

Health transitions, fast and nasty: the case of Marshallese exposure to nuclear radiation

Abstract: The concept of health transitions assumes that health status improves with the introduction of western medicine. In this paper I demonstrate that the health of the people of Rongelap, Marshall Islands, has undergone serious damage as a result of nuclear testing, and that women in particular have suffered unduly. Exposure to nuclear radiation over a period of almost fifty years has been recognised by US authorities as a major contributory cause to the high rates of cancers and birth defects suffered by the Rongelap people. Women's reproduction has been severely affected, as evidenced by the many stillbirths and small stature of children born alive. Two generations have been exposed to both background radiation and to radiation ingested with the local foods on which they rely in the absence of other food sources. Clean up has commenced only after this and other communities sought compensation from the United States. The Rongelap people will live with the effects of radiation for generations to come. This transition to ongoing health problems is thus a negative outcome of modern health transition.

Nancy J. Pollock*

Introduction

The peoples of Rongelap and Utrik in the Marshall Islands have endured fifty years of exposure to radiation from fall out from U.S. nuclear tests. The current analysis of the impacts of radiation on health has shown that not all transitions lead to better health: some are regressive and harmful. This case study also shows that social factors, especially those concerning gender, must be considered as part of the broader context of health transition within which demographic changes occur. The concept of better health, as implied in Health Transition analysis, must be queried, not assumed.

Omran's theory¹ of epidemiological transition, based on historical data from Europe, may not be directly applicable to the Pacific region for several reasons. His construct of a series of ages sets the transition in an evolutionary framework that implies progress over time towards better health care. His sequence of controlled infectious diseases, followed by emergence of non-infectious diseases arising from a "modern" lifestyle is based on a bio-medical approach, which Barrett et al.² have termed "the emerging paradigm of evolutionary medicine." However, such a "Triumphalist" assessment, as May³ has

labelled it, overlooks wider concerns of these health transitions as found in the Pacific. The re-emergence of infectious diseases in recent times, as graphically depicted in Garrett⁴, reinforces the point that Omran's "ages" are not discrete. Health transitions are not completed stages or eras. Rather, they should be considered as broad-brush generalisations, with notable exceptions, such as the case study discussed here.

The evolutionary model of changes in health has been criticised in its application to the Pacific. This has occurred primarily after Moorehead's historical presentation of what he termed "The Fatal Impact"⁵. Discussion of the impact of infectious diseases on Pacific populations has been reiterated by Miles, who provides a bio-medical perspective drawing on extracts from historical sources. Miles argues that isolation of island societies has been the key element in the spread of infections⁶. While this argument does explain some Pacific health patterns, Miles neglects the volume of data on extensive voyaging between islands that dominated the Pacific before European controls limited those contacts. In addition, in Pacific societies the grounds for labelling them "modern" (i.e. post World War II) cannot be based on a strong statistical contrast with "traditional" times, as statistics for that pre-war period were not fully recorded. Details of births, deaths, and causes of death were not fully recorded until the South Pacific Commission provided a coordinated service in the 1970s. Also, the island populations were considered too small for statistical processes to be convincing. At present, diabetes, coronary heart disease, obesity and cancers have been given prominence by epidemiologists, who label them as diseases of modernisation⁷. And yet, despite a general move towards the eradication of infectious diseases, diseases such as AIDs, tuberculosis, and dengue nonetheless continue to take their toll on Pacific health.

The evolutionary model of changes in health has been criticised in its application to the Pacific.

*Senior Research Associate in Anthropology and Acting Director of Development Studies, Victoria University, Wellington, New Zealand.

Thus, any arguments about risks of dying from non-infectious diseases as presented today are largely assumed to be true for the Pacific. They do not rely on Pacific population data. However, it is becoming increasingly clear that Pacific populations differ significantly. For example, the obesity figures that Dowse and Zimmet⁸ cite as high risk for coronary heart disease in Pacific populations are not borne out by mortality statistics⁹. Obesity as measured by BMI (body mass index) has been weighted upward for Polynesian populations to accommodate such anomalies. A broader social understanding by Community Health specialists working with Pacific populations in Auckland and in the islands has highlighted this anomaly internationally.

