

EDITORIAL

Health and the environment in the Tari area

The Tari Research Unit

This special issue of the Journal contains papers on health and the environment in the Tari area of the Southern Highlands Province (Figure 1). The papers in this issue present the results of research done over more than 30 years, at what has become known as the Tari Research Unit or TRU. The TRU began life as the Pneumonia Research Unit of the Department of Public Health in 1970. Before 1970 the Department of Public Health had chosen Tari as the site for epidemiological work on the disease patterns of the highlands people of Papua New Guinea (PNG). At that time, little was known of the major health problems of highlanders, as opposed to lowlanders. It was generally recognized that respiratory tract diseases were a major cause of

morbidity and mortality in the Tari area, which had been dramatically shown during the 1969 influenza epidemic, and the Pneumonia Research Unit was established to define the problems of respiratory infection in a rural community, to determine the pattern and cause of mortality from respiratory disease and to evaluate a pneumococcal vaccine.

Once it was well established in Tari, the Pneumonia Research Unit became the Tari Research Unit. Ian Riley, the first Director of the TRU, established a method of monitoring respiratory disease patterns in around 22,000 people in the area surrounding Tari by employing literate young people living within local communities to report on the morbidity of respiratory disease in their local area. These people became known as Reporters. In one

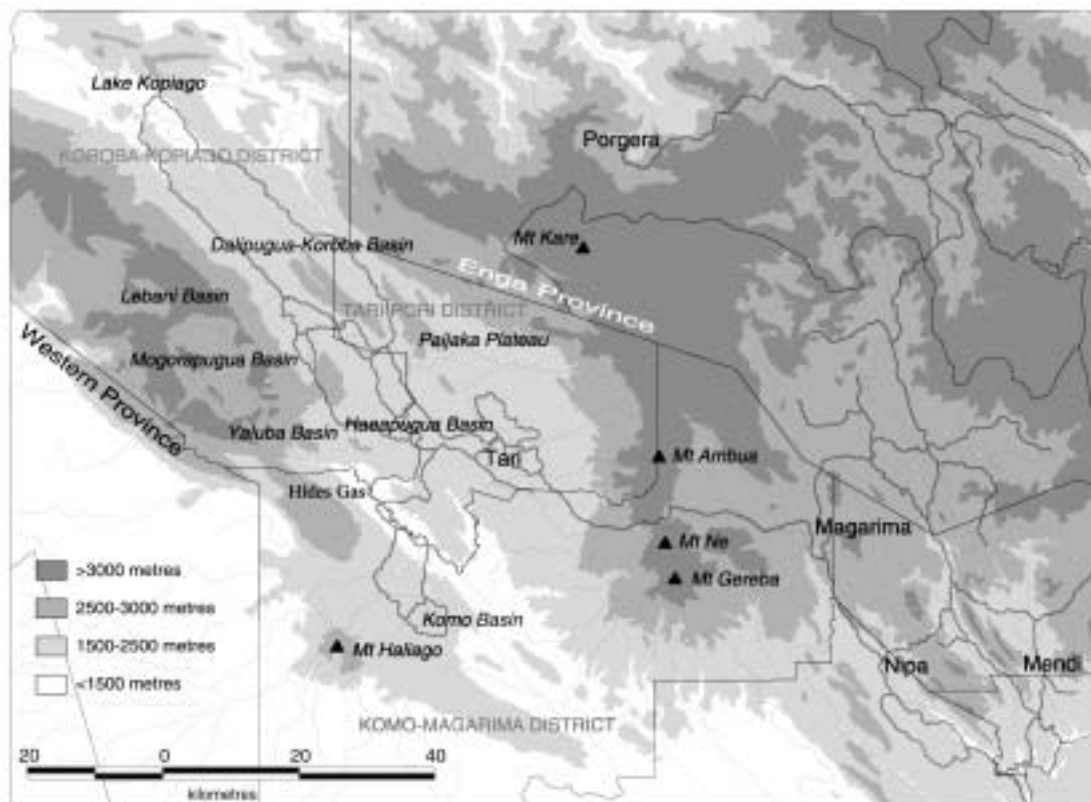


Figure 1. The Tari region.

