inversely associated with IMR among the South Pacific countries/regions (Fig. 3). However, the unique position of Nauru, the highest-GNP
Fig. 1. The relationship between per-capita GNP (in Australian dollars) and life expectancy at birth (in years) in the South Pacific countries in the early 1980s.

Fig. 2. The relationship between per-capita GNP (in Australian dollars) and infant mortality rate (per 1000 births) in the South Pacific countries in the early 1980s.
HEALTH AND DISEASE IN PAPUA NEW GUINEA

Statistic Records of the Country as a Whole

Human habitats in Papua New Guinea (PNG) are diversified from the main island to the small islands and from the coast to the high altitude areas up to 2600 m. Genetically, the inhabitants are classified into the Non-Austronesian-speaking group, who are descendants of the migrants from Asia more than 50,000 years ago, and the Austronesian-speaking group, descending from the second-wave migration about 4,000 years ago; the former group shares its ancestors with Australian aborigines and the latter group with Polynesians (e.g., Yoshida et al., 1995). Culturally, the peoples are again highly diversified. In their traditional settings, they have been divided into more than 700 linguistic groups, each of whom have maintained to a considerable degree their lineage units by marriages, particularly until several decades ago. In the recent period, modernization progresses differently in the areas close to and far from the centers of economic activity and in urban and rural areas. Thus, health status differs markedly from place to place, though discussion will begin with a brief look at the nation level.

From the comparisons among the South Pacific countries/regions mentioned
above, PNG is classified as a country of lower health status. In the country as a whole, life expectancy at birth extended from 40.4 to 49.6 and IMR dramatically dropped from 134 to 72 per 1000 live births between 1971 and 1980. The available national health statistics are based on the records for hospital outpatients and inpatients, and only approximately one fifth of all deaths are registered (Department of Health, 1986). According to these statistics for 1980, the first cause of death was respiratory diseases (28%); the second, infectious diseases such as malaria and tuberculosis (24%); and the third, uncertain diagnoses (14%). Chronic diseases — i.e., malignant tumors and cardiovascular diseases — and accidents each accounted for 3–5% of all the deaths. The statistics of diagnoses at admission also revealed that patients with respiratory and intestinal infectious diseases were the most often admitted, except for women’s admission to give birth (Department of Health, 1986).

**Heart Diseases**

It has been claimed that because of high mortality from respiratory and intestinal infectious diseases among PNG people, chronic malignant tumors and cardiovascular diseases have not yet been fully manifested, even if there exist genetic predispositions in certain groups (Sinnett et al., 1992).

With respect to heart diseases, a report of 724 post-mortem examinations between 1923 and 1934 (Backhouse, 1958) revealed no case of myocardial infarction. According to the 995 post-mortem examinations conducted in the PNG General Hospital in Port Moresby (the national capital) between 1962 and 1968, only 8 cases (0.8%) of myocardial infarction were identified (Cooke and Kariks, 1970); if the 146 cases autopsied in the same hospital are included, this rate increased to 4.8% (Aiken et al., 1974). An analysis of 400 autopsies, half of which were performed in Port Moresby and the other half in Goroka (the capital of Eastern Highlands Province), found that in the former samples 11% of the deaths were due to ischemic heart disease and in the latter samples, only 2% (Misch, 1988).

A study of the traditional Highlands population called the Murapin conducted in 1966 showed that coronary risk factors such as hypercholesterolemia, hypertension, diabetes, high dietary fat intake, and high salt intake were virtually absent and that the prevalence of cardiovascular diseases was very low (Sinnett and Whyte, 1973; Sinnett, 1977). Their blood pressure remained unchanged or even decreased with aging (Boyce et al., 1978). In the 1960s, the first report appeared to show age-related increase of blood pressure among the people living near Port Moresby, and this increase was attributed to high salt intake (Maddocks, 1967). A repeat study of the Bougainville population revealed significant increases of blood pressure in association with body mass (body fatness) and salt intake (Freidlaender and Rhoads, 1980). These findings are parallel to the nation-level change in the frequency of admission by hypertension, which increased from 0.5/100,000 in 1961
to 7.5/100,000 in 1984 (Sinnett et al., 1992).

**Diabetes Mellitus**

The thrifty genotype hypothesis (Neel, 1982) asserts that genetic selection took place to favor the survival of individuals whose genetic traits made it possible to store excess food energy as body fat when food was abundant in order to overcome risks in hunger periods. According to this hypothesis, prevalence of NIDDM (non-insulin dependent diabetes mellitus, or type II DM) rises among the individuals with this genetic predisposition when their body fat increases during the modernization process. It has often been quoted to explain the recent increasing prevalence of NIDDM among Polynesians, who are descendants of long-distance sea voyagers.