An alternative model of health transition, relevant for the Pacific, must include the demographic and epidemiological arguments in a framework that assesses the processes of disease causation as well as the end states of disease clusters. I will demonstrate that the following five factors must be included.

- The *agency* by which any major change that interrupts an ongoing health system must be identified. That agency may be an event such as a natural disaster, or a human intervention such as mining.
- The process of *medical assessment* must be critically evaluated.
- The *medical interventions* available to the people must be assessed by more than one agency.
- The *statistical outcomes* must be transparent.
- The *effects on the genders* must be differentially assessed.

Discussion of health transitions in the Pacific must include reference to the health effects of nuclear radiation.

When these five factors are put alongside the demographic and bio-medical data, then we can begin to understand trends in health transition in the Pacific.

Discussion of health transitions in the Pacific must include reference to the health effects of nuclear radiation. The testing of nuclear weapons by the U.S., France and Britain has generated strong negative reactions by Pacific states, particularly during the 1970s and 1980s. Strong anti-nuclear policies were promulgated by the newly independent Pacific governments, as well as New Zealand and Australia. The main reason behind anti-nuclear activism was that Pacific islanders were afraid the radiation would have negative health effects on peoples of the region. The people of the Marshall Islands and French Polynesia have been the most directly affected by radiation, but other nations expressed great anxiety that the testing sites would leak and thus contaminate the rest of the Pacific islands¹⁰. Those fears are only now becoming justified as data from the Marshall Islands has been presented in association with claims for compensation from the United States.

I collected data on Nuclear Testing in the Marshalls as an Expert Witness to the Nuclear Claims Tribunal hearings for each of the four atolls claiming compensation for the effects of nuclear testing (Rongelap, Enewetak, Bikini and Utrik). I researched extensively in order to formulate a position paper for each compensation claim and respond to other witnesses' statements. I have been working in the Marshall Islands on food and dietary issues since the 1960s, and drew on this work to reconstruct diets as a source of ingested radiation for these Tribunal hearings.

The agency

Health transitions have been attributed to agencies, both at the macro- and micro-level, and both are involved in the Marshallese case. At the macro-level, the agent is the U.S. military, which controlled the nuclear testing programme in the Marshalls. The need for the U.S. to have a high level of strategic preparedness was strongly promulgated in Washington in the 1950s and 1960s to combat the threat of conflict with Russia and the Cold War. The Marshall Islands become part of a United Nations Strategic Trust Territory awarded to the U.S. in 1946, at their request. It stretched from Palau and Guam in the west to Truk, Ponape, and the Marshalls in the east, to provide the band of islands previously used in the 1930s by the Japanese preparatory for their attack on Pearl Harbour. The islands were considered strategic for the defence of the United States, and remain so today.

The northern Marshall Islands were chosen for the U.S. nuclear testing programme because they were situated well off-shore from U.S. mainland, and the people were not expected to raise any objections. The populations of each atoll numbered in the low hundreds. Communications in the 1950s and 1960s were strictly controlled by the U.S. military command based in Kwajalein, so that little was known about these military exercises and their effects.

While the nuclear tests may not be hazardous per se, the effects of any errors can be serious. One such error occurred on March 1, 1954 when the cloud of radioactive material resulting from a thermo-nuclear explosion over Bikini atoll, code named Bravo, drifted east and deposited radio-active debris on the inhabited atolls of Rongelap, Ailinginae, and Utrik. Serious health problems have resulted for those people ever since.