part of the Tari area, the morbidity area, reporters brought data to the TRU at Tari every two weeks, where it was recorded on to cards. Bi-annual censuses were also carried out. Because Huli people do not live in villages and because, at least in the past, many men had more than one residence, the censuses were carried out by families walking to a census point (Figure 2). In a more extensive area, mortality was studied by regular censuses only. Over the years, the population under surveillance gradually grew and reporter-based surveillance became universal. By 1995, when surveillance ceased, the morbidity and mortality of over 35,000 people were being monitored.

In the late 1970s the TRU was managed by the Department of Finance on behalf of the Southern Highlands Rural Development Project (SHRDP) which was funded by the World Bank. The responsibility for technical direction of the TRU was entrusted to the Papua New Guinea Institute of Medical Research (PNGIMR). As the work of the SHRDP came to an end, from 1985 the TRU progressively came under the direct control of the PNGIMR. The role of the unit expanded, with the aim of establishing patterns of disease morbidity and mortality in the Tari area, particularly in children, as well as studying demographic trends. The ability to draw samples from a known rural population that was being monitored and censused regularly gave the TRU a very powerful research tool. The surveillance data could be applied to a range of other health and development studies that had potential benefits, not only for the Huli people of Tari but for other Papua New Guineans and rural people in developing countries elsewhere in the world.

Between 1970 and 1980, studies carried out through the TRU included the first of three formal trials of polysaccharide pneumococcal vaccines (1). Later, a number of broader studies of rural health, family planning and nutrition in children were conducted and a wide range of diseases and health problems investigated, for example pigbel (2), chronic lung disease, diarrhoea, injury, hepatitis B (3) and haemophilia (4). In 1978-1979, the TRU conducted a large study designed to determine which indices of nutritional status in children

predicted risk of death or illness (5). This study involved the anthropometrical measurement of over 2800 children who attended maternal and child health clinics in the Tari area.

In 1981 the TRU appointed a full-time epidemiologist and a demographer-field supervisor. The surveillance area was rationalized and the data cleaned and updated by a number of rolling censuses. By October 1985 the TRU had 27 reporters in the field, 3 reporter supervisors, 3 clerks, 1 mortality clerk, 1 field assistant, 1 health extension officer, a field supervisor, a principal research officer and an epidemiologist-director.

Between 1985 and 1995 health and medical studies continued: for example, further work on respiratory disease (6) and the pneumococcal vaccine (7-9); the public health effectiveness of the aid post system (10); an ethnography of health among the Huli (11); a study of the carriage of the respiratory pathogen *Streptococcus pneumoniae* on people's hands (12); oral rehydration as a treatment for childhood diarrhoea (13); the ecological and socioeconomic determinants of birthweight (14); the antibody response to Edmonston-Zagreb measles vaccine (15); and ongoing demographic analysis (16). Other research included studies of smoke inhalation, genetic profiles of Huli and Duna schoolchildren, the prevalence of proteinuria in Huli adolescents and indirect childhood mortality estimation from maternal histories.

The SHRDP and the existence of the TRU's population databases, the ability to draw sample frames and the link between the reporters and their communities, attracted other than medical researchers. Major work was undertaken on Huli agricultural systems that included the creation of a map of agricultural land use (17) and a map of the boundaries of the major Huli territorial and landholding units, the *hamegini* (18); studies of the prehistory of settlement and vegetation change in the Tari area (19,20); and research on food production, food intake and energy expenditure in contrasting environments within the Tari Basin (21).