Zimmet et al. (1985) reviewed the prevalence rates of diabetes mellitus among the Pacific countries in the years 1976–82 and revealed that it was higher in urban populations or among migrants to urban centers than in rural populations. It should also be noted that the prevalence rate in Nauru was extremely high; about one fourth of both male and female adults suffered from diabetes. Furthermore, some Melanesian populations showed higher prevalence rates (2–3%) of diabetes than European populations, although the rate was low in New Caledonians and in rural population in Fiji.

King (1992), who investigated the prevalence rates of diabetes mellitus in PNG, found the highest level in the non-traditional population in the Port Moresby area. Though these are insufficient data, the prevalence rates of NIDDM were always higher in coastal populations than in Highlands populations, and the difference is attributed to the genetic predispositions of the Austronesian-speaking populations (King et al., 1991). Thus, the overall prevalence pattern of NIDDM in PNG seems to support Neel’s (1982) thrifty genotype hypothesis.

**Nutrition**

Many reports have demonstrated the links among economic development, changes in subsistence activities, food intake and nutritional conditions, and health conditions (Sinnett and Whyte, 1973; Sinnett, 1977; Harvey and Heywood, 1983; Ulijaszek et al., 1987; Ohtsuka and Suzuki, 1990; Sinnett et al., 1992). Traditional PNG people depended on one or two starchy staple foods, but recently they have accepted foreign foods such as rice, flour, tinned meat and fish, and salt. The change in food consumption patterns has led to larger amounts of intake of protein, lipid, and sodium and smaller amounts of intake of complicated carbohydrates and fiber.

Particularly drastic changes in nutritional conditions have taken place among populations who inhabit the area in which modern enterprises such as timber and mining industries began operations. According to Ulijaszek et al. (1987), after discovery of a gold mine in 1975 in the region where one of the most traditional
people lived, the people abandoned slash-and-burn horticulture to work at the mining site, and since then they have heavily depended on purchased foods. As a result, their nutritional conditions, in particular among the young people, have improved, and they have attained higher stature and body weight than expected.

**Findings from Manus Population**

In contrast to Polynesian countries, where obesity-related problems have become a major public concern, few investigations have focused on the effects of long-term nutritional conditions on the chronic disease-related health status of the PNG peoples. In 1988, the author, together with colleagues, began a health monitoring survey of the people in Manus Province, who belong to the Austronesian-speaking group and are one of the well-nourished populations in PNG (Inaoka et al., 1995).

When obesity is defined as an individual of either sex whose body mass index (BMI) is 26.0 or higher, more than 50% of males and 30% of females among the subjects above 20 years old were placed in this category.

The Manus islanders’ blood pressure was not correlated with age in either sex, mostly because there were young people whose blood pressure was considerably high. The rates of hypertension (defined as 160 mmHg or higher in systolic blood pressure, SBP, or 95 mmHg or higher in diastolic blood pressure, DBP) plus borderline cases (140–160 mmHg in SBP or 90–95 mmHg in DBP) were 39% in males and 33% in females. Among the factors contributing to their blood pressures, salt intake and protein intake were significant in both SBP and DBP of males, while body fat percentage was significant in SBP of females.

According to the results of health examinations for more than 800 adults in 1994, the positive rate of urinary glucose varied from 2–6% depending on the village. Prevalence rates of diabetes mellitus have not been examined, but the positive glucose rates suggest that they are genetically predisposed according to the thrifty genotype hypothesis (Neel, 1982) and that their prevalence of diabetes mellitus — NIDDM in particular — will increase with modernization.

**New Stage for Infectious Diseases**

Last, two problems with infectious diseases, which have recently became significant, are discussed. One is the spread of malarial infection into the non-immune Highlands region. Malaria had long been rare in the Highlands because its low temperature is inhospitable to *Anopheles* mosquitoes, the vector of malaria. The development of transportation systems between the Highlands and the lowlands, however, made it possible for both people and mosquitoes to travel frequently to the Highlands, and consequently malaria has become sporadically endemic there (Radford et al., 1976).

The other is introduced AIDS (Van der Meijden and Malau, 1991). The first case
of full-blown AIDS was reported in Port Moresby in 1987. At the end of 1993, the number of HIV-positive persons exceeded 100; however, it is generally accepted that this number is only the visible tip of the iceberg. It is characteristic that the proportion of females among the registered HIV-positives is higher than expected — about 4 females to 6 males. This ratio suggests that heterosex is the major means of HIV transmittal in PNG. Given the people’s free sexual behavior pattern into account, the future spread of AIDS presents a serious problem.

CONCLUDING REMARKS

Major health problems in PNG have been described. It is clear that all of them are closely related to modernization and changes in the people’s lifestyle, and that some of the harmful health conditions have been caused by economic development directly or indirectly. As mentioned at the beginning of this paper, sustainable development should include the improvement of the people’s health conditions and avoid undue increases in new health problems. An important obstacle to solving these problems is the lack of reliable information on the changing health conditions and disease patterns. It is thus concluded that, at minimum, health monitoring studies should be conducted to concretely relate health problems with the modernization process and to work toward sustainability not only of the environment but also of human beings themselves.

REFERENCES