The Bikini and Enewetak populations had been moved off their home atolls in 1946 and relocated on distant atolls of Kili and Ujelan, respectively. Bikini people still cannot return to their atoll as it retains high levels of radio-activity. Yet in the 1970s, some 100 of them had been allowed to return after a peremptory clean-up by U.S.

agencies deemed levels of radio-activity to be safe. However, the peoples' body-counts were found to be unacceptably high in 1978, and they were removed to live again on Kili and elsewhere in the Marshalls. The trauma of removal for islanders was exacerbated by food shortages in their new locations, due to lack of support from Majuro (the capital of the Marshall Islands) or Washington D.C.. In their testimonies before the Nuclear Claims Tribunal in 2001 (see below), representatives of each of these communities stressed the hardships of not being able to find food, or fish, and the subsequent health problems. The Enewetak people returned to their home atoll from Ujelan in 1980 after a more thorough clean-up. However, all of the useful species of plants have failed to thrive, leaving the people almost totally dependent on purchasing food imported from the United States¹¹.

The two populations of Bikini and Enewetak have health problems that differ from those of the Rongelap and Utrik people, who have lived continuously amidst a radio-active environment. The U.S. Atomic Energy Commission (AEC) was in charge of links between the U.S. and the Marshallese people. They sub-contracted Brookhaven National Laboratory (BNL), under Dr. Conard, to assess the health of the people of Rongelap annually and the people of Utrik every three years.

Rongelap people based their claim for compensation from the U.S. (see below) largely on the resultant serious health problems. Heavy bodily contamination that resulted from living amidst and eating foods from their radio-active atoll had not previously been considered seriously by U.S. authorities. Lack of response to their repeated pleas for explanations of and assistance with their health problems led the Rongelap people to take the drastic decision of leaving their contaminated atoll in 1985. Currently they live on neighbouring Mejjatto islet in Kwajalein atoll, awaiting a thorough clean-up of their home atoll.

Utrik people have lived continuously on their atoll at the eastern end of the Bravo fallout isobar. The AEC authorities judged their atoll to have received a minimal fallout of radiation, which at the time was thought to be less harmful to health. (That view has subsequently been revised.) They were removed to Kwajalein for two months in 1954 for a battery of medical examinations, but returned in May 1954 and have lived there ever since. They have been visited every three years by the BNL medical team to check on their health.

... the people claim that their health problems are the result of residuals of fallout, and that they continue to be exposed ... They draw attention to the still births, cancers, stunted growth of children, and environmental changes that they had not known before nuclear testing.

Radio-active agents continue to contaminate the land and the plants of Rongelap and Utrik, as well as the bodies of those who reside there. The people have been told repeatedly by the health assessors that their health is good, and that they have not suffered any ill effects. However, the people claim that their health problems are the result of residuals of fallout, and that they continue to be exposed, as evidenced by their health concerns. They draw attention to the still births, cancers, stunted growth of children, and environmental changes that they had not known before nuclear testing. Yet, their voice is pitted against that of scientific bodies, such as the Atomic Energy Commission (AEC) and Brookhaven National Laboratory (BNL), that carry out the health checks. In this context, smallness is insignificant.

In the 1970s the Rongelap and Utrik people began to question the BNL reports and sought alternative assessments from Japanese doctors, and other U.S. doctors.

Their lack of trust in BNL's programme was reiterated at United Nations meetings, and more recently through their lawyers at the Compensation Hearings before the Nuclear Claims Tribunal.

The Tribunal was set up in 1987 to hear claims against the U.S. for damages and hardship caused by the nuclear testing programme. Compensation was a key point of debate during the course of the Marshall Islands government negotiations with the United States for independence throughout the early 1980s. The resulting Compact of Free Association included a specific section, Section 177, that addressed issues associated with the U.S. continued use of Kwajalein as a nuclear testing site, as well as a claims process for those affected by past nuclear testing activities. Section 177 applied only to the four northern atolls, namely Enewetak, Bikini, Rongelap, and Utrik and their populations. Specific medical monitoring and care was provided, as well as treatment for health problems. The 177 programme, as it is known, thus provides special health centres on these four northern atolls, with regular visits from BNL laboratory officials from the U.S.. They are linked to the United States rather than to the health facilities in Majuro.