On 1 January 1987, the TRU was formally transferred from the SHRDP to the PNG

Institute of Medical Research. The Unit acquired new capacities when the surveillance data were moved on to desktop computers within TRU and a bacteriology laboratory was established in Tari. However, from around 1987, clan fighting, which had been in abeyance since the forced pacification of the area in the 1950s, became more and more frequent. Homemade and manufactured firearms made an appearance. This, in association with increased lawlessness and criminality, made the work of the TRU increasingly problematical. Censusing became more difficult and the TRU concentrated its resources on the surveillance population and analyses of the demographic changes in this group over the previous 20 years. The early stages of the HIV/AIDS epidemic in PNG stimulated studies of sexual behaviour among the Huli (22). The impact of the Mt Kare gold rush was also studied (23).

The rapid increase in money from Mt Kare and from the royalties from gas and mineral extraction operations in the region destabilized Huli society in the 1990s. Criminal activity climaxed with the shooting murder of the manager of the local supermarket, numerous bank hold-ups that caused the closure of local bank branches and disruption to the air service from Port Moresby to Tari. Frequent armed hold-ups and poor road maintenance made travel hazardous along the road between Tari and Mendi. These events were accompanied by a severe decline in the quality of public administration, the neglect and misuse of government services and the run-down of private businesses. Because of these conditions, the TRU was forced to end demographic surveillance in May 1995.

Between 1995 and 2000 the TRU ran the Family Health and Rural Improvement Program (FHRIP) (24) which had grown indirectly from the preceding two decades of research work. Analysis of demographic data continued and in 1998 a volume was published setting out trends in mortality and fertility between 1979 and 1993 (25). A major conference, with public meetings conducted in each of the districts in which TRU had worked, was also held in Tari that year to disseminate the results of this research to local people and district officials.

In September 2000 the IMR reluctantly closed the TRU after reaching an agreement with Community-Based Health Care to continue the work of FHRIP. All the TRU demographic data files were secured in Goroka and they remain a valuable resource. For example, in 2001 immunization data collected in Tari between 1989 and 1994 were used to analyze the indirect effects of diphtheria-tetanus-pertussis (DTP) and BCG vaccinations on child mortality, as part of a World Health Organization (WHO) study.

A trajectory of change

The papers contained in this volume focus on the relationships between health and the environment in the Tari area. Tari provides an exceptional setting in which to study these associations – people who are genetically closely related occupy a number of contrasting environments. They speak one language and subscribe to one set of cultural beliefs and practices. The previous section shows that, relative to other parts of PNG, a lot is known about the patterns of disease and health in these people. Until the closure of the TRU, the surveillance population and the close contact with communities through the reporters provided an unequalled framework for scientific study. The results could be applied not only to improving the welfare of the 80,000 Huli, but also to understanding the situations of people in similar environments all over Papua New Guinea.

It is likely that for at least the last 1000 years, and probably longer, the Huli have been on a 'trajectory of change' (26) that has increased in speed as it approached the present. The trigger that started Huli society on this trajectory is not known, but the fertile environments of the region provided conditions that allowed agriculture to steadily expand and intensify (27). Around 500 years ago, however, the introduction of a new crop, sweet potato, set in train a 'revolution' in agricultural technology that brought with it sudden and extensive environmental change: in particular, the clearing of forest, the drainage of swamps and the expansion of agriculture to higher, steeper and less fertile areas, with consequent increases in soil erosion. Importantly, these changes were accompanied by rapid demographic and social changes.

We can fairly safely assume that the demographic, social and environmental changes that began in the early 1800s were reflected in changes in disease patterns and health among the Huli. The fact that the population grew rapidly and expanded suggests that there was an improvement in food supply and perhaps a decline in infant and child mortality. The Huli were trading over long distances, especially into the lower altitude zones to the south. It is possible that malaria came into the lower parts of the Tari region during the late 1800s or early 1900s. Areas of abandoned and tree-covered agricultural land, complete with ditches and walls, are found in the lower Tagali Valley south of Benalia below 1400m. The adoption of the sweet potato as a staple food, with its higher levels of sugar than other foods, also probably changed patterns of oral health among the Huli (28).