The Utrik and Rongelap people question the reasons for this agency. The information they receive about their health is that it is satisfactory (i.e. they have no problems). Any suspicions of lingering radiation are considered to be all in their minds. Yet, the 177 health teams return to the atolls year after year, giving Marshallese no test results, nor allowing them to access health files. Thus, the communities are growing stronger in their demands for

specific answers about their health problems, and wish to find agencies that will provide alternative medical opinions.

At the micro-level, healthcare for the 177 populations has thus been separated from the rest of the Marshall Islands. Each of the other outer islands has a health aide responsible to the central health agency in Majuro. The health aide has only a brief period of training and relies on CB radio contact for any complications. Now that each of the outer islands has air service, evacuations are quicker than pre-1990 when the only service was by ship. Evacuations are sent to the main hospital in Majuro, or to Ebeye, if it is closer.

The health centres on these outer islands carry only rudimentary equipment (i.e. a bed, some medicines, and the health aide to administer them). The main hospital in Majuro is a very busy place and so antiquated that it is about to be replaced by a new facility provided by Japanese aid money. The hospital provides a combined doctor/medical facility, so sick patients can be seen almost any time over a 24 hour period. The hospital facility is heavily focussed on the health problems of the large urban population in Majuro, with minimal funds and support for outer island health clinics.

In contrast, the 177 populations on Utrik and Rongelap have a resident health professional, a Marshallese, who has had long term experience and on the job training from the 177 doctors, who visit the island every four to six months. He is paid from the 177 programme. He has concerns about the lack of clarity of his responsibilities. Technically he is supposed to treat only those patients who carry a card as "exposed," that is, exposed to radiation as of March 1, 1954. However, as he sees it, he cannot ignore the health concerns of other members of the community, especially the children who suffer high rates of respiratory problems. Yet, he is paid to treat only the 177 people, the 15 elderly people today who carry an "exposed" card.

The week after our visit in May a team of 177 doctors flew in to Utrik to spend the whole week examining those 15 "exposed" members. I did not witness their work, but the local Marshallese doctor told me that that team of seven or more U.S. medical personnel also attended to other sick persons. Thus, the 177 health programme expands to cover all residents on the atoll, though technically it is not supposed to do so.

Medical assessment

The people of Rongelap and Utrik have been divided into two groups for the purposes of medical assessment. Those designated by Conard et al. as "exposed" carry a red card, and those designated as "non-exposed" carry a green card. This distinction has been in place since the people returned to Utrik in 1954 and to Rongelap in 1957. The exposed community on Utrik today numbers 15 persons, with a further 10 elderly in Utrik living on Majuro or elsewhere. As "exposed" people, they are eligible for 177 medical assessment. I do not have the numbers of "exposed" currently living on Mejjatto in the Kwajalein Rongelap community.

The "exposed" group has undergone many medical examinations from March 3, 1954 to the present. There is much suspicion today regarding the ongoing and intensive medical assessments. While details of the tests and generalised results were published in annual reports by Conard et al., each report asserted that no health problems were discernibly linked to radiation exposure. The people themselves, however, became increasingly dissatisfied with the indignities they had to suffer during the medical examinations, and with not getting any test results back. So in the 1970s, they began to question and resist further examinations on the grounds that the tests were apparently not necessary.

Since 1972 the rising numbers of cancers, particularly cancer of the goitre and nodules on the goitre, have led to serious questioning of the BNL medical assessments.

The difficulties of linking these cancers to radiation exposure have been overridden, so that now some 36 types of cancer are compensable, under the Nuclear Claims Tribunal listing. It is also interesting that some patients with goitre nodules and cancers are now presenting themselves from Marshallese atoll

populations other than the 177 ones, raising questions as to whether radiation was more widespread than was first considered.

Women's reports of stillbirths and malformed fetuses were set aside at first by the authorities because they said they could not be linked with certainty to radiation. Cultural factors and deliveries beyond health facilities resulted in scepticism by medical authorities due to lack of evidence. Since the 1980s, the stillbirths have been admissible for compensation. The women refer to them as jelly babies because of their deformities, while medical authorities refer to them as hydatidiform cysts. The latter designation disassociates such phenomena from birth

The women refer to them as jelly babies because of their deformities, while medical authorities refer to them as hydatidiform cysts. The latter designation disassociates such phenomena from birth and fertility, while for the women they are traumatic realities.

and fertility, while for the women they are traumatic realities.

Reproduction in Marshall Islands society, particularly on outer islands, is a central part of life. Both women and men expect to bear a child every two years. A young woman becomes pregnant after her second or third menses, and may bear children regularly from then until her menopause (NJP fieldnotes, Wotje 1994). The result is an average of 9.2 children per woman. Of 15 extended families on Namu, I found that 6 women had produced 10 or more children (1967-8). On another atoll, Wotje, almost 30 years later (1996), I recorded reproductive histories for all women over age 32, and also asked their husbands about their numbers of children and birth order. Eighty five percent of the interviewed women had suffered one or more miscarriage, with several women having lost five or seven fetuses.

Residents on Wotje in 1954 have also suffered a high number of cancers of the goitre, thus there is suspicion that they too were affected by fall-out. These goitres have been treated, some with surgery in the U.S., but they fall beyond the specific provisions for the 177 communities.

This long lasting distinction between the exposed and unexposed populations on Rongelap and Utrik and the rest of the Marshallese population has raised many questions as to whether BNL as a medical team was conducting research or treating the peoples' medical problems arising from nuclear fall out. Because BNL did refer severe goitre cases and cancers to other medical authorities, some claim that they were treating the sick. But others claim that the research element dominates Conard et al.'s reports, thus indicating that their scientific interests predominated over the well-being of the Marshallese people per se.

Medical treatment

The BNL programme, as set out by AEC, included both assessment of medical conditions and treatment. Individuals have had thyroid nodules removed, either surgically or by laser treatment, while others received medication. Other cancers have been treated under the Section 177 Agreement for treatment of those exposed to radiation.

Over the course of the BNL annual surveys, groups of Rongelap and Utrik people have been sent to Cleveland for ultra-scanning. Another group was sent to California

for technical assessment. A young man with leukemia died in a Bethesda, Maryland hospital. These individuals were not informed as to the reasons for undertaking such a long trip. This lack of information made them very anxious and worried their families at home. Moreover, the results of the tests were not conveyed to them.

A major complaint raised by both exposed and unexposed persons is that they have never received clarification of their medical conditions, nor are their files available for scrutiny by themselves or other medical practitioners. As Kotrady argued in 1977, in a paper highly critical of the BNL medical programme, patients on mainland U.S. would never tolerate such treatment¹².

A major complaint raised by both exposed and unexposed persons is that they have never received clarification of their medical conditions, nor are their files available for scrutiny by themselves or other medical practitioners.

Today the resident 177 doctor on Utrik treats all residents, making no distinction between the exposed and unexposed card-carriers. Any serious complications, or conditions requiring surgery are sent off island, either to Ebeye or the U.S. mainland. Treatment has thus followed the structures set up for medical assessment.

Diet

Food intake as related to radiation dosages has gained recognition only in the last ten years. It is now clear that those residents on Rongelap and Utrik have been absorbing radiation through their daily ingestion of local food plants. Coconuts and breadfruit have been found to take up Strontium 90 and Cesium 137, which is then absorbed by those consuming the fruits. Children absorb these toxic elements at a rate that has serious effects on their health. These ingested sources of radiation are in addition to the background radiation that continues to exist in the soil and general environment of these atolls.

The level of exposure deemed safe for human occupation has also been a matter of considerable debate. For these two populations, ingested radiation must be added to the rate of background radiation. After much debate between health physicists, a level of 100 rem per annum has been agreed upon. But the cumulative effects of such dosages are not clear, particularly on children and reproductive women.