Without doubt, however, the most significant changes at Tari have come about as the result of the penetration of the region by European gold miners and colonial officials from around 1930 onwards. Their appearance coincided with a series of calamities that include a climate-induced famine in the late 1930s (29) and a shigella dysentery epidemic in the early 1940s that spread from Benabena near Goroka, west up the main highlands valleys, to kill an unknown number of people at Tari (30). Understandably, these events stood out in the memory of eyewitnesses still alive in the 1970s, whereas the widespread deaths from pneumonia and respiratory diseases (31) were taken for granted as part of everyday life.

Also accepted as 'normal' was the undernourishment of children. It is not known whether patterns of malnutrition in children worsened significantly as the population spread from the richer lower environments around the swamps to the higher altitude slopes and plateaux, but it is likely. By the 1970s a clear pattern of child malnutrition had been observed at Tari (32), associated with environmental differences (33) and the struggle that women faced to produce adequate amounts of food in poorer environments (34). These challenges to the well-being of young and growing children were translated into differential morbidity and mortality rates in poorer environments (35).

The Europeans brought with them a colonial administration and a cash-based market economy. An airstrip was built near the centre of the Huli population. The colonial administration, the market and the airstrip introduced further distortions to the geography of health at Tari, begun by the earlier expansion of Huli settlement and agriculture after the introduction of sweet potato. At first, the only outcome of the new economy at Tari was the migration of young men out of the region to work as labourers on coffee, cocoa and coconut plantations elsewhere in Papua New Guinea. However, their movements to and from the larger world brought about immediate changes in the pattern of communicable diseases among the Huli (36) and the beginning of subsequent social and cultural changes.

The first health services and schools and the first commercial activities, including the retailing of introduced foods, clothing and tools, were established close to the airstrip at Tari. An administrative and economic influence on patterns of health was added to existing environmental influences (37). These new influences provided both opportunities (38) and pitfalls. For example, Huli women, who had previously given birth alone, because the fluids associated with sexuality and birth were considered to be dangerous to men and women, quickly took advantage of antenatal and delivery services offered at the new health centres (39). But those who most needed the new services, people living on the steeper, higher, poorer, more isolated environments, were furthest from the services. Although the rate of change was slower on the periphery, not all of the changes occurring in the centre were desirable. Increased monetization led to increased crime and also to a greater dependence on imported consumption items. Gender conflict may have intensified as men and women competed for scarce cash resources. In a society that remains dominated by men, some women have used their sexuality to protest their poor treatment at the hands of their male relatives and husbands (40). Their behaviour is highly dangerous to themselves and their sexual partners, in the face of an impending HIV/AIDS (human immunodeficiency virus/acquired immune deficiency syndrome) epidemic.

At the time of writing it is difficult to be optimistic about the immediate future at Tari. Governance has all but collapsed, and health and education services struggle to survive, let alone deliver benefits to the Huli people. Firearms are widespread, fighting is endemic again, yet population growth is rapid, and there are signs of environmental degradation caused by agriculture in poorer environments. HIV/AIDS is loose in the population while the old diseases, described in this issue of the Journal, are still causing unnecessary morbidity and mortality in children and adults.

It needs to be acknowledged, however, that although some of the changes that have been introduced in the previous 50 years were accepted willingly by the Huli people, for example the introduction of health services, many, such as the cessation of fighting, were not of their own choosing but were forced upon them, sometimes at the point of a gun. Some Huli men, but not all and certainly not Huli women, are responding to a weak and indecisive national government by attempting to reassert control over affairs at Tari by force of arms, with fairly dire consequences. We can only wait and hope that life at Tari will not deteriorate too far before a majority of Huli will want to change it again for the better. When that happens, the knowledge of interrelationships between Huli land and culture and health and nutrition, that the TRU has played such an important part in creating, will be available to help them achieve their new goals.

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