The people of Utrik are concerned that the breadfruit and coconut they have been eating since 1954 are contaminated and contributing to their health problems. The people see more and more groups of scientists studying their bodies and their environment, thus exacerbating their concerns that their atoll really is contaminated. In addition, it is not clear what assessment of diet

the BNL team used in their assessment of health, as their reports do not refer to diet. Both populations were warned not to eat local food immediately upon their return in 1954 and 1957, respectively. But when the USDA supplies ran out (within a year of their return), the people had no alternative but to eat local foods. They have continued to use local foods without any contrary advice from the BNL, and these factors have not been addressed in the annual BNL health reports.

For Marshallese and other Pacific peoples food is essential to their social well-being¹³. Components of dietary intake may change significantly over time, and thus are an important diagnostic tool for assessing health transitions. While obesity has been widely studied by Zimmet and others, connections between diet and cancers has not received the same attention. However, diet in this case has serious implications for the uptake of radiation, possibly leading to associated cancerous conditions. Yet that data was not recorded in the reports on the people's health.

The lack of dietary data in the BNL records has had to be rectified retrospectively. In order to calculate an approximate level of dosage from ingested radiation from 1954 to the present for the Utrik people, and between 1957 and 1985 for the Rongelap people, several reconstructions of diet have been drawn up. My own dietary records for the 1960s from Namu, a nearby atoll in the Marshalls, have contributed to this data set. The main difficulty is estimating the amount of local food consumed in proportion to purchased food, notably the amounts of rice and flour used.

Diet is thus important for management of health problems arising from exposure to radiation. Dose rates are vital to understanding both past health conditions and exposures, as well as to planning for future levels of exposure. Clean-up programmes of existing radiation must meet the accepted standard of 100 rem per person per annum. The expectation by U.S. nuclear physicists is that the people will continue to obtain 75 per cent of their dietary intake from local foods, with the balance coming from rice. That aim is basic to clean-up processes, including replanting of local food plants.

Statistics

The populations under consideration numbered in the hundreds, so are very small for statistical evaluation. For demographers and epidemiologists, the numbers falling into different age, gender or medical categories are so small as to be irrelevant for statistical testing.

Sixty four (64) people on Rongelap suffered direct exposure to fallout in March 1954, plus another 15 who were working on Ailinginae at the time of the explosion (79 in total). One hundred sixty seven (167) people on Utrik also experienced fallout, though a day after the Rongelap people, as the former atoll is farther east of Rongelap.

Over the intervening 40 + years other relatives of these people have come and gone from their home atolls, as it is the wont of Marshallese to travel frequently. There is no accurate record of those who have been resident on the two affected atolls for a given period, nor is there any record of the pattern of residency of those suffering from goitre nodules and other malignancies. (I attempted to collate population figures and changes in population size for the Nuclear Claims Tribunal hearings, but such information was imprecise). Thus, epidemiological data is sparse at best and cannot provide statistical medical evidence.

However, if the figures for occurrence of medical problems are small, does that mean they are medically insignificant?

In their distressed recall of those days in 1954, the women remain affronted today that they were told to take off their clothes and bathe naked in the lagoon, while the men watched.

Gender concerns

The health transition literature generalises changes across all sectors of the population. However, I argue that the effects on each of the genders have not been considered in depth. Significantly, women are major caretakers in Pacific communities. Any negative health events disproportionately impacting women affect the whole community. Marshallese women's concerns for their children was, and continues to be, a major reason why Rongelap people left their atoll. Women knew there was something in the environment that was causing the children's sicknesses and stunted growth. As a Rongelap midwife put it, "I'm glad to be away from the radiation but I still worry about the children. With so little fresh food, they're just not getting enough vitamins in their diet. They aren't growing well"¹³. Also, since women tend to eat last at mealtimes, feeding children and men first, their diet has had particularly deleterious effects on their health and reproduction in times of physical stress.

Both atoll populations underwent several weeks of daily examinations after their removal from their atolls to Kwajalein. In their distressed recall of those days in 1954, the women remain affronted today that they were told to take off their clothes and bathe naked in the lagoon, while the men watched. Their clothes were burned, and replaced with men's underwear, with no covering for the rest of their bodies. Additionally, physical examinations by men were culturally inappropriate by Marshallese custom.

There were no interpreters through whom the Marshallese could express their disgust. Instead, they wrote a song in Marshallese that refers to "Mr. Urine collector," "Mr, he's so close when he examines ears, eyes, nose, throat that he can almost kiss his patients, Mr. put the patients on rotating equipment, and Dr. touching and examining both internal and external parts." All these men, from Dr. Robert Conard to his staff, carried out health assessments as if Marshallese were not really people, but just "a group of guinea pigs for your government's bomb research effort," as the Rongelap Magistrate expressed in a letter dated April 9, 1975 to Robert Conard. Gender niceties were disregarded.

Effects on reproduction of both females and males are a particular concern of this case study. Exposure to radiation has notably affected women's reproduction as outlined above. Women speak graphically of sequences of still-births and miscarriages. They refer to the foetuses as jelly-babies, because they are deformed and defy recognition as human beings. As one woman expressed it, after many such experiences in the community, "we knew and expected these kinds of kids.... It was like what, like grapes. What kind of children were those that appeared"¹³. The women grieve and seek answers as to why this is occurring. Initial denial of the connection between stillbirths and radiation for compensation only served to increase the peoples' aggravation. However, this has been rectified since the Nuclear Claims Tribunal has accepted these stillbirths as compensable.

Children who were born full-term have brought the community even further distress. As Dorothy states:

"Some of the children who were born were deformed. Their arms and legs are short. Nothing covering their brains. Some were not the [offspring of] poisoned people but they were the ones who went back in 1957 and after some years they also gave birth to those kids... Some kids live for a week or so. You see their brains. Their faces are O.K. but their brains are scary. Their hands and feet come out of their torsos. They appear to be people, but they are different"¹⁴.

Catherine recalled that the baby from her first pregnancy died of a high fever, with his skin peeling off after one day of life, and her second son was delivered live, but missing the whole back of his skull - as if it had been sliced off. So the back part of the brain and the spinal cord were fully exposed. After a week, the spinal cord became detached and he, too developed a high fever and died the following day... and my son was also missing both

testicles and a penis. It was heart wrenching having to nurse my son, all the while taking care his brain didn't fall into my lap¹⁴.

Some of those children have continued to live with their deformities. Both "exposed" parents and unexposed parents continue to give birth to such deformed children. In May 2002 a child was brought to the doctor in Utrik by her young mother because of the child's lifeless condition, and because the child had a large tumour on her brain/skull. She was breathing, but vital signs were low. Yet, she was beautifully dressed and much loved. The distress crosses all generations, and both genders.

Those children that have died are buried and recalled with much love. In Marshallese view they are part of their family, even though they may have had a very short presence with other members. The women did not speak of their own role in bearing these children for nine months, only to discover the child had severe abnormalities. They spoke only of their distress for the children.

The Marshallese case study demonstrates that serious health concerns resulting from nuclear testing continue to be manifest today. It is clear that not all health transitions are for the better, as the general theory implies.

Another concern is the high number of male doctors under BNL and other medical programmes, who are called on to assess women's health problems. Under Marshallese custom it is culturally inappropriate for a man to examine a woman's genital area. Babies are delivered by local mid-wives. Thus, many female health problems have remained unexamined and untreated due to the unavailability of female medical practitioners. This problem is not confined to the Marshall Islands, but is exacerbated by the large numbers of pregnancies that many women have during their child-bearing years.

In contrast to the effects of radiation on women's reproduction, nothing is known about the effect of radiation on men's reproductive capacities. Discussions now revolve around whether or not birth problems result in part from men's genetic contribution. If genetic transfer of the effects of radio-activity on human bodies is a contributing factor, then we must ask how long these populations must continue to experience these health conditions, and whether we are doing enough to assist these families. Living on remote outer islands such as Utrik and Mejjatto for the Rongelap people, places onus on local medical agencies (whether the health aide, or the 177 doctor) to become more sensitive to Marshallese culture of reproduction and subsequent health concerns. Women health professionals would be an important first step in remedying some of the concerns.

Conclusions

The Marshallese case study demonstrates that serious health concerns resulting from nuclear testing continue to be manifest today. It is clear that not all health transitions are for the better, as the general theory implies. The cancers and birth deformities discussed here are the outcome of U.S. nuclear testing, a technologically sophisticated and very expensive programme that has left pervasive health problems in its wake. For the Marshallese people, these are not the expected outcomes of the care and responsibility due from a U.S. Trust Territory. The neglect they have suffered stands in direct contrast to the high level of military spending and the development of defensive weaponry in the region.

This example of a negative health transition in the latter half of the 20th century has drawn on five factors that are essential to assessing any transition. The role of an agency charged with responsibility for health is a vital component in understanding how that health transition is treated. The medical assessment and treatment that participants receive may bring either a positive or negative outcome; diet must be considered as integral to any assessment. Statistics in small Pacific communities are fraught with difficulties for analysis and require adjustments. The place of gender relations within the cultural setting is also an important indicator of health outcomes. But all these aspects of a transition must be assessed within their social context. The health outcomes for these two Marshallese communities have been nasty and brutish. If the data now available can prevent other such negative transitions, then some good may come of their loss and suffering. However, the Marshallese still have to live with the negative health consequences for several generations to come.

References

1. Omran, T. The epidemiologic transition: a theory of the epidemiology of population change. *Millbank Memorial Fund* 49(4):509-537, 1971.
2. Barrett, Ronald et al. Emerging and re-emerging infectious diseases: the third epidemiologic transition, in *Annual Review of Anthropology* 27:247-71, 2002.
3. May, Robert, Changing Diseases in changing environments. In B., Cartledge, editor *Health and Environment*. Oxford University Press, Oxford. Pp. 150-171 , 1984.
4. Garrett, Louise. *The Coming Plague*. New York: Penguin. 1994.
5. Moorehead, Alan. *The Fatal Impact*. London: Penguin. 1966.
6. Miles, John. *Infectious Diseases: Colonising the Pacific*. Dunedin: Univ. of Otago Press. 1997.
7. Zimmet, P. and H. King. The epidemiology of diabetes mellitus. *The Diabetes Annual* 1:1-15. 1985.
8. Dowse, G.K. and H. King. Obesity in Pacific populations, in *Pacific Health Dialog* 32(1):77-86, 1996.
9. Pollock, Nancy J. Large Body Size - a Polynesian perspective. *Proceedings of Atherosclerosis Congress*, Salzburg 2002.
10. Pollock, Nancy J. The Marshall Islanders, in *Endangered Peoples of Oceania*, J. Fitzpatrick, editor. Westport, Conn: Westwood Press. 2001.
11. Pollock, Nancy J. *These Roots Remain*. Hawaii: Institute for Polynesian Studies and University of Hawaii Press, 1992.
12. Kotrady, K. The Brookhaven medical program to detect radiation effects in Marshallese people. Unpublished paper. Cited in Dibblin, J. *Day of Two Suns*. Virago Press, 1988, p.74.
13. Cited in Dibblin, Jane, *Day of Two Suns*, Virago Press 1988, p.74.
14. Cited in Johnston, Barbara Rose and Holly Barker's testimony to the Nuclear Claims Tribunal, Sept. 17, 2001. Pp. 42-53. ■

It is not the crook in the modern business that we fear, but
the honest man who doesn't know what he is doing.

Owen D. Young